FACILITATING PHYSICAL ACTIVITY ENGAGEMENT DURING THE EARLY RECOVERY PERIOD FOLLOWING CORONARY ARTERY BYPASS GRAFT SURGERY

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ABSTRACT

Background: Physical activity engagement during the first three months following coronary artery bypass graft (CABG) surgery has many benefits but there are also barriers. Benefits include counteracting peri-operative deconditioning and enhancing functional recovery, both of which enable earlier return to activities of importance. Potential barriers include physical symptoms such as pain and fatigue and psychological barriers such as fear and uncertainty. For many people following hospital discharge, there is a period of weeks to months where they are required to self-manage their physical activity engagement before further support from health professionals can be accessed at outpatient cardiac rehabilitation. Those unable to access cardiac rehabilitation may never receive any further support for return to participation in physical activity following their hospital discharge. There is therefore a need for health professionals to optimally prepare people for physical activity prior to discharge, and to provide appropriate follow up support during the weeks following hospital discharge. However, current cardiac rehabilitation guidelines provide little information about how health professionals can optimally prepare and support people to engage in physical activity during the early recovery period following CABG surgery. Having a better understanding of people’s experiences of engaging in physical activity, including barriers and facilitators, during the initial weeks and months following CABG surgery will enable health professionals to develop clinical services that optimally prepare and support physical activity engagement.

Aim: The aim of the thesis was to develop a programme to facilitate people to engage in physical activity during the first three months following CABG surgery.

Methods: To address the aim, the adapted Medical Research Council Framework for developing health interventions was utilised to inform the design of a series of investigations that led to the programme development. Initially, a systematic review of the literature was undertaken to explore physical activity engagement during the first three months following CABG surgery. This review explored factors influencing physical activity, as well as the amount and type of physical activity engaged in. A prospective observational study was then undertaken to gain a greater understanding of people’s perspectives and experiences of engaging in physical activity during this time. This step was followed by a survey of current
practice at hospitals across New Zealand to: 1) benchmark current practice regarding preparation and support for physical activity following CABG surgery and 2) determine if the preparation and support received met the needs of people undergoing CABG surgery. The final step involved the programme development which was undertaken through a series of consultations with stakeholders (former recipients of CABG surgery and health professionals). The programme development process followed the Behaviour Change Wheel method for designing interventions and was also informed by self-management principles, Ryan and Deci’s Theory of Self-Determination and Bandura’s Self-Efficacy Theory. Modelling of the programme design was undertaken using the Behaviour Change Wheel method for designing interventions.

**Results:** From the systematic review a range of physical (for example pain and fatigue), psychological (for example, fear and uncertainty) and environmental (for example weather) barriers to physical activity during the first three months following CABG surgery were identified. However, many of these barriers were not described in depth or were supported by low quality evidence. In addition, the review revealed little information about facilitators to physical activity engagement. The observational study built on the findings of this review by providing greater insight into how these barriers change over time and identifying additional facilitators to physical activity, such as support, self-motivation and sources of self-efficacy. The findings also provided insight into the relationships between many of these barriers and facilitators, for example the presence of fear and uncertainty resulted in feeling cautious and created a need for support. Outcomes from the survey study enabled a benchmark for current practice to be established and identified areas for potential improvement of clinical practice in this area. For example, addressing barriers to physical activity and the use of strategies such as problem solving to overcome such challenges were infrequently utilised in standard clinical practice. The final study resulted in the development of a programme that included both tailored preparation prior to discharge and individualised support from health professionals following discharge. As well, by taking into account participants’ feedback regarding their needs and preferences, two illustrated resource booklets were developed to support the delivery of the programme to patients.

**Conclusion:** Return to physical activity during the first three months following CABG surgery is difficult, with many physical and psychological barriers for people to overcome. There is thus an opportunity for health professionals to improve clinical practice to better
prepare and support people who have had CABG surgery to engage in physical activity during the first three months. The programme and supporting written materials produced as an outcome from this thesis, together have the potential to facilitate people to self-manage their engagement in physical activity during the first three months following CABG surgery. The next stage in the research journey would be to undertake a feasibility study and randomised controlled trial to test the feasibility and effectiveness of the programme in the clinical setting.
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RESEARCH OUTPUTS

Publication


Conference presentations


Associated outputs

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<tr>
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<tbody>
<tr>
<td>ACSM</td>
<td>American College of Sports Medicine</td>
</tr>
<tr>
<td>ADLs</td>
<td>Activities of daily living</td>
</tr>
<tr>
<td>APEASE</td>
<td>Affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety, equity</td>
</tr>
<tr>
<td>BCTs</td>
<td>Behaviour change techniques</td>
</tr>
<tr>
<td>BCW</td>
<td>Behaviour change wheel</td>
</tr>
<tr>
<td>BMI</td>
<td>Body mass index</td>
</tr>
<tr>
<td>CABG</td>
<td>Coronary artery bypass graft</td>
</tr>
<tr>
<td>CAD</td>
<td>Coronary artery disease</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>CINAHL</td>
<td>Cumulative Index of Nursing and Allied Health</td>
</tr>
<tr>
<td>CG</td>
<td>Control group</td>
</tr>
<tr>
<td>cm</td>
<td>Centimetre</td>
</tr>
<tr>
<td>CSES</td>
<td>Cardiac Self Efficacy Scale</td>
</tr>
<tr>
<td>DHB</td>
<td>District health board</td>
</tr>
<tr>
<td>DVTs</td>
<td>Deep vein thromboses</td>
</tr>
<tr>
<td>HR_max</td>
<td>Maximum heart rate</td>
</tr>
<tr>
<td>HPP</td>
<td>Health professional participant</td>
</tr>
<tr>
<td>IG</td>
<td>Intervention group</td>
</tr>
<tr>
<td>JBI</td>
<td>Joanna Briggs Institute</td>
</tr>
<tr>
<td>kg</td>
<td>Kilogram</td>
</tr>
<tr>
<td>KYMITT</td>
<td>Keep Your Move in the Tube</td>
</tr>
<tr>
<td>MI</td>
<td>Myocardial infarction</td>
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<tr>
<td>MMAT</td>
<td>Mixed Methods Assessment Tool</td>
</tr>
<tr>
<td>MOS SF-36</td>
<td>Medical outcomes study 36-item short-form health survey</td>
</tr>
<tr>
<td>MRC</td>
<td>Medical Research Council</td>
</tr>
<tr>
<td>aMRC</td>
<td>Adapted Medical Research Council</td>
</tr>
<tr>
<td>MVPA</td>
<td>Moderate to vigorous physical activity</td>
</tr>
<tr>
<td>NS</td>
<td>Not significant</td>
</tr>
<tr>
<td>NZ</td>
<td>New Zealand</td>
</tr>
<tr>
<td>OR</td>
<td>Odds ratio</td>
</tr>
<tr>
<td>RCT</td>
<td>Randomised controlled trial</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>-------------</td>
<td>-----------</td>
</tr>
<tr>
<td>RPE</td>
<td>Rate of perceived exertion</td>
</tr>
<tr>
<td>RM</td>
<td>Repetition maximum</td>
</tr>
<tr>
<td>RR</td>
<td>Risk ratio</td>
</tr>
<tr>
<td>SD</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>SMS</td>
<td>Self-management support</td>
</tr>
<tr>
<td>SDT</td>
<td>Self-determination theory</td>
</tr>
<tr>
<td>TDF</td>
<td>Theoretical domains framework</td>
</tr>
<tr>
<td>T2DM</td>
<td>Type II diabetes mellitus</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>VO$_{2\text{max}}$</td>
<td>Maximal oxygen consumption</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
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CHAPTER 1 : INTRODUCTION

1.1 Prologue

This chapter provides the background to the thesis and summarises key concepts relating to supporting people to engage in physical activity during the first three months following coronary artery bypass graft (CABG) surgery. The rational for the thesis is built around the aim to develop an intervention that facilitates physical activity engagement during the first three months following CABG surgery. The specific thesis objectives and the way in which the thesis will achieve its overall aim are then described.

1.2 Background

1.2.1 Coronary artery disease

Coronary artery disease (CAD) is a type of cardiovascular disease that affects the coronary blood vessels. According to the World Health Organization (WHO), CAD is the leading cause of death worldwide, representing 16% of global deaths in 2019.¹ The 2018/2019 Ministry of Health survey found that 4.3% of the New Zealand (NZ) adult population - an estimated 168,000 people - were living with CAD. The survey also reported socioeconomic inequalities in relation to those affected by CAD, with significantly higher prevalence in Māori compared to non-Māori, and in the most deprived compared to least deprived populations (adjusted ratios 1.66 and 2.27 respectively).²

Risk factors for the development of CAD are classified as non-modifiable (age, sex, family history and genetic factors), and modifiable (smoking, hypertension, dyslipidaemia, unhealthy diet, physical inactivity, obesity, and diabetes mellitus). The study by Erhardt et al. (2007) published more than a decade ago, showed that management of a single risk factor is less effective at reducing the risk of CAD than managing multiple risk factors.³ Current clinical practice guidelines continue to stress the importance of optimising the management of each risk factor to prevent, or manage CAD.⁴ ⁵
1.2.2 Coronary artery bypass graft surgery

Coronary artery bypass graft (CABG) surgery is open heart surgery that is performed on people with advanced coronary artery disease, who have either had a previous myocardial infarction (MI), or who are at significant risk of having a MI in the future. CABG surgery is defined as “open-heart surgery in which a section of a blood vessel is grafted from the aorta to the coronary artery to bypass the blocked section of a coronary artery and improve the blood supply to the heart.”(p.1) Access to the heart is via a midline incision through the sternum, which is subsequently wired back together at the end of the surgery. Grafted blood vessels are either arterial grafts (such as the internal thoracic or radial artery) or vein grafts (most commonly the long saphenous vein). By restoring blood supply to the myocardium, CABG surgery reduces myocardial ischaemia, thereby reducing exertional related angina and/or dyspnoea as well as the risk of MI.

CABG surgery is the revascularisation procedure of choice for unstable CAD when there is either multi-vessel disease or the blockages in the arteries are not amenable to the less invasive revascularisation procedure, percutaneous coronary intervention (PCI). According to data from the United States of America (USA), between 2003 and 2018 the number of CABG surgeries and PCI’s performed declined by 43% and 40% respectively. This decline has been attributed to, at least partly, by the introduction of statins as part of the medical management of CAD. However, CAD remains the leading cause of death worldwide, and therefore revascularisation procedures, including CABG surgery, continue to be required. According to the most recent NZ Cardiac Surgery Report, 1,235 CABG surgeries were performed in public hospitals in NZ in 2018. Following CABG surgery, patients typically have an in-hospital stay of six days followed by a two to six month recovery period.

1.2.3 Physical activity following CABG surgery

Engagement in physical activity in the long term, as part of comprehensive secondary prevention management following CABG surgery, is important to 1) manage CAD risk factors and thus limit future progression of CAD; 2) reduce risk of future major adverse cardiac events; and 3) reduce risk of both all-cause and CAD-related mortality. Physical activity engagement during the early recovery period has also been shown to have
short term benefits following CABG surgery. Indeed, physical activity engagement during the first three months has been shown to result in improved physical, psychological and health-related quality of life outcomes. Further description of the benefits of physical activity following CABG surgery is found in Chapter 2, section 2.4.

Immediately following CABG surgery, both physical function (the ability or capacity to perform physical activity), and physical activity levels (the actual behaviour of engaging in physical activity), decline markedly compared to pre-operative levels. While there can be considerable variation in individual recovery trajectories, it has been shown that, the majority of the recovery of physical function generally takes place during the first three months following CABG surgery, with smaller improvements between three and 12 months. Similarly, the majority of improvement in physical activity levels has also been shown to occur during the first three months following CABG surgery, with the findings from the study by Miller et al. (2007) indicating the largest increase occurs between discharge and six weeks post-operative.

While there are many reasons for people who have had CABG surgery to engage in physical activity, there are also many potential barriers, especially during the first few months. Barnason et al. (2012) undertook an integrative review of literature published between 1995 and 2009 about the trajectory of patient recovery during the first year after hospitalisation for acute cardiac events. For those patients who had had cardiac surgery, symptoms reported following discharge from hospital were both physical (including pain, fatigue, shortness of breath, palpitations, loss of appetite and swelling of the lower limbs) and psychosocial (such as depression and anxiety). All these symptoms have the ability to impact on people’s ability to engage in physical activity following CABG surgery, especially during the first three months when the symptom burden is highest. Few published studies have however explored in depth the range of factors that impact on people’s physical activity engagement in the first three months after surgery. Having an understanding of the potential factors that impact on physical activity during the early recovery period following CABG surgery is important for health professionals to optimally prepare and support people for discharge from hospital.
To support people to return to normal functioning, self-manage their condition and engage in healthy lifestyle behaviours (including physical activity) following CABG surgery, best practice guidelines state patients should be provided with a referral to attend a cardiac rehabilitation programme. Yet there can be a considerable gap of weeks to months between the time of hospital discharge and initiation of cardiac rehabilitation. In a survey by Roxburgh et al. (2019) that examined the nature and delivery of cardiac rehabilitation programmes in NZ, the mean reported time from hospital discharge to first visit at cardiac rehabilitation was 3.25 weeks. However, this study included patients who were post-MI, or had percutaneous coronary intervention, as well as those post cardiac surgery. The time delay before commencing cardiac rehabilitation following cardiac surgery may be longer than for MI or percutaneous coronary interventions due to the increased time required for wound healing. Furthermore, once back home the health professional that patients are most likely to see is a general practitioner. Research has shown that physical activity engagement following a coronary event is not commonly addressed in depth by general practitioners. Therefore, following CABG surgery, most people will likely be required to self-manage their physical activity engagement without the support of a health professional during the time between hospital discharge and initiation of outpatient cardiac rehabilitation.

It is also important to note that not everyone has access to cardiac rehabilitation following CABG surgery. Access to hospital-based cardiac rehabilitation programmes can be limited due to a range of factors including low referral rates and lack of transport or distance. To address such inequities in access, some cardiac rehabilitation guidelines suggest implementation of alternative modes of delivery, such as home-based or telehealth services. In the survey by Roxburgh et al. (2019), only 27% of cardiac rehabilitation programmes in NZ and 17% of programmes in selected higher income countries offered home based alternatives. These findings indicate that a large proportion of people are required to self-manage their engagement in physical activity without the support of health professionals, not only for the initial weeks following discharge, but potentially indefinitely. This highlights the importance of making the most of interactions health professionals have with patients prior to their hospital discharge in order to prepare them for physical activity engagement in the short term, but potentially for the long term as well.
Because of the potential need for people to self-manage their physical activity engagement following discharge, services delivered by health professionals that aim to transition people from the acute inpatient environment to continuing their cardiac rehabilitation, while recovering at home, is required. The literature however, lacks comprehensive guidelines on ways to provide such services for people following CABG surgery. Several published cardiac rehabilitation guidelines include advice regarding tailoring interventions for various populations, including those who have had CABG surgery, but none of the guidelines provide specific information regarding how to prepare and support people to engage in physical activity during the transition period following hospital discharge. For example, the 2020 European Association of Cardiovascular Prevention and Rehabilitation position paper includes statements such as: “physical activity counseling should be offered taking into account wound healing and exercise capacity”; and “in-patient and/or out-patient exercise training programmes immediately after discharge from surgery facilities are advisable” (p. 11). A limitation of the position paper is that it does not go on to describe how to approach physical activity counseling or what specific factors impacting the post-operative recovery need to be considered when counseling patients about physical activity engagement. In addition, only a small number studies have previously investigated the effectiveness of psychosocial interventions designed to increase physical activity engagement, during the first three months following CABG surgery, outside of the supervised outpatient cardiac rehabilitation setting. There is therefore a need for further research into the requirements for preparation and support required for people who have had CABG surgery to engage in physical activity. Such knowledge will contribute towards more comprehensive guidelines regarding how health professionals can support people to engage in physical activity during the initial months following hospital discharge.

1.3 Rationale for the thesis

As stated in the section above, engagement in physical activity during the early recovery period following CABG surgery has many benefits, including enabling the person to return to meaningful and important activities of daily living (ADLs). However, there are many potential barriers that people have to overcome when engaging in physical activity during the first few months following CABG surgery. There is a lack of specific guidance in cardiac
rehabilitation guidelines and the literature about how to support people to engage in physical activity during the initial weeks and months post-CABG surgery. Such guidance will enable health professionals to optimally prepare and support people to engage in physical activity during the early recovery period following CABG surgery. This thesis focused on supporting physical activity during the first three months following CABG surgery for the following reasons:

1) The majority of recovery of physical function and physical activity takes place during the first three months; 2) Post-operative symptoms have their highest burden during the first three months; 3) This covers the time period of upper limb sternal precautions, which are typically advised for up to eight weeks post-sternotomy.

The rationale for this thesis, including the current gaps in the literature, is summarised in Figure 1.1.

1.4 Overall aim of the thesis

The overall aim of this thesis was to develop a psychosocial programme that aimed to equip people with the knowledge, skills, and support to engage in physical activity during the first three months following CABG surgery.

1.5 Framework utilised to achieve the thesis aim

The Medical Research Council (MRC) framework for the development and evaluation of complex interventions as described by Bleijenberg et al. (2018) was selected as the framework to inform the development of the programme. The original MRC framework was developed in 2000 with the intention of increasing the effectiveness of interventions and improving the evaluation process of such interventions. In 2008, the original MRC framework were subsequently revised to include additional recommendations to the evaluative aspects of the framework, for example paying more attention to piloting and having a less linear model in the evaluation process. The 2000 and 2008 versions of the MRC framework included three elements for the intervention development phase: systematically identifying the evidence, identifying or developing theory, and modelling process and outcomes. In 2018, Bleijenberg et al. published an adaptation of the MRC
framework which included an additional three elements: problem identification and definition, determine the needs, and examine current practice and context.\textsuperscript{48} Figure 1.2 shows the six components of the adapted MRC (aMRC) framework. The framework represents an iterative process, whereby several studies may be utilised to address each element. As well, a single study may address several of the elements outlined in the framework. Addressing the various elements through different studies provides triangulation, which enables greater ability to fill knowledge gaps as well as increased confidence in the findings relating to each element.\textsuperscript{48}

1.6 Specific objectives of the thesis

To achieve the overall aim of the thesis, a series of four investigations was carried out to address research questions specific to the thesis aim and at the same time to address specific stages of the aMRC framework. The specific objectives of each investigation is outlined below. In addition, the way each study contributes to the various aMRC framework elements for the programme development and addresses the knowledge gaps is outlined in Table 1.1.

1.6.1 Narrative literature review

Chapter 2 is a narrative literature review expanding on concepts introduced in this chapter to further describe the benefit of physical activity following CABG surgery, as well as the safety of engaging in exercise during the first three months. This review also contains a description of published literature on facilitating behaviour change and self-management in populations with CAD in general, and more specifically for those following CABG surgery. Finally in this chapter the knowledge gaps relating to the implementation of behaviour change and self-management support strategies to facilitate physical activity during the early recovery period following CABG surgery were identified.
What is known:

- The majority of the recovery of function and return to PA takes place during the first three months following CABG surgery.
- Engagement in PA during the first three months following CABG surgery results in improved physical, psychological and quality of life outcomes.
- Best practice guidelines recommend people are referred to outpatient cardiac rehabilitation to improve outcomes following CABG surgery.
- Facilitating self-management and behaviour change for healthy lifestyle behaviours (including PA) are core principles of cardiac rehabilitation.

The problem:

- There are many potential barriers to PA during the first three months following CABG surgery.
- Due to low cardiac rehabilitation attendance rates, most people are required to self-manage their engagement in PA following discharge from hospital without support or guidance from health professionals.
- Few studies have explored the application or effectiveness of self-management and behaviour change principles to facilitate PA following CABG surgery.
- There are currently no clear guidelines in the literature regarding how to prepare and support people to engage in PA following CABG surgery.

What is not known:

- The nature and extent of barriers and facilitators to PA engagement during the first three months following CABG surgery is largely unknown.
- The current practice regarding how hospital services prepare and support people to engage in PA is largely unknown.
- It remains unknown how to optimally prepare and support people who have had CABG surgery to self-manage their engagement in PA during the first three months following their hospital discharge.

Figure 1.1 Rationale for the thesis. PA = physical activity; CABG = coronary artery bypass graft.
1.6.2 Engagement in physical activity during the first three months following CABG surgery – a mixed methods systematic review

Chapter 3 reports on a systematic review which provides the foundation for an understanding of the current knowledge (including identification of any knowledge gaps) contained in the literature regarding physical activity engagement following CABG surgery. The specific objectives of the chapter were to conduct a systematic review of the literature to:
1) Identify barriers and facilitators to physical activity engagement during the first three months following CABG surgery;

2) Determine the amount and type of physical activity that people typically engage in during the first three months following CABG surgery.

1.6.3 People’s perceptions and experiences of engaging in physical activity during the first three months following CABG surgery – an observational mixed methods study

Chapter 4 describes a mixed methods study that investigated people’s perceptions and experiences of engaging in physical activity to provide an understanding of the various factors that impact on physical activity engagement and how these factors inter-relate. The specific objective of the chapter was to:

- Explore people’s perceptions and experiences of engaging in physical activity during the first three months following CABG surgery.

1.6.4 Preparing and supporting people to engage in physical activity following CABG surgery – a survey of current practice in New Zealand

Chapter 5 describes a survey which provided an overview of current practice and services in NZ hospitals in relation to their preparation and support for people to engage in physical activity following CABG surgery. The specific objective of the chapter was to:

- Determine the current practices of hospital services in NZ for preparing and supporting people who have had CABG surgery to engage in physical activity following their discharge from hospital.
Table 1.1 Contributions of each chapter within the thesis to the adapted Medical Research Council framework for programme development elements and to address knowledge gaps

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<tr>
<th>Study</th>
<th>aMRC framework elements</th>
<th>Knowledge gaps from the literature</th>
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aMRC = adapted Medical Research Council
1.6.5 Development of a programme that aims to prepare and support people who have had CABG surgery to engage in physical activity during the first three months following hospital discharge

In Chapter 6, consultation with end users (both health professionals and people who have previously had CABG surgery) was undertaken to develop a programme that aims to prepare and support people to engage in physical activity during the first three months following CABG surgery. The specific objectives of this chapter were to:

1) Determine the need and capacity for the programme, including identification of target behaviours and exploration of the clinical context in which the programme will be delivered;

2) Identify potential strategies and techniques to enhance capability, opportunity and motivation for people to engage in physical activity during the first three months following CABG surgery;

3) Determine the preferences of end users for intervention components to include, and the mode of delivery of the programme;

4) Develop a programme framework and resources to support the delivery of the programme.

1.6.6 General summary and conclusions

Chapter 7 consists of a general discussion which draws together the main findings of the individual studies undertaken within the thesis and discusses their implications for future research and clinical practice. The objectives of this chapter were to:

1) Summarise and integrate the findings of the individual studies within the context of the thesis and describe their contributions to the programme development based on the aMRC framework;

2) Discuss the findings of the thesis and propose possible implications in relation to their integration into clinical practice;

3) Describe the strengths and acknowledge the limitations of the thesis;

4) Recommend future directions for research arising from the findings in the thesis.
1.7 Significance of the research

This thesis is an original piece of work that contributes to the science of physiotherapy, specifically in three main areas within the field of cardiac rehabilitation. Firstly, it provides greater insight into the factors that impact on physical activity following CABG surgery. Secondly, it establishes a benchmark for current practice for the way in which people who have had CABG surgery are prepared and supported to engage in physical activity following hospital discharge. Thirdly, through the development of the intervention it identifies potential guidelines for key strategies and techniques that can be used to prepare and support people to self-manage their engagement in physical activity during the initial months following discharge from hospital.
CHAPTER 2: NARRATIVE LITERATURE REVIEW

2.1 Prologue

This chapter expands on the overview in Chapter 1 by providing an in-depth description of the literature regarding physical activity for cardiovascular disease and specifically following CABG surgery. The chapter also provides a description of the potential for the use of behaviour change and self-management strategies to facilitate physical activity during the early recovery period following CABG surgery. Finally, the chapter includes a critical review of psychosocial interventions in the published literature that have aimed to increase physical activity during the first three months following CABG surgery.

Studies included in Sections 2.4 to 2.10 exploring the benefits of physical activity in populations with CAD (including those post-CABG), factors influencing physical activity after CABG surgery, and the utilisation of behaviour change and self-management strategies to increase physical activity engagement in populations with CAD were identified by conducting a search in Scopus and PubMed using relevant search terms. The most recent systematic reviews and/or key international statements were identified, from which individual studies relevant to the topic were then identified and explored. The studies included in Section 2.11 were identified by a systematic review that was conducted by our research team in parallel to the current thesis. Further details of the search strategy and processes utilised to identify these studies are included in 2.11.

2.2 Operational terms for and measurement of physical activity

The term ‘physical activity’ refers to “any bodily movement produced by skeletal muscles that results in energy expenditure beyond resting” (p.126) and includes both activities of daily living and exercise. ‘Exercise’ is a subset of physical activity that is defined as “planned, structured, repetitive and purposeful” (p.128) movement with the goal of maintaining or improving physical fitness. Throughout this thesis, the term ‘physical activity’ will refer to any bodily movement, and thus includes both engagement in ADLs, leisure activities and exercise. Use of the term ‘exercise’ will refer solely to the subset of the broader term ‘physical activity’ as defined above.
Physical activity can be measured subjectively (for example, questionnaires, diaries or interviews) or objectively (for example accelerometers and pedometers). While subjective measures of physical activity have advantages over objective measures such as being low cost and having a low participant burden, they also have many disadvantages, including recall and response bias. Indeed it has been shown that people can both over- and underestimate their physical activity levels in self-reported questionnaires. A systematic review published in 2008 showed that the correlation between self-reported and objectively measured physical activity varied widely, with correlations ranging between -0.71 and 0.98. As a result of such findings, it is widely accepted that objective measures of physical activity are more reliable than subjective measures. However it is important to note that objective measures have their own limitations such as the inability to capture various types of physical activity, for example upper limb activities and swimming, high cost and requiring high levels of participant adherence to wearing the physical activity monitoring device.

### 2.3 Physical activity for health

Engagement in physical activity provides many health benefits, and has been shown to improve quality of life and reduce the risk of all-cause mortality. To gain these benefits, the WHO recommends that all adults (>17 years of age) engage in at least 150 – 300 minutes of moderate intensity exercise per week or 75 – 150 minutes of vigorous intensity exercise per week (or an equivalent combination of the two); and resistance exercises of the major muscle groups at least two times per week. Limiting time spent being sedentary (defined as “any waking behaviour characterized by an energy expenditure < 1.5 metabolic equivalents (METs), while in a sitting, reclining or lying posture” (p.9)) is also recommended. If high levels of sedentary behaviour cannot be avoided, due to having a sedentary occupation, for example, the WHO has recommended that adults do more than the recommended duration of moderate- to vigorous-intensity physical activity to combat the detrimental effects of being sedentary. Evidence suggests, however, that even small amounts of physical activity below the recommended levels are associated with significant health benefits including a reduction in both all-cause mortality and cardiovascular disease associated mortality. Indeed, a systematic review undertaken by Warburton et al. (2017), noted that while health benefits increased with increasing physical activity levels, in many studies the greatest reductions in relative risk of morbidity and mortality were seen
when people moved from being sedentary to engaging in some physical activity below the recommended levels. The WHO recommendations therefore acknowledge that in regard to health benefits, doing some physical activity is better than doing none.

2.4 Physical activity and coronary artery disease

Both the inverse correlation between physical activity and risk of CAD and direct correlation between sedentary behaviour and risk of CAD have been known for over six decades. In the seminal study by Morris et al. (1953), they found that sedentary workers such as bus drivers and telephonists had a higher incidence of coronary events compared to their more physically active counterparts, conductors and postmen. The contribution of physical activity to the prevention and/or management of CAD is multifactorial. Physical activity has been shown to improve lipid profiles and reduce blood pressure, body weight and risk of type 2 diabetes mellitus (T2DM) hence lowering the risk of the development or progression of CAD. In contrast, sedentary behaviour has been positively correlated with the development of major risk factors for CAD. Indeed physical activity has been described as a “polypill” (p.333) for CAD due to its ability to positively reduce more CAD risk factors (albeit more modestly) than any currently available pharmacological agent. Thus physical activity is listed as a class I recommendation for the therapeutic management of CAD.

2.5 Benefits of physical activity following coronary artery bypass graft surgery

Due to the progressive nature of cardiovascular disease, CABG surgery is not a permanent cure for CAD. Atherosclerotic plaques can continue to build up in both the native coronary arteries and the grafted blood vessels. Indeed, a study investigating the patency of saphenous vein grafts found, that at an average of 7.7 years post-CABG 19.7% of grafts were at least 70% occluded. Fitzgibbon et al. (1996) found that at 15 years post-CABG, only 19% of grafts did not show any angiographic evidence of atherosclerotic lesions and 50% of the grafts were completely occluded. Thus a proportion of patients within the second decade following the initial CABG surgery require repeat revascularisation surgery. In a study by Carey et al. (1992) that followed 2,479 people post-CABG, reported reoperation rates at 15 years were 26% for those aged 49 years or less, 15% for those aged 50-59 years, 5% for those aged 60-69 years and 7% for those aged 70 years or older. Therefore, optimisation of
secondary prevention measures, including physical activity engagement, is required following CABG surgery, to reduce the need for repeat revascularisation procedures, and reduce the risk of long term mortality in these patients.\textsuperscript{11,13} Indeed, studies that have reported a reduction in mortality with increased physical activity levels in populations with CAD have included participants, who have had a history of CABG surgery.\textsuperscript{14,15} Engagement in exercise in the medium to long-term following CABG surgery has also shown to significantly improve physical function,\textsuperscript{73,74} quality of life,\textsuperscript{73} engagement in household and leisure activities\textsuperscript{75} and reduce fear of activity.\textsuperscript{75} It is for these reasons that the current European Society of Cardiology Guidelines on Myocardial Revascularisation (2014) include a Class 1 Level A recommendation that all patients be advised on lifestyle changes, including engagement in regular physical activity, as part of the long term management following myocardial revascularisation procedures.\textsuperscript{37}

Engagement in physical activity from the first postoperative day (Day one) following CABG surgery is advised to provide short term health and quality of life benefits. Firstly, progressive engagement in physical activity is required during the first few months after CABG surgery, to assist individuals to gradually return to daily activities, including social, vocational and recreational activities.\textsuperscript{76,77} Participation in such activities contributes to the enhancement of quality of life.\textsuperscript{21} Indeed, engagement in physical activity during the first three months following CABG surgery has been shown to result in significant improvements in both quality of life\textsuperscript{20,78} and psychological well-being.\textsuperscript{19}

Secondly, exercise training commenced during the first three months following CABG surgery has been shown to restore physical function.\textsuperscript{18,20} A key way that exercise restores physical function after CABG surgery is by improving aerobic capacity,\textsuperscript{79} with a number of studies showing that exercise training during the first three months results in significant improvements in peak oxygen consumption,\textsuperscript{17,20,80,81} anaerobic threshold,\textsuperscript{80} left ventricular ejection fraction and peripheral blood flow during exercise,\textsuperscript{82} and walking distance.\textsuperscript{83,84}

Another way physical activity engagement may restore physical function is through the restoration of lean tissue mass. Boujemaa et al. (2020) demonstrated that lean tissue mass significantly decreased by 1.9 kilograms (kg) (standard deviation (SD) = 2.5; p<0.05) within three weeks of CABG surgery. The lean tissue mass loss was associated with reduced aerobic capacity (r=0.59-0.61, p<0.05).\textsuperscript{85} In an earlier study Hansen et al. (2015) observed mean loss
of whole body lean tissue mass of 1.9 kg (p<0.01) at 23-25 days post-CABG surgery, with more severe absolute reductions experienced by younger participants (β =0.68, p<0.01). While both Hansen et al. (2015) and Boujemaa et al. (2020) observed lean tissue mass losses in the arms and legs, Miller et al. (2007) observed significant losses in the arms, but not legs, at three months post-CABG. This difference may be explained by the difference in the measurement timepoint, whereby lower limb tissue mass loss may be restored by three months, whereas such losses may persist for longer in the upper limbs.

While the exact aetiology of post-surgical reductions in muscle mass remains unknown, such losses are likely due to the rapid decline in protein synthesis rates (approximately 36%) during the first four hours after surgery. The decline in protein synthesis can be explained by the physiological and metabolic surgical induced stress response, and endocrine hormone disturbances. Indeed, Hansen et al. (2015) found a significant correlation between lean tissue mass loss and elevated blood cortisol/testosterone ratios, which was caused by reductions in testosterone levels (β =0.64, p<0.01). Low physical activity levels both pre and post-operatively also likely contribute to this deconditioning.

Loss of lean tissue mass is associated with the development of insulin resistance, decreased strength and functional capacity, and elevated risk of mortality. In addition, low muscle strength and frailty have been associated with poorer outcomes following cardiac surgery. Therefore, purposeful engagement in exercise during the initial weeks and months following CABG surgery may help to counteract these deconditioning responses. Such interventions should include resistance exercise, given that resistance exercises are more strongly associated with hypertrophy and increases in strength compared to endurance exercise. The findings from Miller et al. (2007) suggest that the arms in particular should be targeted with resistance exercises post-CABG surgery.

In a systematic review by Pengelley et al. (2019), there was a trend for improved physical and functional recovery post-cardiac surgery when resistance exercise was added to aerobic exercise compared to aerobic exercise alone, though this finding was not statistically significant. However, only five of the included 18 studies implemented resistance exercise prior to three months post-surgery and included a comparison group by which the effectiveness of resistance training could be observed. All five studies happened to be conducted with participants following CABG surgery. Two studies compared the
effectiveness of aerobic versus strength training. In the first study, by Ghroubi et al. 2013, low intensity lower limb resistance training (20-30% of peak torque) was compared to aerobic training (cycling at 70% heart rate reserve) commenced 8–12 weeks post CABG surgery. The authors found that both the aerobic and strength training groups had: 1) significant reductions in resting heart rate and systolic blood pressure, and exercise heart rate, systolic and diastolic blood pressure during submaximal exercise; and 2) significant improvements in maximal power, six-minute walking distance and health related quality of life. In addition, strength training had significantly greater improvements in maximal oxygen consumption (VO$_{2\text{max}}$) (p<0.01), resting diastolic blood pressure (p<0.01) and quadriceps muscle strength (48.2% vs 8.2%, p<0.001). The other study, by Haennel et al. (1990), compared aerobic training (cycling) and hydraulic resistance training (upper and lower limb) commenced 9-10 weeks post-CABG surgery. Both groups had similar significant reductions in resting heart rate, heart rate during submaximal exercise, rate pressure product and significant improvement in peak knee extension torque. The resistance training group additionally had significantly improved peak torque for knee flexion, shoulder flexion and shoulder extension.

Two further studies explored the effectiveness of aerobic training compared to aerobic and resistance training combined. Busch et al. (2012) compared aerobic exercise (walking and cycling) to the same aerobic exercise plus resistance and balance training (knee extensions, knee curls, leg press and bicep curls; 8-12 repetitions at 60% of one repetition maximum (RM)) commenced within four weeks of CABG surgery. Health related quality of life and VO$_{2\text{max}}$ improved significantly in both groups. The aerobic plus resistance and balance exercise group had significantly greater improvements in six-minute walking distance, timed up and go and peak relative workload (in watts per kilogram, measured during the cardiopulmonary exercise test). Ximenes et al. (2015) compared ambulatory exercise and ambulatory exercise plus resistance training in the inpatient setting, commenced immediately post-extubation following CABG surgery. Resistance exercises were performed for the following muscle groups: biceps, triceps surae, quadriceps, hip adductors and hip abductors. Loads for the resistance exercises were determined individually, however the ranges of loads used were not reported. The study findings showed that while the ambulatory only group had a significant decrease in their six-minute walking test distance between pre-operative and hospital discharge, the decrease at discharge in ambulatory plus resistance exercise group was not significantly different to their pre-operative levels.
The final study, by Maiorana et al. (1997) explored the effectiveness of resistance exercise commenced at least three months post-CABG compared to a control group (no exercise). The resistance training included seven upper body exercises (bench press, lat pull downs, seated rows, triceps extensions, bicep curls, pec decks and pull overs) and four lower body exercises (hamstring curls, knee extensions, calf raises and leg press) at 40% of maximum voluntary contraction. There were no significant improvements for either group in aerobic capacity, physical activity levels or body composition. However, the resistance training group had significant improvements in muscle strength for all exercises (as described above) \( (p<0.01) \), compared to no improvement in the control group.

Overall, these studies showed that resistance training implemented during the first three months post-CABG surgery may evoke similar improvements to aerobic training regarding cardiovascular variables at rest and during exercise, and aerobic exercise capacity. Resistance training may also evoke additional benefits to that of aerobic exercise, such as improved functional capacity and muscle strength. However, no study measured lean tissue mass. Therefore, it is currently unknown whether resistance training also attenuates post-operative loss in muscle mass. Overall, the findings support the introduction of resistance during the first 12 weeks following CABG surgery. This may be particularly helpful for people who are unable to engage in sustained aerobic exercise, for example those with lower limb musculoskeletal conditions such as osteoarthritis.

Another indication for engagement in physical activity during the initial weeks following CABG surgery is to maintain lower limb circulation and reduce the risk of developing deep vein thromboses (DVTs). In a study by Ambrosetti et al. (2004), DVTs were present in 17.4% of people 4-19 days post-CABG surgery, with 50% of DVTs being found in the contralateral leg to the vein harvest. These findings indicate that the cause of DVTs in this population may not only be circulatory compromise caused by the vein harvest itself, but may also be due to sedentary behaviour.

Finally, engaging in physical activity during the first few months following CABG surgery may help to initiate physical activity habits for the long term. Cleary et al. (2015) investigated people’s perceptions of engaging in physical activity at three, six and 12 months following CABG surgery. At three months post-surgery, participants were more self-motivated to
engage in exercise compared to engagement at six or 12 months. The main source for this early motivation is to recover from their surgery and return to their previous activities. Participants also reported fewer barriers to exercise at three months compared to six and 12 months, with other commitments being the biggest barrier at the later two time points. Additionally, at all time points participants were more likely to engage in exercise if it had become a habit. The authors therefore suggested that the early recovery period, when people have fewer competing commitments and increased motivation, may therefore be an opportune time for people to initiate and establish long term exercise habits following CABG surgery.

2.6 Safety of exercise during the first three months following CABG surgery

While there is a lack of specific information in cardiac rehabilitation guidelines regarding exercise prescription during the first few months following CABG surgery, a number of studies have been undertaken that implemented exercise interventions in the early recovery period. Doyle et al. (2019) undertook a systematic review examining the safety and efficacy of aerobic exercise interventions commenced within two weeks of cardiac surgery (CABG and/or cardiac valve surgery). Twenty studies were included in the review. Of these studies, six programmes were based on walking, six were cycling and eight were a combination of cycling and walking. The prescribed frequencies were twice daily (n=12), daily (n=4), 3-5 times/week (n=1) and 1-2 times/week (n=1) (frequency was not reported in two studies). Of those studies that reported intensity, two utilised light, one utilised light to moderate, nine utilised moderate, and three utilised vigorous intensities. Exercise duration ranged from 5 to 60 minutes, with the majority of studies indicating a progression in duration of exercise over the study period. However three studies had an initial exercise duration of 30 minutes, one study 40 minutes and one study 60 minutes. Only 16 studies specifically measured the occurrence of adverse events but none of these studies reported the occurrence of an adverse event (MI, stroke, infection, sternotomy dehiscence and mortality) during exercise training. In addition, meta-analysis showed that there was no significant difference in the overall adverse events between the control and intervention groups during the study period (odds ratio (OR) 0.41, 95% confidence interval (CI) 0.12–1.42, p=0.16).
An adverse event during exercise following CABG surgery of interest is the onset of cardiac arrhythmias. One study identified in the systematic review by Doyle et al. (2019) assessed the frequency of arrhythmias during exercise following CABG surgery. Galante et al. (2000) used electrocardiography to monitor for cardiac arrhythmias in 205 participants (mean age 67.6, SD=2.5 years; 81% male) during a 4-week cycle based exercise programme commenced on day three post-CABG surgery. For the first two weeks participants performed cycling against no resistance on a stationary ergometer for 3 – 12 minutes, twice per day. On day 14, cycling duration was increased to 20 – 30 minutes. In week one, exercise intensity corresponded to 75% of maximum heart rate (HRmax), after which the target heart rate was 85% of the HRmax. These heart rate targets correlate with vigorous intensity according to a position statement on exercise intensity published in 2010. In total, 33.5% of participants (30.7% of men and 48.7% of women) were detected as having a cardiac arrhythmia during the exercise programme. The type or frequency of arrhythmias was not significantly different between those who had less than three coronary vessels bypassed compared to those who had three or more. Arrhythmias were significantly more frequent in those with hypertension (47%), diabetes (42.4%) and hyperlipidaemia (36.5%) compared to those without these conditions (15.5%) (p<0.05), as well as in those older than 70 years (49%) compared to those younger (29.2%) (p<0.01). One participant died due to ventricular fibrillation during the course of the study, however this adverse event did not take place during exercise. These findings suggest that while arrhythmias occur relatively frequently during vigorous exercise, the arrhythmias do not necessarily result in a major adverse cardiac event or death. It is currently unknown whether exercise at low to moderate intensities results in a lower occurrence of arrhythmia during the early recovery period post-CABG surgery.

In summary, findings from studies that have investigated lower limb aerobic exercise training during the early recovery period following CABG surgery suggest that the risk of an adverse event during exercise training is low. Exercising at low to moderate intensities may result in a lower risk of cardiac arrhythmia compared to vigorous intensity, however this is yet to be determined in the literature.

In regard to the safety of resistance exercise during the first 12 weeks following CABG surgery, two studies (which were identified in the systematic review by Pengelly et al. (2019) and have been previously described in section 2.5) reported the incidence of arrhythmias in their studies. Interestingly, one study reported that two participants in the aerobic training
group experienced exercise induced ST-segment depression during exercise, compared to no participants in the resistance training group.\textsuperscript{94} Maiorana et al. (1997) also monitored heart rhythm during exercise and reported that there was no ST-segment depression observed for any participant.\textsuperscript{97} These findings suggest that resistance exercise following CABG surgery may not cause an increase in risk of cardiac arrhythmias.

There is a lack of evidence in the literature regarding the safety of upper limb resistance exercise during the first 12 weeks following median sternotomy regarding the occurrence of sternal complications.\textsuperscript{93} As previously described, in the systematic review by Pengelly et al. (2019), only three studies introduced upper limb resistance exercise prior to 12 weeks. Two of these commenced upper limb resistance after eight weeks post-sternotomy.\textsuperscript{95, 97} The other study introduced upper limb exercises (bicep curls) day one post surgery, however the loads lifted during the study could not be determined.\textsuperscript{18} None of these studies, however included the assessment of sternal instability as a potential adverse event. The cardiac rehabilitation guidelines of the European Association of Preventive Cardiology (2020) suggest 30-70\% of 1-RM for the upper body and 40-80\% of 1-RM for the lower body when prescribing resistance exercises. The guidelines also state that such upper limb exercise can be commenced when the chest is stable, and provide a suggested timeframe of around six weeks post-operation.\textsuperscript{33} Similarly, the American College of Sports Medicine (ACSM) guidelines (2018) stipulate that while low-load upper limb activities should be encouraged, individuals with median sternotomy should aim to advance and progress through a pain-free range of movement before focusing on regaining or improving muscle strength and endurance.\textsuperscript{102} However the safety of such protocols has yet to be conclusively shown in the literature.

2.7 Physical activity engagement following coronary artery bypass graft surgery

Studies which have measured physical activity during the initial weeks following CABG surgery showed that physical activity levels were initially very low and were followed by a gradual increase. For example, Thijs et al. (2019) reported that the median daily step count during the first week post discharge from hospital was 1,110 steps/day (range 739 – 10,195). By week 2 the median daily step count increased marginally but remained low at 1,832 (range 856 – 11,282), with a larger increase by week 5 to 5,719 (range 2128 – 11,948).\textsuperscript{103}
Lin et al. (2010) measured self-reported exercise duration in 37 people (study control group) pre-operatively, one and three months post-CABG. Mean exercise duration pre-operatively was 20.4 (SD=24.9) minutes. Post-operatively mean exercise duration decreased to 13.7 (SD=16.2) minutes at one month. While mean exercise duration subsequently increased, at three months post surgery exercise duration was still less than pre-operative levels (mean 18.2, SD=17.6 minutes).!

Schulz et al. (2005) also reported initial low levels of self-reported exercise duration that gradually increased over time post-CABG. In their study mean exercise duration at week 2 was 8.8 (SD=7.8) minutes for females and 10.5 (SD=9.3) minutes for males. By three months this had increased to 37 (SD=19) and 29.8 (SD=22.5) minutes for females and males respectively. Schulz et al.’s study (2005) added to the body of knowledge by reporting exercise frequency following CABG surgery. Their findings indicated that, while initial exercise duration was low, people initially engaged in exercise more frequently with subsequent reductions over time. For example, exercise frequency was 8.8 (SD=7.8) and 10.5 (SD=9.3) times per week for females and males respectively at week 2. By 3 months exercise frequency had decreased to 5.2 (SD=3) and 4.9 (SD=0.6) times per week for females and males respectively.!

In summary, the finding that physical activity is initially low indicates that physical activity engagement may be difficult during the early recovery period. In addition, the studies also showed that the amount of physical activity engaged in was wide ranging, indicating that there is significant variation between individuals. The amount and type of physical activity engaged in following CABG surgery will be explored further in the systematic review in Chapter 3.

2.8 Factors influencing physical activity engagement following CABG surgery

Key reasons for the acute reduction in physical activity engagement immediately following CABG surgery likely include post-surgical symptoms such as pain,105, 106 fatigue,107, 108 and shortness of breath.109 In addition, psychosocial factors such as fear110, 111 also likely influence physical activity engagement following CABG surgery. Indeed, psychological variables (for example, positive affect and positive expectations about returning to work)
have been shown to predict return to work weeks post CABG and/or MI. An in depth exploration of these physical and psychosocial factors is the subject of the systematic review in Chapter 3.

Another factor that influences physical activity engagement during the early recovery period following CABG surgery is the advice provided by health professionals to patients regarding post-sternotomy activity precautions. Despite there being a lack of evidence in the literature for a strong link between loaded upper limb activities and sternal complications, sternal precautions are advised to allow bony union of the sternum and reduce the risk of complications such as non-union or sternal dehiscence. Sternal precautions are a contentious issue in the literature. Although it is outside the scope of the current thesis to develop or determine evidence-based guidelines for sternal precautions, consideration of the literature regarding sternal precautions is required when designing a programme to facilitate and guide physical activity engagement following CABG surgery.

Sternal precautions can be broadly classified as “conventional” or “less restrictive”. Conventional sternal precautions typically include limitations on the amount that people are allowed to push, pull or lift for a set period of time, as well as restrictions on shoulder range of movement during upper limb activities. However, there is no consistency in the clinical setting regarding how much load or upper limb movement is permitted during the initial weeks following discharge. Cahalin et al. (2011) illustrated a lack of consistency when they reported on the different sternal precautions advised by three hospitals in the United States of America (USA). Site one recommended not lifting more than 2.3 – 4.5 kg, not reaching behind the body and limiting shoulder elevation to 90 degrees for four weeks. Site two recommended not lifting more than 4.5 kg and avoiding reaching backwards for six weeks, but permitted any other upper limb movement within a pain free range. Site three recommended not lifting more than 9.1 kg for six to eight weeks, but did not mention avoiding reaching behind the body and permitted upper limb activities above shoulder level. One reason for the lack of agreement regarding permitted loads and ranges of movement is likely to be the lack of evidence in the literature linking loaded upper limb activities and sternal complications. Indeed, it has previously been shown that many ADLs commonly performed during ‘the sternal precaution period’, such as opening doors, exceed 10 kg of force. Given that such activities do not routinely result in sternal dehiscence it suggests that the limiting upper limb loading to less than 10 kg may be unnecessarily restrictive. In
addition, Cahalin et al. (2011) have suggested that overly restricting upper limb activity may actually hinder sternal healing due to insufficient stresses on the connective tissues of the chest wall.\(^{47}\) Further, it has been suggested that telling people “loading the arms too much may cause sternal dehiscence” may create a fear and therefore reduce engagement in upper limb activities.\(^{116}\)

Such criticisms of conventional sternal precautions have resulted in the development of less restrictive alternatives for guiding upper limb activities following median sternotomy.\(^{47}\) One such approach is “Keep Your Move in the Tube” (KYMITT) developed by Adams et al. (2016).\(^{117}\) The approach is based on recognition that certain upper limb activities and movements will place more strain on the healing sternum than others and therefore the authors utilised a kinesiological approach to sternal precautions rather than basing it on traditional load and time restrictions. KYMITT does not place load restrictions on activities as long as they occur “in the tube” (that is with the arms close to the body) and are not painful to perform. Patients are therefore guided by pain, rather than time or load, when reintroducing load-bearing upper limb activities.\(^{117}\)

Utilising less restrictive precautions, such as KYMITT, has been suggested to increase the potential for participation in various activities of daily life during the first three months following cardiac surgery compared to traditional load and time sternal precautions.\(^{118}\) To date, four studies have compared recovery of physical function or return to activity between conventional and less restrictive sternal precautions. The most recent of these studies showed that, according to unadjusted comparisons, significantly more of those following KYMITT compared to those following conventional sternal precautions had achieved “independent” or “modified independent” status by hospital discharge for bed mobility (49% versus 11% respectively, \(p<0.001\)) and transfers (66% versus 35%, \(p<0.001\)). Another important finding from this study was that those in the KYMITT group were more likely to be discharged home than to a skilled nursing facility compared to the conventional precautions group (OR 2.9, CI 1.95-4.32).\(^{119}\) In another study, using univariate analysis Park et al. (2020) found a significant improvement (\(p<0.01\)) in physical function at week four in the KYMITT group compared to the conventional precautions group. Though the difference attenuated between weeks eight and 12. These findings suggest that while KYMITT resulted in less difficulty in performing self-care, walking, reaching and gripping type activities during the first four weeks following discharge, the difference was not maintained after the conventional sternal precaution period
had ended. However, it is important to note that multivariate analysis found no significant difference between groups at any time point once age, body mass index and sex were accounted for.\textsuperscript{118} Holloway et al. (2020) found no significant differences in perceived functional mobility between those following KYMITT and those following conventional sternal precautions at two – three weeks post-discharge.\textsuperscript{120} Similarly, Katijjahbe et al. (2018) found no significant difference in physical function between the two approaches at four and 12 weeks post-operative.\textsuperscript{121} Therefore the ability of less restrictive sternal protocols to increase physical function post-discharge is yet to be conclusively shown.

A reason for the lack of difference in these studies may have been a ceiling effect relating to the assessment of physical function, which only included basic assessment tasks such as self cares (for example, washing and dressing), walking, getting in and out of bed or a chair and closing a drawer. Additionally, all of these studies have focused on physical function (the ability or capacity to perform a task) rather than physical activity engagement (the actual performance of a task). Given that the purpose of less restrictive precautions is to increase physical activity participation, there is a need for future research to determine whether less restrictive protocols achieve this aim. Regardless of whether a difference in physical activity engagement exists or not, it could also be argued that because both conventional and less restrictive precautions place limitations on various upper limb activities, both types of sternal precautions pose a potential barrier to physical activity engagement during the initial weeks following CABG surgery.

2.9 Behaviour change, self-management and person-centred care

Behaviour change interventions aim to maximise the capability of individuals, communities or whole populations to regulate their own behaviour.\textsuperscript{122, 123} Behaviour change techniques (BCTs) are the ‘active ingredients’ of behaviour change interventions.\textsuperscript{123} BCTs are defined by Michie et al. (2013) as “an observable, replicable and irreducible component of an intervention designed to alter or redirect causal processes that regulate behaviour”.\textsuperscript{123}(p.82). Behaviour change intervention planning involves the application of theory to the mapping of BCTs designed to target specific behaviours.\textsuperscript{124} A commonly utilised method for designing behaviour change interventions is the ‘Behaviour Change Wheel’ (BCW).\textsuperscript{124} Since its introduction in 2011, according to a Scopus search undertaken on 3\textsuperscript{rd} June 2021, the BCW approach has been cited over 2,900 times in the literature and has been used to develop
numerous behaviour change interventions, including interventions designed to facilitate physical activity engagement.\textsuperscript{125-127}

It is suggested that to enhance the effectiveness of behaviour change interventions they need to be tailored\textsuperscript{128} and this requires a person-centred approach. Person-centred care is fundamental to physiotherapy practice.\textsuperscript{129} Utilising person-centred approaches in the development of behaviour change interventions ensures that the intervention is grounded in an understanding of the perspectives and psychosocial context of the end-users.\textsuperscript{130} Person-centered approaches to intervention design are not intended to replace theory-based approaches. Rather they are intended to complement theoretical mapping and planning by ensuring the most effective way of applying the BCTs in the specific context of the individuals who will use the intervention.\textsuperscript{130} The degree of person-centredness of an intervention can be categorised on a spectrum, ranging from a personalised intervention (for example, utilising the persons name in any resources or messages), to tailored interventions (where each person receives the same intervention in a way that is customised to them), or to individualised interventions (where the intervention is so customised that it is possible for no two people to receive the same information and support in the same way).\textsuperscript{131} An example of an individualised person-centered approach to behaviour change is motivational interviewing,\textsuperscript{132} whereby a specific framework is adhered to, but any information and support provided is based on the specific needs or desires of the individual.

Person-centered care is also important in selecting the BCTs to use in an intervention. Being person-centered means to support the autonomy of an individual by ensuring that the person has choice and feels like they are the initiator of their own behaviour, rather than being externally controlled.\textsuperscript{133} Deci and Ryan (1987) differentiate between controlling versus autonomy supportive techniques, where controlling BCTs, such as punishment and rewards have been demonstrated to undermine autonomy, whereas autonomy-supportive BCTs, such as goal setting, barrier identification and self-monitoring, equip people with the required knowledge and skills to self-manage their behaviour.\textsuperscript{133}

Self-management support (SMS) refers to facilitating people’s beliefs, skills and knowledge to enable active engagement in their own health\textsuperscript{134, 135} and is therefore a model of care that philosophically aligns with person-centred care. Self-management support has traditionally been addressed in the domain of chronic condition management.\textsuperscript{136} However, SMS has been
identified as having relevance to multiple conditions and recently the expansion of SMS into acute care, where people are recovering from acute illness, trauma or surgery, has been advocated. The core self-management skills as described by Lorig and Holman (2003) are: problem solving; decision making; taking action; partnership with health professionals and resource utilisation. There is similarity between many of these self-management skills and various BCTs (as coded and defined in Michie et al.’s BCT taxonomy version 1). For example, the self-management skill of ‘problem solving’ relates to BCT 1.2 ‘problem solving’. ‘Decision making’ relates to BCTs 4.1 ‘instruction on how to perform a behaviour’ and 2.3 ‘self-monitoring’. ‘Taking action’ relates to BCT 1.4 ‘action planning’. ‘Partnership with health professionals’ relates to BCTs 3.1 ‘social support (general)’ and 3.3 ‘social support (emotional)’. Therefore it is suggested that behaviour change interventions which include these and other autonomy supportive BCTs will facilitate the development of these core self-management skills. Indeed Cooper et al. (2014) state that self-management occurs when a person applies behaviour change strategies in a way that promotes active engagement in a behaviour, including engagement in physical activity. Figure 2.1 illustrates the relationship between person-centered care, behaviour change techniques and self-management in order to improve health and quality of life related outcomes.

Figure 2.1 Relationship between person-centered care, behaviour change and self-management to improve health and quality of life-related outcomes. Adapted from Lennon et al. (2018).
2.10 Utilisation of behaviour change and self-management principles to increase physical activity in cardiac rehabilitation

International guidelines for primary and secondary prevention of coronary artery disease, such as those from the British Association for Cardiovascular Prevention and Rehabilitation, recommend the use of health behaviour change and education, including the adoption of self-management skills, to target modifiable cardiovascular disease risk factors. In relation to physical activity, this recommendation means that comprehensive cardiac rehabilitation needs to move beyond providing information and prescribing exercise, to also incorporating psychosocial strategies that support individuals to make their own decisions about physical activity and empower them to incorporate physical activity into their life. However, while the incorporation of BCTs and self-management strategies are recommended as part of comprehensive cardiac rehabilitation, such guidelines do not provide any guidance regarding which specific BCTs or self-management strategies are likely to result in CAD risk factor reduction.

Psycho-educational interventions which incorporate behaviour change and self-management strategies have been shown to be effective in increasing physical activity levels in populations following myocardial infarction and cardiac revascularisation procedures. A systematic review and meta-analysis by Aldcroft et al. (2011) found that cardiac rehabilitation programmes that included psycho-educational interventions (including the self-management skills of problem solving, goal setting, self-monitoring and action planning) resulted in a moderate effect for increasing physical activity levels in the medium term (6 – 12 months) compared to comparison groups of exercise and/or risk factor education alone ($\delta = 0.62, 95\% \text{ CI } 0.30-0.94, I^2 = 20\%$). In addition, trials that adopted more than two behaviour change or self-management strategies reported significant between-group differences.142

A systematic review and meta-analysis published by Goodwin et al. (2016) reviewed the effectiveness of interventions incorporating BCTs on CAD risk factors in cardiac rehabilitation populations.143 Overall while the interventions from the 22 included studies did not reduce the risk of CAD related events, there was a significant reduction in mortality risk (risk ratio (RR) = 0.82, 95% CI 0.69–0.97). The interventions in the included studies utilised a mean of 8.3 BCTs (range 4-16). No single BCT was identified to predict mortality. The
authors found that the only risk factor on which the interventions had a significant effect was smoking (RR = 0.89, 95% CI 0.81-0.97). In all of the studies that included physical activity as an outcome measure, physical activity was measured subjectively in a variety of ways, including validated physical activity questionnaires, exercise diaries, or self-reported adherence to exercise recommendations. Therefore the data in this systematic review relating to physical activity was unable to be combined statistically due to the heterogeneity of physical activity outcome measures used in the studies. Of the studies that included physical activity as an outcome measure, 11 favoured the intervention, eight found no difference, and one favoured the control. These findings indicate the potential benefit of BCTs to positively influence physical activity in people with CAD. The authors did not provide information regarding which BCTs were included in each intervention, but they did report the most frequently included BCTs overall. These were (in order of most frequency): providing information on the consequences of behaviour in general (n=21); providing information on consequences of behaviour to the individual (n=19); providing instruction on how to perform the behaviour (n=16); goal setting in relation to behaviour (n=16) and outcome (n=15); providing information on where and when to perform the behaviour (n=12) and prompt review of behavioural goals (n=11). Interestingly, BCTs that overlap with self-management principles were utilised less frequently in the interventions, for example barrier identification and problem solving was utilised in five of the included studies, and action planning in only two studies.

More recently, Duff et al. (2017) conducted a systematic review on the application of BCTs in electronic health interventions designed to increase physical activity levels in people living with cardiovascular disease. The heterogeneity of the 23 included studies regarding physical activity outcome measures (which included a range of subjective and objective physical activity measures) and time-points did not allow meta-analysis of the effectiveness of individual BCTs. However, eight of the included studies showed significant improvements in physical activity levels. Of these eight studies, four measured physical activity using a validated physical activity questionnaire, three used an objective measure such as an accelerometer or pedometer, and one used both a physical activity questionnaire and an accelerometer. The utilisation of BCTs in these studies were (in order of frequency): goal setting (behaviour) (n=6); information about health consequences (n=6); feedback on behaviour (n=5); instruction on how to perform the behaviour (n=5); self-monitoring of behaviour (n=4); social support (practical) (n=4); social support (unspecified) (n=3); credible
source (n=3); problem solving (n=2); review behaviour goals (n=2); social support (emotional) (n=2); prompts/cues (n=2); graded tasks (n=2); reduce negative emotions (n=2); action planning (n=1); self-monitoring of outcomes of behaviour (n=1); biofeedback (n=1); social reward (n=1); and pharmacological support (n=1). When comparing studies that found a significant effect from the intervention to those that did not, the authors of the review noted that there was no difference between the mean number of BCTs utilised (which on average was 7.2, range 1-14). Interestingly, only three of the identified studies in the review included specific mention of BCTs applied in their intervention descriptions, and only seven stated using behaviour theory to inform the intervention design.

In summary, both the use of behaviour change and self-management techniques are recommended as part of comprehensive cardiac rehabilitation and have been shown in the literature to be effective in increasing physical activity levels in populations with stable cardiovascular disease and following MI and cardiac revascularisation procedures. However, there is no clear guidance in the literature regarding which specific BCTs and self-management strategies are likely to result in CAD risk factor reduction, including improvement in physical activity levels. In addition, it is likely that the effective strategies may differ between populations with CAD (for example, a person with stable CAD may have different needs to a person recovering from CABG surgery). Further, the needs for BCT and self-management strategies may change over time. For example, a person recovering acutely from CABG surgery will have different needs to someone who is several years post-surgery. Therefore particular attention to the needs of specific subgroups within the population with CAD is required when designing psychosocial interventions.

2.11 Interventions in the literature designed to facilitate physical activity engagement during the first three months following CABG surgery

Because the goal of this thesis was to design a programme that aimed to facilitate engagement in physical activity during the first three months following CABG surgery, the final section of Chapter 2 is focussed on a review of studies in the literature that utilised psychosocial interventions to achieve the same aim. The identification of techniques or strategies that have previously been shown to be effective in increasing physical activity post-
CABG surgery will provide insight into which of the strategies to potentially include in the
design of the current programme.

In 2020 our research team undertook a systematic review of the literature to determine the
effectiveness of psychosocial interventions to increase physical function and/or physical
activity during the first three months following CABG surgery. The secondary aim of this
review was to examine the use of BCTs and self-management strategies utilised in the
intervention designs of the included studies. For this review, BCT identification was done by
examining the intervention designs of the included studies and mapping the intervention
components against 26 BCTs commonly used to increase physical activity as described by
Abraham and Michie (2008). A specific focus of this particular review was to include only
interventions that were conducted outside of the supervised cardiac rehabilitation setting.
This focus was chosen because the primary interest was: 1) interventions that improve
physical activity during daily life outside of a structured or supervised exercise setting; and 2)
the ultimate aim was to design an intervention that could be applied remotely for those who
are unable to access supervised cardiac rehabilitation.

The systematic review was undertaken as an undergraduate physiotherapy group research
project, for which the doctoral candidate was a co-supervisor. The doctoral candidate
developed the research question and oversaw the screening process and data extraction which
was primarily undertaken by the undergraduate physiotherapy students. Nine databases
(PubMed, Scopus, Medline, CINAHL, Web of Science, SPORTSDiscus, Cochrane Library,
EMBASE and Clinical Key) were searched using the following search terms (CABG OR
“coronary artery bypass graft*” OR CABG surgery OR aortocoronary surgery) AND
(physical function OR physical activity OR exercise OR recovery of function). The screening
process identified 18 papers for inclusion in the review. Six of the studies reported findings
relating to the subanalysis of one randomised controlled trial (RCT). Therefore a total of 13
studies were reported on in the review. Of these studies, six included physical function, five
included physical activity, and two included both physical function and physical activity in
their outcome measures. Since the aim of the current thesis is to facilitate physical activity
behaviour, rather than increasing physical function, only the seven studies identified in our
review which included physical activity as an outcome measure are discussed in this section.
The discussion and conclusions in the current section regarding which strategies were
effective (or ineffective) therefore differs from that included in the original systematic
review, since the focus in this section is limited to only those studies that measured physical activity and has excluded the findings from the studies identified in the earlier systematic review that only measured physical function. To the doctoral candidates knowledge, no further studies exploring the effectiveness of psychosocial interventions for increasing physical activity specifically during the first three months following CABG surgery have been published since undertaking the systematic review.

As with the systematic reviews described in the previous section of this chapter, a meta-analysis was unable to be undertaken due to heterogeneity in physical activity outcome measures and varying measurement timepoints. However of the seven interventions which included physical activity as an outcome measure, five were found to significantly increase physical activity levels. Table 2.1 includes a summary of these studies, including a description of the intervention designs and outcomes relating to physical activity engagement.

Two studies explored the effectiveness of providing information about engaging in physical activity, to people who have had CABG surgery prior to their hospital discharge. Marshall et al. (1986) investigated the effectiveness of structured teaching using a written education guide compared to unstructured teaching where nursing staff verbalised information about post-operative recovery prior to discharge. The booklet contained information on six areas: structure and function of the heart, risk factors for heart disease, common postoperative problems, and the importance of activity, diet and medications after surgery. The intervention therefore included the BCT ‘provide information regarding the behavior-health link’. In this non-randomised controlled trial of 59 participants (intervention group (IG) n=29; control group (CG) n=30; mean age and range 58.6 (48-78) and 59 (46-71) respectively), the IG group reported walking more blocks per day at 4-6 weeks post-CABG (15.6±4) compared to the CG (7±5.7), p<0.05. However, it is important to note that pre-operatively the groups were not similar regarding exercise compliance (though the authors did not provide details
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<th>First Author (year), country</th>
<th>Study Type/ Sample Size</th>
<th>Participant Details</th>
<th>Intervention description</th>
<th>Outcome measures for Physical Activity</th>
<th>Summary of Findings</th>
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| Barnason (2009), USA        | Multi-site RCT/ n = 280| Range ≥ 65 yrs/ 83% | **Intervention:** Usual care plus a 6-week daily telehealth intervention using device called “Health Buddy”, which attaches to the patient’s telephone as means of one-way communication and provided patients with:  
  a) Assessment of symptoms  
  b) Advice regarding self-care strategies to manage reported symptoms  
  c) CAD risk factor modification education  
  d) Positive reinforcement/ encouragement  
**Usual care:** Patient education prior to discharge, including instructions on CABG recovery, CAD risk factor modification recommendations and an exercise prescription for home exercise progression. | Measured at 3 and 6 wks, 3- and 6-months post-op:  
Modified 7-Day Activity Interview  
RT3 accelerometer Physical Activity Diary (mean kcal/kg/day; mean minutes spent in light, moderate and vigorous activity) | Trend for increased engagement in moderate or higher activity (diary) in IG, but no significant differences for any post-op physical activity measures. |
**Golgahaei (2019), Iran**

- **RCT**
- **N=70**
- **IG:** 59.7 (7.9)/ 56%
- **CG:** 60.8 (10.1)/ 44%

**Intervention:**
- 2 x one-hour pre-operative group peer education sessions (4-5 people per group) conducted by former CABG patients.
  - Session 1: Nature of CAD, treatment course and wound care.
  - Session 2: Lifestyle changes (medications, physical activity, diet, weight control and smoking cessation).
  - Peer educators also shared their own experiences of the post-op recovery, their related concerns and how they dealt with them.
  - Question and answer time at the end of each session. The researcher nurse was present in all sessions to observe and answer questions if necessary.

**Usual care:**
- One 15–20-minute education session by nurse, using the same educational content as intervention. All participants (usual care and IG) received the same educational pamphlet containing information presented in the education sessions.

**Measured pre-op and at 1- and 2-months post discharge:**
- **Adherence to Medication and Lifestyle Changes questionnaire**

**Trend for positive effect on adherence to physical activity recommendations in IG, but not statistically significant.**

---

**Kummel (2008), Finland**

- **RCT**
- **N=117**
- **IG:** M: 70.2 (3.9); F: 70.3 (3.9)/ 70%

**Intervention:**
- Usual care plus group counselling, guidance and adjustment education sessions implemented by nurses. Adjustment education involves information, awareness of self-care, social and peer support. One session was held pre-

**Measured at pre-op, 3-, 6- and 12-months post-op:**
- **Exercise frequency** (open question)

**At 3 months reported frequency of exercise increase more among males in IG (OR 3.1) than men in CG (OR 1.1), p<0.01. No significant difference**
operatively, with four sessions within 12 months post-op.

*Usual care:*
Counseling and guidance during inpatient stay, follow up examination by surgical physician post-discharge and follow-up care at health center (medical doctor).

<table>
<thead>
<tr>
<th>Lin (2010), Taiwan</th>
<th>Non-RCT</th>
<th>N=73</th>
<th>IG: 61.8 (10.9)/ 83%</th>
<th>CG: 62 (10)/ 91%</th>
<th><strong>Intervention:</strong> Usual care and 20-minute education session by researcher about lifestyle changes (verbal explanation and brochure) about CAD, risk factors for CAD and risk factor management.</th>
<th>Measured at 1- and 3-months post-discharge: Exercise engagement (frequency, duration, and type)</th>
<th>IG had significantly higher levels of exercise (frequency and duration) at 3 months (p&lt;0.01).</th>
</tr>
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<tbody>
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<td>IG had significantly higher levels of exercise (frequency and duration) at 3 months (p&lt;0.01).</td>
</tr>
<tr>
<td>Mahler (1999), USA</td>
<td>Multi-site RCT</td>
<td>n=215</td>
<td>61.4 (8.4)/ 87%</td>
<td><strong>Intervention:</strong> Prior to discharge participants viewed on of two videos (a mastery and a coping video). Both videos contained procedural information (for example, instructions for lifting, exercise, and resumption of normal activities and when to seek medical advice) and sensory information (for example, pain, fatigue, common emotions).</td>
<td>Measured at discharge, 1- and 3-months post-discharge: Exercise compliance (estimated physical activity levels)</td>
<td>Participants who viewed the coping video reported significantly more frequent moderate exercise at 1 month and vigorous exercise at 3 months compared to CG and those that viewed the</td>
<td></td>
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</table>
**Mastery video:** Descriptions by former patients that depicted themselves to be calm, confident, and making steady progress with no complications.

**Coping video:** Depicted same patients mentioning various concerns or difficulties they experienced and coped successfully but with effort.

**Usual care:**
Standard written discharge information including procedural information for lifting, exercise, and activities of daily living.

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<table>
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<tr>
<th>Marshall (1986), USA</th>
<th>N=69</th>
<th>IG: 58.6 CG: 59/70%</th>
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**Intervention:**
Structured teaching using written education guide including information about the structure and function of the heart; risk factors for CVD; common post-op problems and activity, diet and medications after surgery.

**Usual care:**
Unstructured teaching with no written guide where nurses verbalized information to patient about post-op recovery.

**During previous week:**

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<th>mastery video (p&lt;0.02 and p&lt;0.05 respectively).</th>
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**Measured at pre-op and 4-6 weeks post-op:**

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<tr>
<th>Exercise compliance (self-report: total, partial or none)</th>
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</table>

IG group reported walking more blocks per day (mean 15.6, SD 4) compared to CG (mean 7, SD 5.7), p<0.05. More participants in IG were completely compliant with activity recommendations compared to CG, and no participants in IG reported total non-compliance to activity recommendations compared to 7% in CG.
| Parent (2000), Canada | RCT N=56 | IG: 57.6 (7.4) | CG: 55.9 (7.8) | Males only | **Intervention:** Usual care plus three one-on-one peer support visits on day 1, day 5 and 4-wks post-op. During the sessions, peers (former patients) shared their recovery experiences and reassured and coached patients toward activity and reinforced risk factor reduction. The supportive acts included listening, responding to concerns, affirmation, and feedback. | **Measured at 5 days and 4 wks post-op:** Jenkins Activity Checklist | IG reported significantly higher levels of self-reported activity for general activities at 5 days and 4 wks (p<0.01 and p<0.05 respectively). IG reported significantly more walking compared with CG at 5 days (p<0.01). |

**Usual care:** Routine/standard information on recovery delivered by health professionals.

SD = standard deviation; yrs = years; RCT = randomised controlled trial; CAD = coronary artery disease; CABG = coronary artery bypass graft; wks = weeks; kcal = kilocalories; kg = kilograms; post-op = post-operative; IG = intervention group; CG = control group; M = male; F = female; OR = odds ratio
regarding pre-operative differences). Exercise compliance was measured by self-report and classified as total, partial or none (though no definition of what level of physical activity determined total or partial compliance was provided). More participants in the IG (n=25/29) were fully compliant with activity recommendations compared to the CG (n=14/30), and no participants in the IG reported complete non-compliance to exercise recommendations compared to approximately 7% in the CG. This study was the first to show the effectiveness of providing structured education prior to hospital discharge to facilitate physical activity post-CABG. Another key factor in the information design was the provision of a written education guide. It has been shown that cognitive function is acutely impaired following CABG surgery in approximately 43% of patients and can take up to four – six months to resolve.147 Such cognitive impairment may present as psychomotor slowing, executive dysfunction and short-term memory loss.148 These deficits may impact on the ability to retain information during the early recovery period. Having a written guide that can be referred to is therefore of potential benefit to many people recovering from CABG surgery.

In 2010, Lin et al.24 added to this knowledge by exploring the effectiveness of two components of pre-discharge education following CABG surgery. In the study, the control group was only provided with a brochure regarding cardiovascular risk factor management (which relates to the BCT ‘provide information about the health-behaviour link’), whereas the IG was provided with the brochure alongside a 20-minute talk explaining the brochure content. The intervention was tested by a non-randomised controlled trial of 73 participants (IG n=36, 83% male, mean age 61.8 (SD=10.0) years; CG n=37, 92% male, mean age 62.0 (SD=10.0) years). Physical activity was measured using self-reported exercise engagement. The study findings showed that, while there were no significant differences at one month, the IG had significantly higher levels of engagement in exercise (frequency and duration) at three months (p<0.01). These findings showed that the face-to-face explanation of information verbally alongside written information had a positive effect on exercise engagement three months post-CABG compared to providing written information alone. The lack of differences between groups at the earlier time point may be explained by the apparent lack of information provided regarding symptom management, which likely had an impact on physical activity at that time.

Mahler et al. (1999)149 explored the usefulness of addressing coping with early recovery challenges post-operatively. In this study, participants in the intervention groups were
provided with videos that depicted either mastery or coping experiences post-CABG surgery. The mastery video tape included descriptions from former patients that depicted them to be calm and confident and who made steady progress without complaints. The coping video depicted the same patients mentioning concerns experienced and the way that they needed effort to successfully cope with a variety of difficulties. Both the mastery and coping videos, and details provided to the control group, included information about how to engage in physical activity, where to seek help and information about common symptoms. Both videos therefore addressed the following BCTs: ‘provide information regarding health-behaviour link’; ‘provide instruction’ and ‘social comparison’. In addition, the coping video addressed the BCT ‘barrier identification’ and role modelled the self-management skill of problem-solving. All videos prompted resource utilisation by telling people where to seek help. In the randomised controlled trial of 215 participants (with approximately one third in each group; mean age 61.4 (SD=8.4) years; 86.5% males), those who viewed the coping tape reported significantly more frequent moderate intensity exercise at one month (p<0.05), and more strenuous exercise at three months post-discharge compared to both the group who viewed the mastery video and the control group.

Two studies explored the effectiveness using peers to deliver information and provide support on physical activity engagement post-CABG surgery. The first of these was published in 2000 by Parent and Fontin. In their intervention, volunteer former patients visited people who had undergone CABG at days one and five and four weeks post-surgery. The purpose of these visits was to reassure and coach towards activity, as well as listen, respond, affirm and provide feedback to participants about their physical activity engagement. The BCTs addressed by this intervention were therefore: ‘provide general encouragement’, ‘provide feedback on performance’ and ‘provide instruction’. The authors investigated the effectiveness of the intervention in a RCT of 56 male participants (IG n=27, mean age 57.6 (SD=4) years; CG n=29, mean age 55.9 (SD=7.8) years). Physical activity was measured using the Jenkins Activity Checklist. The study findings showed that the IG engaged in significantly greater levels of activity at five days (p<0.01) and four weeks (p<0.05) post-surgery.

The second study to explore the effectiveness of using peers was by Golaghaie et al. (2019). In this study the intervention consisted of two one-hour group education sessions (four to five people per group) delivered by people who had previously undergone CABG
surgery. The first education session covered information about the pathology and treatment of atherosclerosis, and post-operative wound care. The second session discussed lifestyle changes and post-operative symptoms to report to the physician. The peer educators also shared their own experiences of the postoperative and post discharge period, their related concerns, and the ways they dealt with them. Time for questions was provided at the end of each session. The researcher, a nurse, was present at all sessions as an observer and answered the participants’ questions if necessary. The control group received usual care, which was a 15 – 20-minute talk by a nurse providing the same information provided by the peer volunteers. Both groups were provided with the same educational pamphlet containing the information addressed in the sessions. Therefore, both usual care and the study intervention addressed the BCT ‘provide information regarding health-behaviour link’. However, the intervention also ‘provided opportunity for social comparison’ and modeled ‘barrier identification’ and problem-solving. The effectiveness of the intervention was explored using a RCT with 70 participants (IG n=36, 56% males, mean age 59.7 (SD=7.9) years; CG n=34, 44% males, mean age 60.8 (SD=10.1) years). Physical activity adherence was measured pre-operatively and at one- and two-months post-discharge using the Adherence to Medication and Lifestyle Changes questionnaire. The study findings showed that there were no significant differences in physical activity adherence between groups at any timepoint.

One of the key factors that may explain the differences in the effectiveness of peer involvement found by the studies by Parent and Fontin (2000) and Golaghaie et al. (2019) was the nature of the peer support provided. The support provided in the study by Parent and Fontin was more individualised in both the way it was delivered (one on one), and the nature of support provided, which was more person-centered and focused on the needs of the individual. Another key difference between the two studies was the timing of the intervention delivery, with Golaghaie et al. providing peer support pre-operatively, compared to the study by Parent and Fontin where support was provided post-operatively.

Two studies investigated the effectiveness of follow up support provided by health professionals to facilitate physical activity during the first three months following CABG surgery. Kummell et al. (2008) tested the effectiveness of group counselling and education sessions led by nurses. The first session was held pre-operatively, with four further sessions being held during the first 12 months post-CABG surgery (exact time points not provided). While details of the session content was not provided, the sessions included information and
awareness of self-cares. Each session started with a talk by the nurse followed by time for group discussion. The BCTs covered by the intervention therefore included: ‘provide information about health-behaviour link’, ‘provide general encouragement’ and ‘provide opportunity for social comparison’. Exercise frequency was assessed using a single open question pre-operatively and at three, six and 12-months post-operative. The authors undertook a RCT with 117 participants aged 65 years or over (IG n=49, mean age males 70.2 (SD=3.2) and females 70.3 (SD=3.9); CG n=68, mean age males 70.2 (SD=4) and females 71.5 (SD=4.1) years). Reported frequency of regular physical exercise at three months increased more among men in the IG (OR 3.1, 95% CI 1.3-7.1) than men in the CG (OR 1.1, 95% CI 0.7-1.9) (p<0.01). For women, however the change in frequency of exercise at three months was more favorable among women in the CG than for women in the IG.

The second study to investigate the effectiveness of follow up support was by Barnason et al. (2009) who investigated the effectiveness of a six week, daily symptom management intervention, delivered via automated telehealth (one way communication), to facilitate self-care management and improve physical activity levels in older adults following CABG surgery. The automated system, called “Health Buddy”, attached to the participant’s phone and provided a means to assess a range of symptoms, including fatigue and sleep problems. “Health buddy” then provided advice regarding management of the relevant symptoms, on how to monitor and progress physical activity levels incrementally, CAD risk factor modification and also provided positive reinforcement. Usual care (which was received by both the IG and CG) consisted of education prior to discharge regarding instructions for self-care during recovery, CAD risk factor recommendations and a progressive home exercise programme. The BCTs addressed by both the IG and CG were: ‘provide information about the health-behaviour link’; and ‘provide instruction for how to perform the behaviour’. The intervention additionally addressed the BCTs: ‘provide general encouragement’ and ‘prompt barrier identification’. Physical activity was measured using the Modified 7-Day Activity Interview questionnaire, an exercise diary and an accelerometer at weeks 2 and 6, and 3 months post-CABG. The multi-site RCT for this intervention included 280 participants all aged 65 years and over (IG n=143; CG n=137); 83% male). The RCT findings showed that while there were trends towards increased physical activity in the IG for several of the outcome measures, there were no significant differences for physical activity levels at any time point. The authors also published three subanalyses of the data from the parent study. However none of these subanalyses (including one examining effectiveness in
participants with diabetes mellitus and one only of the female participants found significant differences in physical activity levels at any of the time points.

One potential reason for the limited effectiveness of follow up support found in the studies by Kummel et al. (2008) and Barnason et al. (2009) could be the lack of individualisation in the support provided. For example, while the intervention by Barnason et al. was tailored (by only providing information about symptoms relevant to each person), the information which was then provided about a particular symptom was the same for all participants. Similarly, support and encouragement was delivered didactically through pre-recorded messages, which did not allow for any individualisation or partnership with health professionals. In the study by Kummel et al., the ability to individualise support was limited by the delivery of the intervention in a group setting. Another limitation for the application of these findings was that each study only included participants aged 65 years and over. Therefore the effectiveness of the type of support provided in these studies for those younger than 65 years is unknown.

In summary, the studies reviewed have shown the potential for psychosocial interventions to increase physical activity engagement during the first three months following CABG surgery. The most effective interventions were those that provided 1) structured pre-discharge education, with face to face, verbal explanations appearing to add to the effectiveness; 2) interventions that address coping with barriers to physical activity; and 3) individualised, person-centred peer support post-operatively. An overview of the effectiveness (or non-effectiveness) of the various strategies shown in these studies to achieve a statistically significant increase in physical activity engagement is provided in Table 2.2.

These findings have highlighted several gaps in the intervention designs in many of the studies. Firstly, there was a general lack of individualisation in six of the seven interventions. As described earlier, individualisation of an intervention is important in order to provide person-centered care. In addition, as shown by the study by Parent and Fontin (2000), which provided individualised peer support, individualisation has the potential to increase the effectiveness of an intervention. Secondly, there appeared to be a lack of application of theory utilised in the design of the interventions. As stated earlier, behaviour change intervention planning involves the application of theory to the mapping of BCTs designed to target specific behaviours. Finally, each of the studies addressed relatively few of the BCTs in their intervention designs. Further, none of the interventions met the requirements for any
Table 2.2 Summary of effective and non-effective strategies to increase physical activity during the first three months following coronary artery bypass graft surgery

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Effective</th>
<th>Non-effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of information</td>
<td>Structured face-to-face verbal explanations with written guide more effective than unstructured explanation without a written guide (Marshall et al., 1986).</td>
<td>Automated one-way communication post-discharge (Barnason et al., 2009).</td>
</tr>
<tr>
<td></td>
<td>Face-to-face verbal explanation with written information more effective than written information alone (Lin et al., 2010).</td>
<td></td>
</tr>
<tr>
<td>Peer support/vicarious experiences</td>
<td>One-on-one peer visits to share experiences, reassure, listen, affirm and provide feedback (Parent &amp; Fontin, 2000).</td>
<td>Group peer education sessions sharing recovery experiences and how overcome problems, as well as providing information about CAD and recovery from surgery (Golaghaie et al. 2019).</td>
</tr>
<tr>
<td></td>
<td>Viewing videos depicting former patients describing coping with and overcoming problems was more effective than viewing former patients describing progressing with no complications and/or standard written information about physical activity engagement (Mahler et al., 1999).</td>
<td></td>
</tr>
<tr>
<td>Follow-up support from health professionals</td>
<td>Group counselling and education post-discharge (effective in men only) (Kummell et al., 2008).</td>
<td>Automated one-way communication (Barnason et al., 2009).</td>
</tr>
</tbody>
</table>

of the core self-management skills as described by Lorig and Holman (2003).138 Thus the findings from the review revealed the need for interventions which: 1) utilise theoretical frameworks to inform their design; 2) include a range of BCTs that are shown to meet the needs of individuals following CABG surgery; 3) facilitate the development of self-
management skills; and 4) are designed with a framework which allows for individualisation of information and support.

2.12 Conclusion

This chapter has examined the literature relating the benefits of physical activity for health and specifically during the early recovery period following CABG surgery. Literature relating to the use of behaviour change and self-management interventions to facilitate physical activity in populations with cardiovascular disease, and specifically during the first three months following CABG surgery was also explored. In doing so, the review has identified the need for the development of theory informed interventions, that incorporate behaviour change and self-management principles to facilitate physical activity engagement following CABG surgery.

To identify potential intervention techniques and strategies that facilitate physical activity during the first three months following CABG surgery, it is first important to understand the factors that facilitate and inhibit physical activity during this time. The following chapter is a systematic review which explores the influence of such factors.
CHAPTER 3: PHYSICAL ACTIVITY ENGAGEMENT DURING THE FIRST 12 WEEKS FOLLOWING CABG SURGERY: A MIXED METHODS SYSTEMATIC REVIEW

3.1 Introduction

Physical activity engagement during the early recovery period following CABG surgery has many physical\textsuperscript{16-18} and psychosocial\textsuperscript{19, 20} benefits. As discussed in Chapter 2, section 2.7, it has been previously shown that immediately following CABG surgery, physical activity levels are very low\textsuperscript{24, 103} but this is followed by a progressive increase over the subsequent weeks and months\textsuperscript{29, 103}. This indicates that physical activity engagement likely has many barriers, especially during the first few weeks following hospital discharge. In 2012 Barnason et al. published an integrative review of literature from 1995 to 2009 about the trajectory of patient recovery during the first year after hospitalisation for acute cardiac events\textsuperscript{30}. The findings of the review identified symptoms reported by patients following discharge from hospital after cardiac surgery to be both physical (including pain, fatigue, shortness of breath, palpitations, loss of appetite and swelling of the lower limbs) and psychosocial (such as depression and anxiety).\textsuperscript{30} All these symptoms have the ability to impact on people’s ability to engage in physical activity following CABG surgery. In addition, as discussed in Chapter 2, section 2.8, sternal precautions inherently limit the engagement in many types of physical activity, such as household or outdoor chores and exercise involving the upper limbs, and may induce fear and reluctance to undertake physical activity during the first weeks post discharge\textsuperscript{116, 158}.

At present, there is a lack of guidance in the literature for how health professionals can support people to engage in physical activity during the first three months following hospital discharge, especially for those who are unable to access supervised cardiac rehabilitation programmes. Having an understanding of the factors that influence physical activity following CABG surgery, that is both barriers and facilitators, is required to develop interventions that facilitate physical activity engagement. In addition, knowledge of the amount and type of physical activity that people typically engage in following CABG surgery is important for identifying current levels of adherence to physical activity recommendations and hence provide further evidence for the need for such interventions. More importantly
though, knowing the amount and type of physical activity engagement will enable the recognition of realistic expectations for the progression of physical activity engagement following CABG surgery.

Prior to undertaking this systematic review, a preliminary search of the Cochrane Library, PROSPERO, Scopus and Cumulative Index of Nursing and Allied Health (CINAHL) databases was undertaken to check for any existing systematic reviews on this topic. The search revealed that a systematic review on the safety and efficacy of aerobic exercise during the first 12 weeks following CABG surgery was published by Doyle et al. in early 2019.79 While the systematic review provided evidence for the benefit of prescribed exercise during the early recovery following CABG surgery, it did not address barriers or facilitators to people engaging in such types of physical activity. In addition, the studies included in the review focused on prescribed exercise programmes and did not explore the progression of other types of physical activity, for example ADLs, that people are able to engage in during their daily life following CABG surgery. No previous systematic reviews were located that examined factors that impact on physical activity engagement or the expected progression in physical activity during the first three months following discharge from hospital after CABG surgery.

Subsequent to undertaking the systematic review reported in this chapter, a systematic review was published by Lee et al. (2021) that explored factors influencing physical activity in patients following cardiac surgery.159 However, a number of the studies in the review by Lee et al. included participants who had undergone a range of invasive cardiac surgery procedures, including CABG, cardiac valve replacement or heart transplantation. Thus it was not possible to differentiate between the experiences of people following CABG surgery and those following other cardiac surgery procedures. The review by Lee et al. also included studies undertaken in the supervised outpatient cardiac rehabilitation setting. Therefore the findings may not fully reflect the experiences of those unable to access follow up support in such settings. In addition, the review by Lee et al. did not include studies published prior to 1990, their reason being that exercise guidelines for cardiovascular patients were only released by the American Heart Association in 1990.160 While these guidelines likely impacted management by health professionals, they may not necessarily have influenced people’s experiences in regard to potential physical and/or psychosocial barriers to physical activity. On this basis findings from earlier studies were considered relevant to the aim of the
current review and were included. Finally, the systematic review by Lee et al. did not include a limit in regard to the post-operative timeframe over which participants were followed up, and therefore the findings did not focus specifically on physical activity experiences during the early recovery period following cardiac surgery. In summary, no review studies have focused on factors influencing engagement in physical activity during the early stages of recovery following CABG surgery specifically. Therefore, the purpose of the current systematic review was to explore the factors that influence engagement in physical activity during the first three months (12 weeks) after hospital discharge following CABG surgery.

Note that in this, and all subsequent chapters, the doctoral candidate who primarily undertook the work in this thesis will be referred to as ‘the doctoral candidate’ or by their initials (EG). The doctoral supervisors will be referred to as ‘the research supervisors’ or by their initials (MS, CS or LH). Any research assistants will be referred to using their initials, or by naming their professional role (for example, professional transcription service).

3.2 Aim

The overall purpose of this systematic review was to explore what is known in the literature about engagement in physical activity during the first 12 weeks following discharge from hospital following CABG surgery. The Population, Phenomenon of Interest and the Context (PICO) criteria\textsuperscript{161} were used to develop the research questions, with the population being people who have undergone CABG surgery, the phenomenon of interest being engagement in physical activity and the context being the first 12 weeks following discharge from hospital. Specifically, the primary aim was to identify the factors that influence engagement in physical activity during daily life during the first 12 weeks after discharge from hospital following CABG surgery. The secondary aim was to identify the amount and types of physical activity that people who have undergone CABG surgery engage in during the first 12 weeks after hospital discharge.

In relation to the aMRC framework, the current chapter addresses three elements: 1) systematically identify the evidence; 2) problem identification and definition; and 3) determine the needs (Table 1.1).
3.3 Methods

A mixed methods systematic review approach was selected as both quantitative and qualitative methods are able to answer the research questions. In addition, the integration of both quantitative and qualitative evidence can provide a greater depth and scope of understanding to assist in answering the research questions.\(^\text{162}\)

The protocol was developed in accordance with the convergent integrated methodological framework for mixed methods systematic reviews proposed by the Joanna Briggs Institute (JBI)\(^\text{162}\) and the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols (PRISMA-P) guideline.\(^\text{163}\) This protocol is registered (ID CRD42020151144) on PROSPERO, an international register of systematic reviews.\(^\text{164}\)

The reporting of the systematic review was informed by the JBI reporting guidelines for mixed methods systematic reviews\(^\text{162}\) and follows the PRISMA 2009\(^\text{165}\) and Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ)\(^\text{166}\) statements for reporting systematic reviews.

3.3.1 Eligibility criteria

The eligibility criteria were determined using the same PICo framework that was used to develop the review questions, in that the studies of primary interest were those that examined engagement in physical activity (phenomenon of interest) during the first 12 weeks (context) for people who had undergone CABG surgery (population). In addition, eligibility criteria for the types of studies, types of outcomes and other limits are stated below.

- **Study Population**

This review included studies in which participants were adults (>18 years of age) who had undergone CABG surgery. Studies that included participants who had undergone a range of cardiac surgical interventions e.g. heart valve surgery, were only included if there was a separate analysis of the data for participants who underwent CABG surgery only.
• **Phenomena of Interest**

The findings of the recent systematic review by Doyle et al. (2019)\textsuperscript{79} concluded there was strong evidence that early structured and prescribed aerobic exercise programmes are safe and efficacious following CABG surgery. The current systematic review considered research that included investigations and/or observations of engagement in physical activity during daily life following CABG surgery in contexts outside of a structured exercise prescription and/or supervised cardiac rehabilitation setting.

• **Context**

This review included studies that examined engagement in physical activity during the first 12 weeks following discharge from hospital following CABG surgery. Studies that also included examination of physical activity during the inpatient hospital stay immediately following CABG surgery, or at a time beyond 12 weeks following discharge were included, but only data relating to the first 12 weeks following discharge from hospital were extracted from the study findings for this review. Studies that only examined physical activity pre-operatively, during inpatient hospital stay or the period beyond 12 weeks following discharge from hospital, were excluded from the review.

• **Type of Outcomes**

There were no restrictions on the types of outcome measures used for assessing physical activity. Thus the review included objective measures such as accelerometry as well as self-report estimates such as those provided by answering questionnaires or direct quotes from participants. As it was anticipated a wide range of variables that may impact on physical activity following CABG surgery would be addressed by the literature, there were no restrictions on either the variables themselves or the outcome measures used to measure the variables.

• **Types of Studies**

This review considered systematic original research resulting from published quantitative, qualitative and mixed method studies, with no restrictions on the types of study design or sample size, including single case studies. Experimental studies exploring the effectiveness of an intervention on physical activity were only included if there were relevant control group data available. For such studies only the control group data was extracted to ensure that the
data reflected physical activity during daily life without the interference of the intervention. Conference abstracts, book chapters, editorials, guidelines, theses or reviews were not eligible for inclusion.

- **Limits**

The initial search for this review was undertaken in October 2019. Subsequently an updated search was conducted in October 2020 to ensure a more up to date inclusion of articles in this review. Therefore studies published from each electronic database from inception to 20th October 2020, as well as only those published in English were included in the review.

### 3.3.2 Information sources

The electronic databases searched included PubMed, CINAHL, Scopus and Web of Science.

### 3.3.3 Search strategy

In July 2019, an initial limited search of PubMed and CINAHL the terms “physical activity OR exercise” and “coronary artery bypass” was undertaken to identify relevant articles relating to the research questions. The text words contained in the titles and abstracts of relevant articles, keywords, index terms and Medical Subject Headings (MeSH) were reviewed together by the doctoral candidate and an experienced healthcare research librarian and were used to develop a full search strategy. The full list of keywords and terms used in the database searches are:

- **Concept 1**: “coronary artery bypass” and “CABG”
- **Concept 2**: “physical activity”, “exercise”, “activities of daily living” and “recovery of function”.

The final search strategy for PubMed was as follows:

1. coronary artery bypass[MeSH Major Topic] OR CABG
2. physical activity OR exercise OR activities of daily living OR recovery of function
3. #1 AND #2

Filters: English
See Appendix 1 for the full search strategy for each database.

The screening of the reference lists and forward citation tracking of included studies were also undertaken independently by two reviewers (EG and SD) to identify any potentially relevant studies that were missed in the electronic database search. The potentially relevant studies identified by EG and SD were subsequently compared, with all the potentially relevant studies being added to the total number of studies to undergo screening.

3.3.4 Data management

Following the search, all identified citations were exported into EndNote X9. Duplicates were manually removed in EndNote X9. Following removal of duplications, all citations were exported into the Covidence reference management software (Melbourne, Australia).

3.3.5 Study selection

Two reviewers (EG and SD) independently screened the articles identified in the initial search and the subsequent screening of reference lists and forward citations for eligibility based on the titles and abstracts. Articles were classed initially as 1) ‘not meeting the eligibility criteria’ or 2) ‘potentially meeting the study criteria’. The full text of studies that potentially met the eligibility criteria were retrieved and reviewed independently by EG and SD to confirm or exclude eligibility for inclusion. Following independent screening at each stage, EG and SD met to compare eligibility decisions and to discuss any disagreements. A third reviewer (research supervisor MS) was consulted if discrepancies during the study selection process were not resolved by consensus between EG and SD. A flow diagram representing the study selection process was used as recommended by the PRISMA 2009 guidelines.

3.3.6 Assessment of methodological quality

Selected studies were critically appraised and assessed by two independent reviewers (EG and BS) for methodological validity using the JBI critical appraisal tool appropriate for each study design. When undertaking the critical appraisals, it became apparent that the JBI
appraisal tools for observational cohort and cross-sectional studies was leading to overall low appraisal scores due to the number of criteria relating to having an exposed and unexposed cohort. All the observational studies in the current review were single cohort, with all participants having undergone CABG surgery. Therefore the National Heart, Lung and Blood Institute tool for observational cohort and cross-sectional studies was selected to appraise these studies as this criterion included fewer items based on exposure and therefore resulted in a more accurate representation of study quality. Mixed method studies were appraised by the Mixed Methods Assessment Tool (MMAT) version 2018. Because the MMAT asks if each component of the study adheres to the quality criteria of each tradition, the appraisal tool appropriate to the qualitative and quantitative aspects of the study was applied in order to answer this criterion. Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer (MS) if a consensus could not be reached. All studies, regardless of the results or their methodological quality, underwent data extraction and synthesis. While no studies were excluded based on quality, a critical narrative on the overall methodological quality and how the methodological limitations affect the confidence in the findings of the review was integrated into the discussion.

3.3.7 Data extraction

The doctoral candidate extracted the data which was subsequently checked by a second reviewer (BS). Discrepancies were identified and resolved by discussion, or a third reviewer (MS) was consulted if a consensus could not be reached. The following information were extracted from the included articles: authors, year of publication, country, study design, number and characteristics of the participants, physical activity outcome measures, data collection timepoints, and study outcomes relevant to the study questions. Extracted quantitative data comprised data-based outcomes of descriptive and/or inferential statistical tests that were relevant to the study questions. Significant and non-significant results were extracted, as reporting both is more likely to validate, or highlight inconsistencies in the literature, when findings are integrated together with other quantitative or qualitative findings. For qualitative data, themes or subthemes relevant to the review questions were extracted along with supporting evidence, such as direct quotations from participants.
3.3.8 Data transformation

In accordance with a convergent integrated approach for mixed methods systematic reviews,\textsuperscript{162} following data extraction, quantitative data were ‘qualitised’, or transformed into qualitative data to facilitate integration with data extracted from the qualitative studies. This involved transformation of the relevant study outcomes into textual descriptions or narrative interpretations of the quantitative results, so as to respond directly to the review questions.

3.3.9 Data synthesis and integration

The ‘qualitised’ data were assembled into a table with the qualitative data. Guided by the General Inductive Approach,\textsuperscript{171} the data were coded independently by EG and subsequently checked by MS. Resulting codes were then grouped by EG into categories on the basis of similarity in meaning. Categories were grouped into subthemes and themes by EG and subsequently discussed with MS. Where agreement could not be reached, the other research supervisor (LH) was bought into the discussion to reach a consensus.

3.4 Results

3.4.1 Study selection

The combined initial search in October 2019 and the subsequent updated search in October 2020 of each database retrieved the following number of articles: PubMed 2,480; CINAHL 644; Scopus 6,163; Web of Science 10,677. After duplicate removal 7,232 articles remained. The subsequent reference checking and forward citation tracking of included articles resulted in an additional nine articles being identified. Therefore a total of 7,241 articles were identified for screening. After title and abstract screening, 296 articles were included for full text screening. Following full text screening, 28 articles reporting on 22 studies were included in the review (Figure 3.1).
Figure 3.1 Summary of studies exploring effectiveness of psychosocial interventions to increase physical activity during the first three months following coronary artery bypass graft surgery. PA = physical activity; CABG = coronary artery bypass graft.

3.4.2 Characteristics of included studies

Table 3.1 shows the characteristics of the 22 included studies: 13 were quantitative studies, six were qualitative studies and three utilised a mixed method study design. Of the quantitative studies, nine were prospective observational cohort studies, three were randomised controlled trials and one was a cross-sectional study (Table 3.1). One of the
RCTs\textsuperscript{29} was a pilot study of a subsequent full trial.\textsuperscript{28} Six articles that reported subanalyses of findings from the initial RCT study by Barnason et al. (2009)\textsuperscript{28} were also included in this review.\textsuperscript{107, 157, 172-175} All qualitative studies were prospective studies, apart from the study by Wilson-Barnett (1981) which required participants to reflect on their experiences retrospectively.\textsuperscript{25}

As seen in Table 3.1 the majority of studies were conducted in the USA (n = 11), three in the United Kingdom, two in Norway and one each in Australia, Canada, Germany, Pakistan, Taiwan and Belgium. In regard to date of publication, two were published in the 1980’s, five in the 1990’s, seven in the 2000’s and eight between 2010 and October 2020.

The majority of the included studies had aims related to general recovery patterns and/or experiences following CABG surgery (n=13).\textsuperscript{25, 29, 104, 105, 110, 176-183} Three studies had aims relating to health behaviours or lifestyle changes.\textsuperscript{24, 184, 185} Only six studies included specific reference to physical activity in their study aims.\textsuperscript{28, 74, 99, 103, 186, 187} Nineteen of the 28 articles reported findings related to factors impacting on levels of physical activity participation,\textsuperscript{104, 157, 173, 175, 187} 25, 99, 105, 107, 110, 174, 179-185, 188 whilst 17 articles reported findings related to the amount and/or type of physical activity engaged in during the first 12 weeks following CABG surgery.\textsuperscript{24, 25, 28, 29, 74, 103, 104, 157, 172, 176-180, 184, 186, 188}

### 3.4.3 Participant characteristics

Table 3.1 includes participant characteristics from each of the included studies. A total of 1,921 participants (75.3\% male) were included in the 22 studies within the systematic review (excluding participants from sub-analyses studies of Barnason et al. (2009)). Three of the 22 studies included only female participants\textsuperscript{179, 183, 186} and two of the 22 studies included only male participants\textsuperscript{110, 178, 179}. Fourteen of the 22 studies reported the age range of their participants. The participants’ ages ranged from 32 – 89 years. Three of the 22 studies only included participants aged 65 years and older, including the initial study published by Barnason et al. (2009) from which there were six subsequent publications included in this review that reported on subanalyses of the data from the original study.\textsuperscript{28, 99, 104} Whilst the studies in the systematic review included participants from eight different countries, only six studies reported on the ethnicity demographics of their study participants.\textsuperscript{29, 99, 105, 176, 178, 185}
these latter studies there was a predominance of Caucasians (range 59% - 100%). Only one study, by Kulik et al. (1993), stated other ethnic groups represented in their study sample, which were Black 5%, Asian 4% and Hispanic 1%. No studies explored differences between ethnic groups.

3.4.4 Quality appraisal outcomes

Table 3.2 shows the quality appraisal results for the included studies. Five studies were categorised overall as having good quality,124, 74, 99, 179, 187 11 studies were deemed to be fair quality,103-105, 176-178, 181, 183-186 and six studies were deemed to be poor quality.25, 28, 29, 110, 180, 182 The two RCTs were both of poor quality,28, 29 however the data extracted from these studies (and any articles reporting a subanalysis of the parent study) were based on the control group data and therefore concerns such as lack of transparency regarding randomisation or lack of blinding were not applicable to the analysis of the control cohort data. Though the quality of the parent study by Barnason et al. (2009) was reported in Table 3.2, the six articles which were subanalyses of the parent study were not included in the table but were all separately appraised against the cohort study appraisal tool. These studies were determined to have fair,157, 172, 174, 175 or poor quality.107, 173

In regard to the observational cohort studies, some aspects of the appraisal criteria were not applicable to many of the studies. For example, as stated earlier, all the observational cohort studies included a single cohort of participants with the exposure being ‘undergoing CABG surgery’ and therefore items regarding treatment of exposed and non-exposed groups, including the need for assessor blinding, were not relevant. Only one of the quantitative studies, by Kendel et al. (2008)187 included a sample size or power calculation. Other key areas that commonly led to a downgrade in quality were lack of information regarding the source of the study population, participant recruitment rate from available population of less than 50% and a loss of follow up after baseline of more than 20%.
Table 3.1 Characteristics of included studies

<table>
<thead>
<tr>
<th>First author (year), country</th>
<th>Aim</th>
<th>Participants</th>
<th>Outcome variables</th>
<th>Measurement timepoints</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantitative Studies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cross-sectional design</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ali (2017), Pakistan</td>
<td>To investigate the predictors of non-adherence to lifestyle changes and medication adherence following CABG surgery</td>
<td>265 (59% M)</td>
<td>67.2, SD=13.4</td>
<td>Adherence to exercise recommendations (self-report)</td>
</tr>
<tr>
<td><strong>Prospective observational design</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barnason (2000), USA</td>
<td>To examine functional status outcomes following CABG and the impact of selected patient characteristics on functional outcomes</td>
<td>51 (76% M)</td>
<td>66, SD=10.6 (37-81)</td>
<td>Modified 7-day activity interview</td>
</tr>
<tr>
<td>Kendel (2008), Germany</td>
<td>To examine the role of household activities and household stress as factors contributing to gender differences after CABG surgery</td>
<td>351 (82% M)</td>
<td>M 65.6, SD=7.9 F 69.1, SD=9.5</td>
<td>Housework and Family Activity Scale</td>
</tr>
<tr>
<td>Kidd (2016), UK</td>
<td>To determine the association between health-related control beliefs, QOL, depression symptoms, and health behaviours after CABG surgery</td>
<td>149 (89% M)</td>
<td>68, SD=8.2</td>
<td>IPAQ</td>
</tr>
<tr>
<td>Kirkevold (1996), Norway</td>
<td>To describe the recovery patterns of heart surgery patients (first-time CABG)</td>
<td>91 (95% M)</td>
<td>59.8 (32 – 75)</td>
<td>Activity checklist and longest distance walked (both self-report)</td>
</tr>
<tr>
<td>Author, Year, Location</td>
<td>Objective</td>
<td>Sample Size</td>
<td>Mean Age, SD (Gender)</td>
<td>Race Composition (%)</td>
</tr>
<tr>
<td>------------------------</td>
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</tr>
<tr>
<td>Kulik (1993), USA</td>
<td>To examine the relationships of emotional support and marital status with post hospital adjustments following CABG surgery</td>
<td>85 (100% M)</td>
<td>57.8, SD=5.9 (38-69)</td>
<td>Caucasian (90%), Black (5%), Asian (4%), Hispanic (1%)</td>
</tr>
<tr>
<td>Pierson (2003), USA</td>
<td>To determine the effects of age, gender, comorbid conditions and exercise on the recovery of functional capacity after CABG surgery</td>
<td>198 (74% M)</td>
<td>63.4, SD=9.4 (44-86)</td>
<td>Not stated</td>
</tr>
<tr>
<td>Redeker (1995), USA</td>
<td>To examine the relationships between objectively measured activity patterns and functional recovery after CABG surgery</td>
<td>13 (100% F)</td>
<td>62, SD=10.76 (43 – 78)</td>
<td>Not stated</td>
</tr>
<tr>
<td>Schulz (2005), USA</td>
<td>To examine gender differences in early recovery outcomes among elderly CABG patients</td>
<td>65 (71% M)</td>
<td>F 70.95, SD=4.38, M 71.65, SD=5.06 (all &gt; 65 yrs)</td>
<td>Not stated</td>
</tr>
<tr>
<td>Thijs (2019), Belgium</td>
<td>To compare the progress of physical activity in patients undergoing off-pump or robotically assisted minimally invasive CABG surgery</td>
<td>12 (78% M) (Off pump CABG group)</td>
<td>Median 69 (50-82)</td>
<td>Not stated</td>
</tr>
</tbody>
</table>

**Randomised controlled trials**

<table>
<thead>
<tr>
<th>Author, Year, Location</th>
<th>Objective</th>
<th>Sample Size</th>
<th>Mean Age, SD (Gender)</th>
<th>Race Composition (%)</th>
<th>Outcomes and Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnason (2009), (Also Barnason 2008, Young 2012, Zimmerman 2007, 2010, 2011, 2012), USA</td>
<td>To examine the effect of a symptom-management telehealth intervention on physical activity and physical functioning of older patients after CABG surgery.</td>
<td>132 (control group) (84% M)</td>
<td>71.2, SD=4.7 (all &gt; 65 yrs)</td>
<td>Not stated</td>
<td>Accelerometer Modified 7-day activity interview Activity diary</td>
</tr>
<tr>
<td>Author</td>
<td>Country</td>
<td>Study Object</td>
<td>Sample Size</td>
<td>Sample Characteristics</td>
<td>Methodology</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-------------</td>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Lin (2010), Taiwan</td>
<td>Taiwan</td>
<td>To investigate the behavioural and clinical effects of a therapeutic lifestyle change programme on risk factors of patients who have undergone CABG</td>
<td>37 (control group) 62, SD=10 Not stated</td>
<td>Exercise frequency, duration and style (self-report)</td>
<td>Pre-op, 1 and 3 mo post-op</td>
</tr>
<tr>
<td>Miller (2007), USA</td>
<td>USA</td>
<td>To test the feasibility of an early recovery management intervention to improve physical and psychosocial functioning in the diabetic CABG population</td>
<td>24 (control group) 62.7, CAUCAUSIAN (98%)</td>
<td>Accelerometer Modified 7-day activity interview Activity diary</td>
<td>2 and 6wks and 3 mo post-op</td>
</tr>
<tr>
<td>Banner (2012), UK</td>
<td>UK</td>
<td>To explore women’s experiences of CABG surgery</td>
<td>30 (100% F) 68.2 (53-80) Not stated</td>
<td>Grounded theory/semi-structured interviews</td>
<td>Pre-op, 6 wks and 6 mo post-op</td>
</tr>
<tr>
<td>Cleary (2015), USA</td>
<td>USA</td>
<td>To describe factors that influence adherence to exercise, and perceptions of activity limitations and health related QOL in older patients after CABG surgery</td>
<td>29 (82% M) 73, SD=7 CAUCAUSIAN (100%)</td>
<td>Qualitative description methodology/semi-structured interviews</td>
<td>3, 6 and 12 mo post-op</td>
</tr>
<tr>
<td>King (1988), USA</td>
<td>USA</td>
<td>To describe recovery from CABG surgery from the patient’s perspective</td>
<td>34 (71% M) 61.5, SD=9 Not stated</td>
<td>Not stated/semi-structured interviews</td>
<td>1, 2, 3, 4, 6 and 8 wks post-op</td>
</tr>
<tr>
<td>Lie (2012), Norway</td>
<td>Norway</td>
<td>To explore patients’ symptoms and needs in the early rehabilitative phase after CABG surgery</td>
<td>93 (90% M) 62 (39-77) Not stated</td>
<td>Not stated/semi-structured interviews</td>
<td>2 and 4 weeks post-op</td>
</tr>
<tr>
<td>Moore (1994, 1995), USA</td>
<td>USA</td>
<td>To elicit concrete descriptors of CABG surgery and the behaviours most helpful to manage recovery</td>
<td>40 (50% M) 63.5, CAUCAUSIAN (98%)</td>
<td>Not stated/semi-structured interviews</td>
<td>Day 2 and 3 wks post-discharge</td>
</tr>
<tr>
<td>Wilson-Barnett (1981), UK</td>
<td>UK</td>
<td>To examine recovery, physical and psychological problems, time required for recovery, and needs and advice for guidance following CABG surgery</td>
<td>60 (92% M) 57.4 (34-78) Not stated</td>
<td>Not stated/structured interviews (retrospective)</td>
<td>12 months (range 6 – 32 months post-op)</td>
</tr>
</tbody>
</table>
### Mixed method studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Objective</th>
<th>Sample Size</th>
<th>Mean Age (SD)</th>
<th>Race</th>
<th>Data Collection Approach</th>
<th>Duration post-op</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallagher (2004), Australia</td>
<td>To describe the types and frequency of problems Australian women experience following CABG surgery</td>
<td>52 (100% F)</td>
<td>66.3 (53-79)</td>
<td>Not stated</td>
<td>Not stated/NA/semi-structured interviews</td>
<td>1, 3 and 6 wks post-op</td>
</tr>
<tr>
<td>O’Connor (1983), Canada</td>
<td>To examine relationships between rehabilitation outcome and selected physical, psychosocial and health care system variables</td>
<td>30 (100% M)</td>
<td>55.5, SD=6.6</td>
<td>Not stated</td>
<td>Not stated/NA/semi-structured interviews</td>
<td>Mean 77 ± 10 days post-op</td>
</tr>
<tr>
<td>Sethares (2013), USA</td>
<td>To describe pain intensity, interference and strategies used to manage pain after CABG surgery.</td>
<td>80 (70% M)</td>
<td>66.3 ± 10.5 (39-89)</td>
<td>Caucasian (59%)</td>
<td>Not stated/structured interviews</td>
<td>Weekly between 2 and 12 wks post-op</td>
</tr>
</tbody>
</table>

M = male; F = female; wks = weeks; mo = months; pre/post-op = pre/post-operative; NA = not applicable; SD = standard deviation; CABG = coronary artery bypass graft; QOL = quality of life; IPAQ = international physical activity questionnaire; yrs = years.
<table>
<thead>
<tr>
<th>First author (year)</th>
<th>Criterion/item number of relevant appraisal tool</th>
<th>Overall rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mixed method studies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O’Connor (1983)</td>
<td>N Y Y U N</td>
<td>Poor</td>
</tr>
<tr>
<td>Sethares (2013)</td>
<td>N Y Y U N</td>
<td>Fair</td>
</tr>
<tr>
<td><strong>Observational cohort studies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ali (2017)</td>
<td>Y Y Y Y N Y Y NA Y NA N U Y N</td>
<td>Fair</td>
</tr>
<tr>
<td>Barnason (2000)</td>
<td>Y N U Y N Y NA N Y N Y Y</td>
<td>Good</td>
</tr>
<tr>
<td>Kendel (2008)</td>
<td>Y Y y Y Y Y NA Y NA Y U N Y Y</td>
<td>Fair</td>
</tr>
<tr>
<td>Kidd (2016)</td>
<td>Y N N U Y N y Y y NA y NA y U N Y Y</td>
<td>Good</td>
</tr>
<tr>
<td>Kirkevold (1996)</td>
<td>Y Y U Y N Y NA Y NA Y U N N N</td>
<td>Fair</td>
</tr>
<tr>
<td>Kulik (1993)</td>
<td>Y Y Y Y N Y Y NA Y NA Y U Y N</td>
<td>Fair</td>
</tr>
<tr>
<td>Pierson (2003)</td>
<td>Y Y Y Y N Y y Y y NA y NA y N Y Y</td>
<td>Good</td>
</tr>
<tr>
<td>Redeker (1995)</td>
<td>Y N Y U N Y NA Y NA Y N N N</td>
<td>Fair</td>
</tr>
<tr>
<td>Schulz (2005)</td>
<td>Y N U Y N Y NA Y NA Y N Y N</td>
<td>Fair</td>
</tr>
<tr>
<td>Thijs (2019)</td>
<td>Y Y U Y N Y Y Y Y NA y U U N N</td>
<td>Fair</td>
</tr>
<tr>
<td><strong>Qualitative studies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banner (2012)</td>
<td>Y Y Y Y Y Y N N N N Y Y</td>
<td>Good</td>
</tr>
<tr>
<td>Cleary (2015)</td>
<td>U Y Y Y Y N N Y Y</td>
<td>Good</td>
</tr>
<tr>
<td>King (1988)</td>
<td>N N Y Y Y N N N U Y</td>
<td>Poor</td>
</tr>
<tr>
<td>Lie (2012)</td>
<td>Y Y Y Y Y N N y y</td>
<td>Fair</td>
</tr>
<tr>
<td>Moore (1994, 1995)</td>
<td>U U Y Y Y N N N U Y</td>
<td>Poor</td>
</tr>
<tr>
<td>Wilson-Barnett (1981)</td>
<td></td>
<td>Poor (v poor)</td>
</tr>
<tr>
<td><strong>Quasi-experimental trials</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lin 2010</td>
<td>Y Y Y Y Y U Y Y Y</td>
<td>Good</td>
</tr>
<tr>
<td><strong>Randomised controlled trials</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barnason (2009)</td>
<td>U U Y N N N Y Y Y Y Y Y Y N</td>
<td>Poor</td>
</tr>
<tr>
<td>Miller (2007)</td>
<td>Y N U N N N Y Y Y Y Y Y Y N</td>
<td>Poor</td>
</tr>
</tbody>
</table>

Observational cohort studies were assessed using the National Heart, Lung and Blood Institute tool for observational cohort and cross-sectional studies; Qualitative studies were assessed using the JBI tool for qualitative studies; Quasi-experimental trials were assessed using the JBI tool for quasi-experimental studies; RCTs were assessed using the JBI appraisal tool for randomised controlled trials; mixed methods studies were assessed using the Mixed Methods Appraisal Tool version 2018. Y = yes meets criteria; N = no does not meet criteria; U = unclear or cannot determine if meets criteria; NA = not applicable.
Only two of the qualitative studies described a theoretical framework or qualitative methodology that guided the study design and process. Other key factors that led to a down grade in quality was that few of the qualitative studies reported measures taken to establish trustworthiness of the data, and/or did not include direct participant quotes to substantiate their findings.

3.4.5 Findings relating to aim 1: Factors that influenced physical activity engagement during the first three months following CABG surgery

From the systematic review of the literature findings, four main themes were identified as factors that influenced physical activity: sociodemographic variables; physical symptoms; psychosocial factors; and environmental factors. Figure 3.2 depicts the outcome from the synthesis of the systematic review findings relating to each of these themes, as well as the subthemes relating to each main theme.

**Theme 1: Sociodemographic variables**

Under Theme 1 three subthemes were identified from the results of findings relating to sociodemographic variables that impacted on engagement in physical activity: gender; relationship status; and living location (Table 3.3).

- **Gender**
Three articles (one good quality and two fair quality) reported findings on the impact of gender on engagement in physical activity, however results were not consistent. Results from the study by Kendel et al. (2008) reported that females had significantly higher (p<0.001) level of engagement in household related physical activity compared to males at three months post-operation. In the study by Zimmerman et al. (2011) results showed that males had higher energy expenditure and engagement in exercise compared to females at three, six and 12 weeks post-operative, however the actual numbers and levels of significance for these data were not reported. In the third study by Schulz et al. (2005), that reported on the impact of gender on physical activity engagement following CABG surgery, no differences in self-reported engagement in exercise between males and females were found at multiple time points during the first three months following CABG surgery.
Figure 3.2 Factors that impact on physical activity during the first 12 weeks following CABG surgery. PA = physical activity. Note: Each symbol (+, -, 0 or ?) denotes findings from an individual study. + = increased/enabled PA; - = decreased/barrier to PA; 0 = neither increased nor decreased PA; ? = unclear if increased or decreased PA. Double arrow indicates relationship between two subthemes identified by a single study.

- **Relationship status/living situation**

Two articles (both good quality) reported findings on the impact of relationship status or living situation on engagement in physical activity and reported similar findings to each other. Kendel et al. (2008) found that their findings about the above mentioned differences in household related physical activity between females and males was only evident in those who lived with a partner, and that there was no difference in time spent on household activities between males in females who lived alone. Banner et al. (2012) reported that those who lived alone engaged in more physically demanding activities compared to those who lived with a spouse. These findings suggested that living alone created a necessity to undertake certain household activities and therefore increased participation in these activities. However for those who lived with a spouse, who was able to do these activities for them, participants appeared less likely to engage in these activities. The findings of Kendel et al. (2008) also suggested that traditional household gender roles may have also influenced engagement in physical activity, as females who lived with a spouse engaged in more household activities than males who lived with a spouse.
• **Urban vs rural locality**

One article (fair quality) investigated physical activity engagement based on participants’ living location and results showed that those who lived rurally had higher level of physical activity compared to those who lived in urban areas.\(^{175}\) Potential reasons for this difference were not explored by the authors.

**Theme 2: Physical Symptoms**

Eight of the 28 articles in the systematic review reported findings relating to physical symptoms that were barriers to physical activity. The four symptoms were fatigue (four studies), pain (two studies), dyspnoea (one study), with one study reporting the impact of multiple symptom burden on physical activity (Table 3.4).

• **Fatigue**

Results from four studies (all poor quality) provided low quality preliminary evidence relating to the impact of fatigue on engagement in physical activity during the first three months following CABG surgery. Fatigue was described in the studies as a feeling of tiredness, exhaustion or lack of energy, that limited people’s ability to engage in physical activity. King et al. (1988) found that each week between post-operative weeks one to eight, people reported that fatigue was a key reason why they were not doing as much activity as they felt they should.\(^{180}\) Moore (1994) reported that at two days following discharge from hospital, the majority of participants experienced an overwhelming fatigue that prevented them doing what they thought they should do.\(^{182}\) In another analysis of the same study, Moore (1995) reported that more males compared to females experienced this fatigue at both two days and three weeks post-discharge. It was also noted that descriptors of fatigue were often accompanied by explanations about activities.\(^{188}\) However, these findings by King et al. (1988) and Moore (1994, 1995) were all low quality qualitative studies and none included data such as participant quotes, to substantiate the findings reported. Based on participants’ self-reports of the presence of fatigue at that time, Barnason et al. (2008) categorised participants as ‘fatigued’ or ‘non-fatigued’ prior to discharge from hospital.
Table 3.3 Impact of sociodemographic factors on engagement in physical activity

<table>
<thead>
<tr>
<th>Subtheme</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td>Kendel, 2008 41% of females spent more than 3 hours/day on household activities in contrast to 14% of males (p&lt;0.001) at two months post-op; 36.4% of females felt highly stressed by these activities compared to 18.3% males (p&lt;0.001). These gender differences only emerged in patients living with a partner. Males and females living alone reported similar levels of time spent on household activities and household stress. Schulz, 2005 No significant differences between males and females for self-reported exercise frequency or duration at 2, 4 and 6 weeks and 3 months post-operative. Zimmerman, 2011 Levels of physical activity, measured according to energy expenditure (as measured by accelerometer) and minutes spent in moderate or greater intensity activity (as measured by activity diary), showed a gender disparity. Males had higher levels of physical activity than females at 3 weeks, 6 weeks and 3 months (level of significance not stated). In addition, activity levels in females increased at a much slower pace over time.</td>
</tr>
<tr>
<td><strong>Relationship Status/ Living Situation</strong></td>
<td>Banner, 2012 At 6 weeks post-operative, those living alone undertook physically demanding tasks out of necessity, placing themselves at considerable risk of harm, compared to those living with a spouse. Quote “I tried to do a bit of gardening but thought it was no good at all as I immediately ended up on my face in the flower bed. And I fell a couple of times into a bed of nettles when I was walking the dog”. Kendel, 2008 Gender differences in household physical activity only emerged in participants living with a partner. Males and females living alone reported similar levels of time spent on household activities and household stress.</td>
</tr>
<tr>
<td><strong>Living locality</strong></td>
<td>Zimmerman, 2012 During the first 3 months, participants from rural areas had higher physical activity levels compared to those from urban areas as measured by accelerometer, activity diary and Modified 7-Day Activity Interview (p&lt;0.05).</td>
</tr>
</tbody>
</table>
While participants in the ‘fatigued’ group had lower self-reported time spent in engagement in exercise compared to the ‘non-fatigued’ group at six weeks post-operation, there were no statistically significant differences between the groups for any self-reported or objectively measured physical activity at either six weeks or three months post-CABG surgery. Key limitations in this study included questionable validity of the method used to group participants as ‘fatigued’ or ‘non-fatigued’, as well as the lack of reassessment of the presence of fatigue over the study period. These limitations meant that participants who reported fatigue at the time of discharge remained in the fatigued group throughout the study period, even if they reported that their fatigue had reduced or gone by six weeks or three months post-operative. The potential absence of fatigue in the fatigued group at the follow up time points may be one reason why there was no significant difference between the groups.

In summary, while there was some preliminary evidence that the fatigue limited physical activity engagement in the early recovery period following CABG surgery, in the included studies there was a lack of high quality evidence and a lack of detail regarding the impact of fatigue on physical activity engagement over time.

- Pain

Two studies (one good and one fair quality) reported findings about pain impacting on physical activity engagement. The study by Cleary et al. (2015) only reported the impact of pain at 12 weeks post-CABG and reported that pain was the fifth and least most frequently reported barrier to physical activity at that time. However the study by Sethares et al. (2013) followed the impact of pain from the early recovery period to 12 weeks post-operative. As part of their study on examination of the impact of pain on recovery during the first three months following CABG surgery, Sethares et al. (2013) asked participants each week what they had done to manage their pain resulting from the cardiac surgery. While pain medication was the primary pain relieving strategy for post-surgical pain throughout the study period, activity modification emerged as the second most frequently reported strategy, with 37% of participants at week two reporting modifying the amount or way that they performed physical activity in order to manage the pain they experienced with activity. The frequency of the use of activity modification was highest in the first six weeks post-CABG and in general reduced each week. By week 12, only 1% of participants reported using activity modification to relieve pain. Activity modification was achieved by minimising engagement in activities to levels below those recommended by a physician or by stopping an activity if the activity being undertaken caused pain. While these findings do not provide information regarding
the extent to which pain limited physical activity, they do indicate that approximately one third of participants were modifying their physical activity engagement in response to pain during the early recovery period. The low impact of pain as a barrier to physical activity engagement at week 12 was also reflected in the findings of Cleary et al. (2015).

• **Dyspnoea**

Results of one study of fair quality, found that at weeks 2-4 post-CABG a third of participants reported they felt their physical activity levels were not improving and that they were experiencing dyspnoea or getting out of breath easily when walking up slight hills. However, given that ‘feeling slightly breathless when walking up hills’ could be a relatively common experience amongst many of the general population it is unclear from the study results whether this level of dyspnoea was abnormal or different to the participants’ pre-operative levels. In addition, it is unclear from the findings whether the level of dyspnoea reported was the actual cause of the perceived lack of a change in physical activity engagement, or whether it was simply something that participants were experiencing while engaging in physical activity. Furthermore, the findings were largely unsubstantiated, as the only quotation provided in the results in relation to this finding referred only to walking outdoors rather than specifically on an incline. Also the quotation was in relation to a person who had experienced a pulmonary complication post-surgery and therefore may not have been representative of the experiences of those who had an uncomplicated recovery.

• **High symptom burden**

One study of poor quality, used cluster analysis to assess the impact of a combination of multiple symptoms of varying severity on physical activity. In this study, participants were asked to rate the perceived burden of each of eight symptoms (pain, appetite problems, fatigue, swelling, sleep problems, dyspnoea, anxiety and depression) at the time of discharge from hospital. The authors found that while physical activity levels increased over time regardless of the level of symptom burden, those with a higher perceived burden of symptoms at the time of discharge had significantly lower ($p<0.01$) physical activity engagement at both six weeks and three months post CABG, according to most objective and subjective physical activity measures undertaken, compared to those with low perceived burden of symptoms. However, it is important to note that there was no follow up measurement of, or adjustment for the resolution of symptoms over time, so it is unclear from
the results whether a high level of symptom burden remained following discharge from hospital or was still present at each of the post-operative timepoints when physical activity was measured. In addition, not all of the symptoms included in the analysis and groupings were physical, as two of the eight symptoms were psychological factors (depression and anxiety). Further, it was not possible to differentiate between the impact of physical and psychological symptoms in the study findings. However, since the majority of the symptoms included in the groupings were physical and because depression and anxiety were the symptoms least frequently reported by the study participants, this subtheme was included within the physical factors theme. Though the importance of noting the potential impact of psychological factors such as depression and anxiety alongside physical symptoms on physical activity following CABG surgery was recognised when these findings were interpreted.

**Theme 3: Psychosocial factors**

The impact of psychosocial factors was the most frequently reported theme overall in the systematic review. Of the 28 articles reviewed, 11 reported on a range of psychosocial barriers to physical activity and three reported on various psychosocial facilitators to physical activity engagement (Table 3.5). Subthemes identified as psychosocial barriers during the first 12 weeks were: uncertainty (four articles), fear (four articles), feeling reluctant/cautious (two articles), lack of motivation (one article) and depression (one article). Personal motivation was identified as a facilitator of physical activity in one article. Perceived support was a factor that was reported as both a facilitator and a barrier to physical activity (three articles). Two studies examined the relationship between perceived health and health-related control and physical activity engagement.\textsuperscript{110, 185} No significant association between these factors was found in either of these studies, and thus, perceived health and health-related control did not appear to have the impact on physical activity that other psychosocial factors had.
Table 3.4 Impact of physical symptoms on engagement in physical activity

<table>
<thead>
<tr>
<th>Subtheme</th>
<th>Findings</th>
</tr>
</thead>
</table>
| **Fatigue/Lack of Energy**      | **Barnason, 2008**  
Participants were categorised as fatigued or non-fatigued at time of discharge from hospital. Fatigued participants had lower self-reported time (minutes) spent exercising/day (M 26.7, SD 9.6) compared to non-fatigued participants (M 41.5, SD 27) at 6 weeks, however the result was not significant. Exercise time was similar in both groups at 3 months (M 33.7, SD 21.4 vs M 34.7, SD 22.3). There were no significant differences between fatigued and non-fatigued participants in relation to energy expenditure (measured by accelerometer) or self-reported exercise time at 6 weeks and 3 months post-operative. |
| **King, 1988**                  | At 1, 2, 3, 4, 6 and 8 weeks, most participants who reported doing less than they thought they would be able to do (range 15 - 41% across time points) stated that this was caused by a general lack of energy. (No quotes provided)                                                                                                                                                                                                                                  |
| **Moore, 1994**                 | At day 2 post discharge: Overwhelming fatigue and inability to do what the participants had believed they would be able to do in their recovery, for example found it harder to move around the house than they realised (90%). (No quotes provided)                                                                                                                                                                                                            |
| **Moore, 1995**                 | More males reported fatigue than females at two days (85% vs 15%) and at 3 weeks (90% vs 20%) post-discharge. Descriptions associated with energy level included "extreme fatigue", "exhaustion", "feeling tired", and "craving naps". Descriptions of energy level were often accompanied by explanations of activities. (No quotes provided)                                                                                                                                 |
| **Pain**                       | **Cleary, 2015**  
Pain (along with injury and illness) was the fifth (and least) frequently reported barrier to engagement in exercise at 3 months. Quotes: “If my feet bother me and so forth, I wouldn’t walk”; “It hurts ... I had four major surgeries in the last 2 years”.                                                                                                                                                                                                                       |
Activity modification as a pain-relieving strategy was reported by 37% of participants at week 2 was 37%, 25% at week 3, 22% at week 4, 10% at week 5, 18% at week 6, with subsequent weekly reductions until week 12 where the frequency was only 1%.

Dyspnoea

One third of participants described unchanged physical activity levels at weeks 2 and 4 and described getting out of breath easily, especially when walking up slight hills or inclines. One quote provided “I had some pleural effusion when I left the hospital. I still feel some dyspnoea when walking outdoors, and my wife gets a little anxious about what can happen?”

High symptom burden

Participants were grouped into “clusters” based on symptoms at time of discharge: cluster 1 - low symptom burden on all 8 symptoms; cluster 3 - moderate symptom burden on all 8 symptoms; and cluster 2- a combination of low (shortness of breath, fatigue, depression, pain, and anxiety) and moderate (sleep problems, swelling, and appetite problems). The majority of mean physical activity variables except for mean daily minutes in moderate or greater activity (diary) (F = 2.17), were significantly different by symptom burden group regardless of time (p < 0.01), with those more burdened by symptoms having lower physical activity levels: mean daily activity kilocalories expended (accelerometer) (F = 5.65, p < 0.01), mean daily total activity counts (accelerometer) (F = 9.58, p < 0.01), and mean total kilocalories per kilogram per day (diary) (F = 3.76, p < .02).

M = mean; SD = standard deviation.
Psychosocial factors that were reported as barriers to physical activity

- **Uncertainty**

In this review uncertainty is described as a subtheme that “incorporated feelings of confusion, lack of preparedness and/or lack of knowledge regarding engagement in physical activity”. Uncertainty was reported in the findings of four qualitative studies. In three of these studies (one good quality, one fair quality and one poor quality) results showed that during the first six weeks, some participants had questions or needed to seek advice about physical activity engagement, including how to return to work; how to increase their activity; when to begin rehabilitation programmes; how to manage physical limitations to physical activity; and who to contact for support. These findings suggested that people felt unprepared to manage their progression in physical activity, which then created uncertainty about what they could do and when they could return to other activities. One study (that was of very poor quality) reported that some of their participants experienced confusion due to conflicting advice about physical activity that had been provided by health professionals following discharge. However no specific information was included by the authors regarding the nature of this conflicting advice. Overall, none of these four studies where the subtheme ‘uncertainty’ was identified, provided participant quotes to substantiate the findings relating to uncertainty regarding physical activity.

- **Fear**

Four articles (one fair quality and three poor quality) reported findings relating to fear, worry or concern about engagement in physical activity being expressed by study participants at varying time points during the first three months following CABG surgery.

In the qualitative study by Moore (1994), 25% of participants at two days post discharge were concerned about ‘overdoing it’ and were afraid that they would faint in the shower. In a secondary analysis of the same study, Moore (1995) reported that at three weeks following discharge three women (of the 12 female participants included in the secondary analysis who lived alone), were not walking outside because they were afraid that something might happen to them.
Ali et al. (2017) asked their participants a series of questions about activity at six weeks post-operation: did they feel reluctant to engage in exercise; have a busy daily schedule; feel fatigued after exercising; or believe that exercise might aggravate their heart condition? These authors found that out of these options, ‘fear that exercise might aggravate their heart condition’ was the third highest predictor for non-compliance with exercise recommendations at six weeks post-CABG.¹⁸⁴

O’Connor et al. (1983) found that at three months post-CABG fear of injury (which was measured providing a pre-determined list and asking participants to select the factors which they perceived had a major effect on their rehabilitation) was significantly associated with engagement in leisure activities, but not household activities (P<0.05). Interestingly, those who reported engaging in leisure activities that were more strenuous, were also more likely to report fear as a barrier to rehabilitation.¹¹⁰ These findings indicated that fear may not be a barrier to engaging in less physically demanding activities but may become a barrier for more physically demanding tasks where there is potentially a greater risk of doing harm.

In regard to the specific underlying reasons for the fear associated with physical activity, in the studies by Moore the sources of the fear were categorised very generally, e.g. fear of “overdoing it”¹¹² or that “something might happen”.¹⁸⁸ O’Connor et al. (1983) reported that participants were fearful of injury at three months post-operative.¹¹⁰ These authors did not identify however what type of injury it was that the participants feared: that is whether it was fear of general musculoskeletal injuries that can occur with physical activity or if it was fear specifically related to injury at their surgical sites. In the study by Ali et al. (2017), the source of the fear that was reported to be experienced by many participants at six weeks post-CABG was that exercise would aggravate their heart issue.¹⁸⁴ No other sources of fear associated with physical activity engagement were reported by either the study by O’Connor or Ali et al.

- **Feeling cautious or reluctant**

Two studies (one good and one fair quality) provided preliminary evidence regarding feeling cautious or reluctant to engage in physical activity. Ali et al. (2017) reported that, in their study cohort, reluctance was the biggest barrier to engagement in exercise at six weeks post-CABG out of the options provided by the authors (as reported previously).¹⁸⁴ Similarly, Cleary et al. (2015) reported that some participants reported taking a cautious approach to exercise and also that while they did not necessarily restrict physical activity, the participants...
still took extra care when performing strenuous activities at three months post-CABG. However, the underlying reasons for this reluctance or cautious approach to physical activity were not clearly identified in these findings.

- **Lack of motivation**
  One good quality study reported that a lack of motivation was a barrier to physical activity in their study cohort, and that a lack of motivation was the most commonly reported barrier to exercise at three months post-CABG. The quote supplied to support this theme (see Table 3.5) indicated that for at least one participant, the lack of interest in exercise was because they perceived exercise as being boring.

- **Depression**
  Only one study explored depression as a barrier to physical activity. In the study by Zimmerman et al. (2011), which was of fair quality, they found there was a negative association between the presence of depression and physical activity. In their subanalysis of the control group of the parent study by Barnason et al. (2009), they found that depression at the time of discharge from hospital was moderately negatively associated with physical activity as measured by energy expenditure at three months, however the association was not present at six weeks post-CABG.

_Psychosocial factors that were facilitators to physical activity_

- **Personal motivation**
  Two studies (one good quality and one fair quality) identified motivating factors to engagement in physical activity (Table 3.5). Gallagher et al. (2004) interviewed 52 females at six weeks post-operation and found that engagement in household tasks occurred before increasing walking outdoors, and that the two motivating factors for this increase in household tasks were necessity and personal standards. Cleary et al. (2015) included 28 participants all 65 years and older and asked each to identify personal motivators to exercise at three months post-CABG. The motivators (in order of most reported frequency, to least reported) were: it feels good; self-motivation; improves health; environment; habit; get back to previous activities; companionship; and enjoyment.
Support

Three studies (one good quality\textsuperscript{187} and two poor quality\textsuperscript{25,182}) reported findings related to the impact of support from spouses, family and/or health professionals on physical activity engagement. Overall these findings provided evidence for both a lack of support and the presence of support to engage in physical activity. As well, each had the potential to facilitate or inhibit engagement in physical activity. In the study by Kendel et al. (2008) results relating to support for household activities showed more males than females received support from their spouse; more females than males received support from their children; and more females than males reported receiving no support for household related activities.\textsuperscript{187} However, the authors did not clarify whether the lack or presence of support increased or decreased participant engagement in household activities. For example, ‘support’ could mean that the spouse or child did the household activities for the participant (resulting in a reduction in physical activity engagement for the participant). Conversely ‘support’ could mean the provision of encouragement or assistance to enable the participant to engage in the household activities.

The findings of Wilson-Barnett (1981) showed experiences of participants varied in regard to participants receiving support from spouses and health professionals, to engage in physical activity following discharge from hospital. The authors also reported that just over half of their participants had no encouragement to resume physical activity after they returned home following CABG surgery. In addition, for many of these participants either their spouse or general practitioner discouraged them from engaging in physical activity. The remaining participants reported receiving encouragement to engage in physical activity either from the nurse and/or general practitioner following their discharge from hospital.\textsuperscript{25} It is unclear from the results however whether the encouragement led to an actual increase in physical activity engagement.

As stated earlier, Moore (1994) reported that three of the 12 female participants who lived alone were fearful to go for a walk outside in case something went wrong, and that not having anyone to accompany them on the walk contributed to this fear.\textsuperscript{182} This finding suggested that the lack of support was a barrier to physical activity and implies that had
### Table 3.5 Impact of psychosocial factors on engagement in physical activity

<table>
<thead>
<tr>
<th>Subthemes</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uncertainty</strong></td>
<td></td>
</tr>
<tr>
<td>Lie, 2012</td>
<td>Uncertainty about return to work was a concern for 13% at week 2 and 3% at week 4. &quot;I am so afraid I will not be able to return to work. My work means the world to me&quot; (week 2). Some participants wanted advice on how to approach the work situation, especially those with manual work. Patients who had an improved physical activity level wanted advice about how to increase activity (no quote provided).</td>
</tr>
<tr>
<td>Moore, 1994</td>
<td>Some participants had questions at 3 weeks about when they could begin rehabilitation programmes and return to work (no quotes provided).</td>
</tr>
<tr>
<td>Banner, 2012</td>
<td>At 6 weeks some participants felt unprepared for managing the physical limitations to physical activity and were unsure who to contact for advice (no quotes provided).</td>
</tr>
<tr>
<td>Wilson-Barnett, 1981</td>
<td>Following discharge, many participants were confused by different advice about physical activity and felt sad when they were advised not to resume such things as bicycling and dancing when they really wished to (no specific time period for these findings was stated; no quotes provided).</td>
</tr>
<tr>
<td><strong>Fear</strong></td>
<td></td>
</tr>
<tr>
<td>O’Connor, 1983</td>
<td>At 3 months, fear of injury (but not fear of recurrent symptoms) was significantly related to post-operative leisure activities, with fear of injury causing 35% of the variance (p&lt;0.05). Fear was not significantly related to household activities (sample of 30 males). More strenuous leisure activities were performed by those participants who reported fear as a barrier to rehabilitation.</td>
</tr>
<tr>
<td>Ali, 2017</td>
<td>At 6 weeks, many participants were fearful that exercise would aggravate their heart issue; fear was the third highest predictor for non-compliance to exercise recommendations (OR 2.7, 95% CI 1.5-5, p&lt;0.001).</td>
</tr>
<tr>
<td>Moore, 1994</td>
<td>At day 2 post discharge, many participants were concerned about &quot;overdoing it&quot; and were fearful of fainting in the shower (n=10) (no quotes provided).</td>
</tr>
<tr>
<td>Source</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Moore, 1995</td>
<td>At 3 weeks, three women (15%) said they did not walk because they were afraid of getting down the block and not being able to get back if something happened to them (no quotes provided).</td>
</tr>
<tr>
<td><strong>Reluctant/cautious</strong></td>
<td></td>
</tr>
<tr>
<td>Ali, 2017</td>
<td>At 6 weeks, reluctance to engage in exercise was the biggest predictor for non-compliance to exercise recommendations (OR 14, 05% CI 6.3-3.14, p≤0.001).</td>
</tr>
<tr>
<td>Cleary, 2015</td>
<td>Some participants reported on taking a cautious approach particularly for more strenuous activities at three months. This was described not necessarily as restricting physical activity, but taking extra care to perform activities that were more strenuous. “I have to be more cautious now than before, ya know. Before I even found out I was sick, I was doing like everything and all that. Now, I got to be like a little cautious.”</td>
</tr>
<tr>
<td><strong>Lack of motivation</strong></td>
<td></td>
</tr>
<tr>
<td>Cleary, 2015</td>
<td>Lack of motivation or interest was the most frequently reported barrier to exercise at 3 months. Quote provided: “Well lack of interest in it, laziness, and some of it can be very boring, say something on a treadmill or something like that ... that would, I think that would just drive me up the wall.”</td>
</tr>
<tr>
<td><strong>Depression</strong></td>
<td></td>
</tr>
<tr>
<td>Zimmerman, 2007</td>
<td>The presence of depression was moderately negatively associated with energy expenditure (kcal/kg/day) at 3 months (r = -0.34, p&lt;0.05), but not at 6 weeks post-operative.</td>
</tr>
<tr>
<td><strong>Facilitators</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Personal Motivation</strong></td>
<td>Motivators to exercise at 3 months (in order of reported frequency) were:</td>
</tr>
<tr>
<td>Cleary, 2015</td>
<td>Feels good: “It makes you feel good. I always feel good after I go for a walk... I feel like I accomplished something”</td>
</tr>
<tr>
<td></td>
<td>Self-motivation: (no quote provided)</td>
</tr>
<tr>
<td></td>
<td>Improves physical health: “It’s going to make me healthy and keep me healthy and it’s good for your legs, your weight, your brain ... I mean, it’s good for a lot of stuff”</td>
</tr>
<tr>
<td></td>
<td>Environment: “Oh it’s refreshing to get the warm air as I walk along the river bank. It’s fresh and relaxing”</td>
</tr>
</tbody>
</table>
Habit: (no quote provided)
Get back to previous activities: (no quote provided)
Companionship: “It helps to have someone to do it with me”; “I like to go out and walk with my wife”
Enjoyment: “I wouldn’t do it if I didn’t like doing it”; “I just enjoy doing it.”

Gallagher, 2004
In a sample of women, during the first 6 weeks, engagement in household tasks occurred before increasing walking. The increase in engagement in household tasks was due to necessity or personal standards (no quotes provided).

Subthemes that were both barriers and facilitators

Perceived Support

Kendel, 2008
At 2 months, 66% of men compared to 46% of women reported support for household activities by their partner (p=0.002). In contrast 38% of women compared to 16% of men reported support by their children for household activities (p<0.001). 20% of women reported no support for household activities compared to 7% of men (p<0.001).

Moore, 1995
Three women indicated that they did not walk because they were afraid of getting down the block and not being able to get back if something happened to them all lived alone and said they had no one to accompany them on walks (no quotes provided).

Wilson-Barnett, 1981
When returning home 35 (out of 60) participants reported that no one encouraged them to resume activities. The person most likely to discourage activity was the spouse (n=25) but the general practitioner frequently discouraged patients (n=10). However, 13 participants said that the hospital doctor encouraged them to do a little more physical activity each day and told them that walking was beneficial. The remaining 12 received encouragement from a nurse and/or general practitioner.

Subthemes that were neither barriers nor facilitators

Perceptions of Health and Health-related Control

Kidd, 2016
Health related personal control was not significantly related to physical activity engagement as measured by the IPAQ.

O’Connor, 1983
Post-op Household Activities (METs) were not significantly related to post-op perception of health (R² = 0.26).

OR = odds ratio; CI = confidence interval; kcal=kilocalories; kg=kilograms; IPAQ = International Physical Activity Questionnaire; METs = metabolic equivalents.
support been available to each of these participants it may have helped them to overcome their fears and to engage in walking outdoors.

**Theme 4: Environmental factors**

Weather and time were the environmental factors identified in the results of two studies in this review (Table 3.6). Each was reported as a barrier to engagement in physical activity following CABG surgery. Cleary et al. (2015) conducted their study in the north west United States where seasonal variations can result in cold temperatures during winter and found that weather was the second most frequently reported barrier to exercise at three months post-CABG. In regard to time, both Ali et al. (2017) and Cleary et al. (2015) reported that being busy/having lack of time was a barrier to engaging in physical activity at both six weeks and three months post-CABG respectively.

Table 3.6 Environmental factors impacting on physical activity engagement

<table>
<thead>
<tr>
<th>Subtheme</th>
<th>First author, year</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weather</strong></td>
<td></td>
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<tr>
<td>Cleary, 2015</td>
<td>Weather was the second most frequently reported barrier to exercise at three months post-operative. Quote: “A good rainy day might hold me back and I don’t like when it’s icy and slick and an old guy like me with your bones vulnerable, you don’t want to break any of them.”</td>
<td></td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ali, 2017</td>
<td>Having a busy schedule was identified as the second biggest barrier (behind reluctance) to adhering to exercise recommendations at six weeks post-operative (OR 9.2, 95% CI 5.2-16.4, p≤0.001).</td>
<td></td>
</tr>
<tr>
<td>Cleary, 2015</td>
<td>Lack of time was the third most frequently reported barrier to exercise at three months post-operative. Quote: “I don’t seem to have the time to do more of it ...”</td>
<td></td>
</tr>
</tbody>
</table>

OR = odds ratio; CI = confidence interval.
3.4.6 Findings relating to aim 2: Amount and type of physical activity engaged in during the first 12 weeks following CABG surgery

Of the 28 articles included in this systematic review, 13 articles (including two articles that were subanalyses of the parent study by Barnason et al. (2009)) included information regarding the amount of physical activity and five articles included information regarding the types of physical activity engaged in during the first 12 weeks following CABG surgery. The two articles that reported on the amount of physical activity that were subanalyses of the control group data from the parent study Barnason et al. (2009) were included in this section of the review because one article reported data relating only to the female participants, and the other article reported results of different physical activity measures to that of the parent study.

Amount of Physical Activity

The studies used a range of measures to report on physical activity. These measurements included: use of accelerometers, pedometers, questionnaires, activity diaries and self-reports. Physical activity levels were also reported in a variety of ways, including physical activity related energy expenditure; time in moderate to vigorous physical activity (MVPA); step counts; as well as the frequency and duration exercise. Other means of reporting the amount of physical activity engaged in included: farthest distance walked, total distance walked over time and adherence to exercise recommendations.

Studies which included measures of physical activity from the initial weeks following discharge, showed that physical activity levels were initially very low. For example Thijs et al. (2019) reported that the median daily step count during the first week post discharge from hospital was 1,110 steps/day. By week 2 the median daily step count increased marginally but remained low at 1,832, with a larger increase by week 5 to 5,719. However it is important to note that at all three timepoints, there was a large range in mean daily step counts achieved by participants, for example during week one the range was 739 – 10,195 steps/day.

Only two studies measured mean daily physical activity levels between the first few weeks following discharge to three months post-operative. In one of these studies the authors
found that the largest increase was during the first six weeks with a subsequent slight decrease between weeks six and 12.\textsuperscript{29} However, results of another study by Barnason et al. (2009) showed that the increase in distance walked between weeks three and six, and weeks six and 12 was similar.\textsuperscript{28} The reason for the conflicting results in these two studies may be explained by the fact that in the study by Barnason et al. (2009) the initial time point measurement was later, at three weeks whereas in the study of the same participants in Miller et al. (2009) the first measurement of physical activity was undertaken at the time of discharge from hospital.\textsuperscript{28, 29} In summary these results suggest that the biggest increase in physical activity following CABG may actually occur within the first few weeks following discharge from hospital. This possibility is supported by the findings of Kirkevold et al. (1996), which demonstrated that there was a very large increase in maximum walking distance engaged in between discharge and four weeks post-operative and a much smaller subsequent increase between weeks four and eight.\textsuperscript{177}

Three studies\textsuperscript{24, 104, 186} explored physical activity patterns following CABG surgery. Redeker et al. (1995) found that activity was initially mostly spread over the day, however physical activity was also frequently recorded during the night time hours. Over time, physical activity engagement gradually became more consolidated during day and less frequent at night.\textsuperscript{186} Schulz et al. (2005) found that initially during the first weeks following discharge, exercise engagement was undertaken in frequent, short duration sessions, with exercise session frequency decreasing and exercise session duration increasing over time.\textsuperscript{104} In contrast, while Lin et al. (2010) also found that mean exercise duration increased over time post-operatively, these authors did not report a change in frequency of exercise over time, with post-operative exercise frequency being approximately three times/week at both one and three months post-operative.\textsuperscript{24}

Two studies\textsuperscript{74, 184} examined adherence to exercise during the first three months following CABG surgery by using self-reporting. Ali et al. (2017) found that 60\% of their participants adhered to exercise recommendations (defined as non-stop walking at a comfortable pace for at least 30 minutes for at least three days per week) at six weeks post-operative.\textsuperscript{184} Pierson et al. (2003) found that 40\% of participants reported engaging in regular aerobic exercise (defined as aerobic type activity for 30 minutes at least three days/week) at three months post-operation.\textsuperscript{74} These findings suggest that adherence to recommended physical activity may decline after six weeks post-operative, although the findings may also be partly
explained by the different definitions for recommended physical activity levels utilised by each of these studies. Regardless, the findings from these studies demonstrated that a large proportion of people following CABG surgery may not have been meeting recommended physical activity levels (even levels below globally recognised physical activity recommendations) by the post-operative three-month stage. Whether this could be explained by insufficient recovery of physical function, behavioural related factors, or both, was not reported by the authors.

Three articles (all from the same study cohort), reported findings relating to time spent in MVPA or time spent in exercise during the first three months following CABG surgery in participants aged 65 years and older. MVPA and time spent in exercise in these three studies was measured by entering a self-reported activity in a diary. In the parent study by Barnason et al. (2009), the mean daily MVPA was 92.9 minutes during week 3, 126.9 minutes during week 6, and 195.7 minutes by three-months. In a subanalysis of the same study, Young et al. (2012) analysed the data from the female cohort only and reported a mean MVPA/day of 55 minutes however, as for the study by Thijs et al. (2019), there was a large difference in individual ranges achieved of between 15 and 350 minutes/day. Zimmerman et al. (2007) reported time spent in exercise per day (in minutes) for the same female cohort as Young et al. (2012) and found that the daily means were similar at week six and three months post-operative (34.31 and 32.31 minutes respectively).

Type of physical activity engaged in

Five studies reported findings relating to the types of physical activity that people were engaging in during the first three months following CABG surgery. In regard to engagement in daily activities, in general in each of the five studies there was a gradual positive trend in increasingly physically demanding tasks over time. Two studies reported on the types of daily activities engaged in by their study cohorts during the first two weeks. The results of these studies confirmed that the majority of participants were able to engage in light activities such as personal cares and going up and down stairs by two weeks post-operative. At week three, Moore et al. (1995) reported that 70% of their female participants, but no male participants, were engaging in household chores such as sweeping and vacuuming. Two studies reported that the majority of participants had resumed normal domestic functioning or usual activities by six weeks. Only one study included results relating to the introduction
of daily activities that required heavy lifting or more strenuous use of the upper limbs – the majority of participants began engaging in heavy lifting between five and eight weeks, and gardening at approximately two months post-operative. However, it is important to note that in this study the interviews were conducted between six and three years post-operatively and therefore there may be some recall bias regarding the exact time that the participants began to engage in these activities.

Walking was the other physical activity commonly used to describe the type of physical activity engagement in the studies. King et al. (1988) reported that at two weeks post-operation, 45% of participants were walking either as much or more than normal. However, no pre- or post-operative measure of physical activity or engagement in walking was undertaken so it is unclear what actual amount of walking was undertaken. Wilson-Barnett (1981) reported that while just over half of their participants were able to walk outside immediately, many did not start walking outdoors until after three weeks post-operatively, with some taking up to two months to walk outdoors. Moore et al. (1995) reported that at three weeks all male participants reported having walked outdoors, whereas only 60% of females had done the same, even though they had already resumed household work.

### 3.5 Discussion

The key finding that related to the primary aim of this systematic review, to explore the factors that influence physical activity, was the identification of the various sociodemographic, physical symptoms, psychosocial factors and environmental factors that impacted on physical activity during the first three months following CABG surgery. Overall, a limited amount of evidence for each of the subthemes was identified in this review, with many subthemes supported by only low or fair quality evidence. In regard to the secondary aim, to determine the amount and type of physical activity, the key finding was that physical activity engagement was very low during the initial weeks following discharge from hospital, with people engaging in short, frequent exercise sessions, with a subsequent increase in exercise duration and a decrease in exercise frequency up to three months post-surgery. In addition, the largest increases in physical activity engagement appeared to be greatest during the first six weeks following discharge from hospital compared to between weeks six and 12.
Table 3.7 Amount of physical activity during first 12 weeks following CABG surgery

<table>
<thead>
<tr>
<th>Author, year</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ali, 2017</td>
<td>At 6 weeks, 41% of participants were non-adherent to exercise recommendations</td>
</tr>
<tr>
<td>Barnason, 2000</td>
<td>At 3 months after surgery, the patients’ energy expenditure due to physical activity engagement was a mean of 28.87 (SD 5.9) kcal/kg/day. According to the authors, clinically this indicated that patients who had CABG surgery had achieved a moderately active lifestyle that included regular leisure time physical activities incorporated 3 or more times per week.</td>
</tr>
<tr>
<td>Barnason, 2009</td>
<td><strong>Mean activity counts (SD)</strong> (accelerometer)</td>
</tr>
<tr>
<td></td>
<td>Week 3</td>
</tr>
<tr>
<td></td>
<td>Week 6</td>
</tr>
<tr>
<td></td>
<td>3 months</td>
</tr>
<tr>
<td></td>
<td>There were significant time effects for average daily counts (accelerometer) and for time spent in MVPA between week 3 and 6, and week 6 and 3 months (p&lt;0.01).</td>
</tr>
<tr>
<td>Kirkevold, 1996</td>
<td>Mean walking distance (longest distance walked in metres):</td>
</tr>
<tr>
<td></td>
<td>4 weeks</td>
</tr>
<tr>
<td></td>
<td>8 weeks</td>
</tr>
<tr>
<td>Kulik, 1993</td>
<td>Mean miles walked in past week at 4 weeks: 17.9 (SD 11.8) miles</td>
</tr>
<tr>
<td>Lin, 2010</td>
<td>Mean exercise session frequency was slightly more post-op compared to pre-op, but was relatively consistent over time. Mean exercise duration decreased between pre-op and one-month post-op. There was a subsequent increase in mean exercise duration between 1 and 3 months, however mean duration of exercise was still less at 3 months post-op compared to pre-op.</td>
</tr>
<tr>
<td></td>
<td>Mean sessions/week (SD)</td>
</tr>
<tr>
<td></td>
<td>Pre-op</td>
</tr>
<tr>
<td></td>
<td>1 month</td>
</tr>
<tr>
<td></td>
<td>3 month</td>
</tr>
<tr>
<td>Miller, 2009</td>
<td>Mean daily kcal/kg (SD) (accelerometer)</td>
</tr>
<tr>
<td></td>
<td>Discharge</td>
</tr>
<tr>
<td></td>
<td>Week 2</td>
</tr>
<tr>
<td></td>
<td>Week 6</td>
</tr>
<tr>
<td></td>
<td>3 months</td>
</tr>
</tbody>
</table>
Pierson, 2003  
At 3 months, 40% of participants reported engaging in regular aerobic exercise (defined as aerobic type activity for 30 min at least 3 days/week)

Redeker, 1995  
Mean activity counts (SD):  
<table>
<thead>
<tr>
<th>Week</th>
<th>Female</th>
<th>Male</th>
<th>Female</th>
<th>Male</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>1787 (340)</td>
<td>10.5 (9.3)</td>
<td>12.8 (8.3)</td>
<td>14.9 (11.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Week 6</td>
<td>1957 (226)</td>
<td>6.5 (4.0)</td>
<td>19.4 (13.9)</td>
<td>27.9 (21.7)</td>
<td></td>
</tr>
</tbody>
</table>

Over time activity became more consolidated during the waking hours, whereas duration and frequency of night time activity decreased.

Schulz, 2005  
Exercise session frequency tended to decrease while exercise session duration increased over the 3 months post-operative period. There were no significant differences between males and females.

<table>
<thead>
<tr>
<th></th>
<th>Mean sessions/week (SD)</th>
<th>Mean duration (min/session) (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Week 2</td>
<td>8.8 (7.8)</td>
<td>10.5 (9.3)</td>
</tr>
<tr>
<td>Week 4</td>
<td>6.1 (4.9)</td>
<td>6.5 (4.0)</td>
</tr>
<tr>
<td>Week 6</td>
<td>5.7 (2.6)</td>
<td>6.2 (4.2)</td>
</tr>
<tr>
<td>3 month</td>
<td>5.2 (3.0)</td>
<td>4.9 (0.6)</td>
</tr>
</tbody>
</table>

Thijs, 2019  
Step counts/day (range):  
<table>
<thead>
<tr>
<th>Week</th>
<th>Median (range)</th>
<th>Physical activity level (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>1110 (739 - 10,195)</td>
<td>1.29 (1.08 - 1.59)</td>
</tr>
<tr>
<td>Week 2</td>
<td>1832 (856 - 11,282)</td>
<td>1.32 (1.04 - 1.6)</td>
</tr>
<tr>
<td>Week 5</td>
<td>5719 (2128 - 11,948)</td>
<td>1.44 (1.16 - 1.80)</td>
</tr>
</tbody>
</table>

Young, 2012  
At 3 months as measured by activity diary; mean (range):  
Energy expenditure (kcal/kg/day): 23.45 (21.85 - 34.05)  
MVPA/day (min): 55 (15 - 350)

Zimmerman, 2007  
Mean daily activity counts (SD) (accelerometer):  
<table>
<thead>
<tr>
<th>Week</th>
<th>Mean daily activity counts (SD) (accelerometer)</th>
<th>Mean kcal/kg/day (SD) (accelerometer)</th>
<th>Mean minutes in exercise/day (SD) (activity diary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 6</td>
<td>116,693 (58,455)</td>
<td>24.2 (3.1)</td>
<td>34.3 (23.8)</td>
</tr>
<tr>
<td>3 months</td>
<td>127,926 (64,391)</td>
<td>24.6 (3.3)</td>
<td>32.3 (20.5)</td>
</tr>
</tbody>
</table>

SD = standard deviation; CABG = coronary artery bypass graft; kcal/kg = kilocalories per kilogram; MVPA = moderate to vigorous physical activity; post-op = post-operative; pre-op = pre-operative; min = minutes; kcal/kg/min = kilocalorie per kilogram per minute.
Table 3.8 Type of physical activity during the first 12 weeks following CABG surgery

<table>
<thead>
<tr>
<th>Author, year</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banner, 2012</td>
<td>At 6 weeks most participants felt comfortable to ‘resume domestic functioning’ but this required ongoing self-assessment of functioning capacity for ‘establishing boundaries’. Quote: From 6 months only “Your body tells you enough is enough, I mean my heart, I get palpitations and I think ’no, don’t push it’. So I’ve learnt to pace myself.”</td>
</tr>
<tr>
<td>King, 1988</td>
<td>During first 2 weeks: Participants reported doing less than their usual activities in terms of social activities and leaving the house. Most (91%) had resumed personal cares and going up &amp; down stairs; 21% reported walking as much as usual; 24% walking more than usual (other ratings not stated). At 4 weeks: 56% of participants were going out of house as much as usual, however not driving car. Most participants (64%) were having visitors as much as usual. At 6 weeks: The large majority of participants (76%) reported that they had resumed most of their usual activities. 82% were going out of house as much as usual including shopping, visiting and driving a car. 62% were doing work around the house as much as usual. At 8 weeks: 59% of sample reported that they were doing more walking than usual as part of a planned exercise routine. Of the 11 participants who expected to return to work, six had done so (however unsure if the jobs were active or sedentary).</td>
</tr>
<tr>
<td>Kirkevold, 1996</td>
<td>Resumption of roles (0 = not at all doing activities to 10 = totally resumed doing activities; means reported): Usual activities at home 4.72 7.27 8.84 (p&lt;0.001 between each time point) Usual activities in neighbourhood 3.97 6.68 8.26 (p&lt;0.001 between each time point)</td>
</tr>
<tr>
<td>Moore, 1995</td>
<td>70% of female participants reported the ability to sweep and vacuum by 3 weeks after being discharged whereas none of the males reported doing these activities. All but one of the males reported being able to get out and walk by 3 weeks post-op, whereas 60% of females said they were not able to get out, even though they had resumed household work.</td>
</tr>
<tr>
<td>Wilson-Barnett, 1981</td>
<td>Immediately 1-2 weeks 3-4 weeks 5-6 weeks Up to 2 months Up to 4 months Not yet Climbing stairs (n=60): 44 8 8 Walking outside (n=60): 22 15 8 5 10 Gardening (or equivalent) (n=46): 0 4 7 30 5 Lifting heavy objects (n=60): 0 1 22 11 2 25</td>
</tr>
</tbody>
</table>
One of the reasons for the lack of detailed evidence regarding many of the subthemes identified in this review is that only around a quarter of the studies specifically included an investigation of engagement in physical activity following CABG surgery. As a result, many of the relevant data that were extracted from the included articles were incidental findings rather than findings that were key to the aims of the studies. Indeed the research specifically looking at physical activity engagement during the first three months following CABG surgery was minimal. Only two of the included studies had a specific aim to explore either the progression in physical activity or the factors impacting on physical activity during the first three months following CABG surgery. Further, one of these studies had its first measurement point at three months post-surgery and thus only one study in the review specifically explored progression of physical activity engagement during the first three months following CABG surgery.

Most of the evidence identified in the included studies related to psychosocial factors that impacted on physical activity. However, a lot of these factors were not explored in depth. For example, the studies that described a cautious approach to engagement in physical activity did not describe the reasons underlying the justification for being cautious. In addition, the majority of psychosocial factors identified were barriers to physical activity, with relatively little evidence on psychosocial factors that facilitated physical activity.

One of the key psychosocial barriers to physical activity following CABG surgery identified by this review was fear. The findings from studies that reported fear as a barrier to physical activity indicated that in the initial weeks following discharge, fear may have limited engagement in less physically demanding tasks such as self-care activities as well as moderately physically challenging activities such as walking outdoors, whereas by three months post-operative, fear may no longer have limited engagement in more moderately demanding activities such as household activities but may have been a barrier to participation in more challenging leisure activities. However, it is important to note that fear was not reported by all participants in the studies and was not necessarily identified by participants as the greatest barrier to physical activity engagement.

The underlying reasons for the fear associated with physical activity engagement that were reported in the included studies were very generally described and it was not always clear exactly what the participants were afraid of. Parker and Adams (2008) have suggested that
the traditional sternal precautions to protect the healing sternum that are advised to patients following cardiac surgery may evoke fear and limit people’s confidence to engage in activities that use the upper limbs. Indeed, in a study by Lapum et al. (2011) where the authors interviewed participants four to six weeks following CABG with or without cocomitant cardiac valve replacement surgery, participants had a sense of vulnerability and fear of something going wrong during the early weeks following discharge from hospital. In this study particular mention was made of ‘being fearful of damaging the sternum’. One participant said “You’re not supposed to pick up more than 5 pounds. You get to the point where you’re afraid to pick anything up.” (page 231). In the current systematic review, studies in which the theme was identified focused specifically on people undergoing isolated CABG surgery, and whilst ‘fear of aggravating the heart’ was mentioned as well as a fear of injury, none of the studies specifically reported on participants expressing ‘fear of damaging the healing sternum’. More research is needed to explore the specific underlying reasons for people experiencing fear following isolated CABG surgery.

Another key psychosocial barrier identified in this review was ‘uncertainty’, which included a feeling of being unprepared to engage in physical activity following discharge from hospital. The presence of uncertainty and/or unpreparedness suggests that participants may have had insufficient knowledge and resources to initiate and/or progress their engagement in physical activity. However, as reported for the subtheme ‘fear’, in relation to ‘uncertainty’, there was a lack of specific information regarding exactly what participants were uncertain about. For example, were they uncertain about engaging in certain daily activities, exercises or upper limb activities or more than one of these? In addition, the reports of uncertainty identified in this review were only reported during the first six weeks following CABG surgery. It is currently unclear if uncertainty regarding physical activity persists beyond six weeks following CABG surgery.

The fact that fear and/or uncertainty regarding physical activity engagement following discharge from hospital after CABG surgery suggests that support from health professionals through appropriate guidance, reassurance, encouragement and provision of information that matches the needs of the person may help to reduce uncertainty and fear as barriers to physical activity. A greater understanding of the things that people feel fearful of, or uncertain about, as well as the time points when they experience fear and uncertainty is required for health professionals to provide the appropriate support at the time points where it
is most likely required. This may be especially beneficial for people post CABG surgery who are unable to access support from health professionals through outpatient cardiac rehabilitation programmes.

Follow up support from health professionals has previously been shown to independently predict physical activity and adherence to exercise in people who had undergone cardiac revascularisation (of which 48% had undergone CABG surgery) at least six months previously. This suggests that support from health professionals may be a valuable enabler for physical activity during the initial months following CABG surgery. However, from the findings of this review, the evidence is clear that there is no recent literature that has explored the provision of support by health professionals for people following CABG surgery specifically in relation to engagement in physical activity outside of the traditional outpatient cardiac rehabilitation setting. The only study identified in the current review that explored support by health professionals was the study by O’Connor et al. (1983). The findings showed that the participants experienced both encouragement and discouragement from health professionals to engage in physical activity. Given that this study was undertaken over 30 years ago, it is possible that in the current clinical setting health professionals have a greater knowledge and appreciation regarding the benefits of physical activity for improved quality of life and improved health outcomes for people with cardiovascular disease and therefore may provide more support and encouragement to people to engage in physical activity. More recently Dronavalli et al. (2016) undertook an audit of general practitioners’ patient records of 44 patients in Australia following an acute coronary syndrome (30% of whom had undergone CABG surgery). The authors found that in the 12 months following discharge from hospital 50% of patients received a referral for physiotherapy, 10% were referred to cardiac rehabilitation and 39% were provided advice regarding physical activity, however the advice provided was poorly documented. While this provides some evidence of the provision of guidance and support by health professionals to engage in physical activity following acute coronary syndrome outside of the supervised cardiac rehabilitation setting, it is also apparent that in this study many patients were not provided with physical activity related advice or referrals. In addition, it is unclear what the level or amount of guidance and support to engage in physical activity was actually provided to the patients. Further research is required to establish whether patients are routinely provided follow up support from health professionals to engage in physical activity following CABG surgery outside of hospital based cardiac rehabilitation programmes in other settings.
Apart from the potential for support from health professionals to enhance engagement in physical activity following CABG surgery, the only other psychosocial facilitator that was identified in this review was personal motivation. According to Bandura’s Social Cognitive Theory,\textsuperscript{190} outcome expectations about the expected costs and benefits of behaviour and the personal goals that people set for themselves are two factors that are core determinants that mediate engagement in a health behaviour. Bandura also stated that “Motivation is enhanced by helping people to see how habit changes are in their self-interest and the broader goals they value highly.” (page 144).\textsuperscript{190} Similarly, Deci and Ryan’s Self-Determination Theory (SDT) calls this type of motivation (which is based on the conscious valuing of a behavioural goal and acceptance of the behaviour as being personally important) identified regulation.\textsuperscript{191} Two studies in the current review identified a range of personal motivating factors identified by participants at six weeks\textsuperscript{183} and three months\textsuperscript{99} post-operation, including: ‘it feels good’, ‘improves health’, ‘get back to previous activities’, ‘companionship’, ‘enjoyment’,\textsuperscript{99} and ‘necessity and desire to complete housework to a high standard’.\textsuperscript{183} Some of these motivating factors that were identified in these studies reflected a belief by participants that physical activity engagement would lead to positive health outcomes and assist them to reach their health and participation goals.

More research is required to understand the influence that motivating factors and perceptions of the benefits of physical activity have on physical activity engagement during the initial weeks following discharge from hospital after CABG surgery. In addition, as motivation and support were the only facilitating factors for physical activity engagement that were identified in the current review, further research is required to identify other facilitators for physical activity that may be introduced during the early recovery period following CABG surgery. For example, Gortner and Jenkins (1990) found that in a population of people undergoing first time or repeat CABG and/or cardiac valve surgery, self-efficacy expectations for activity were strongly correlated with self-reported walking behaviour at four and eight weeks post-operative (0.89 and 0.86 respectively; both p<0.01).\textsuperscript{192} Research to identify specific factors that contribute to building self-efficacy for physical activity following CABG surgery may provide further insight into ways to facilitate physical activity engagement during the early recovery period following CABG surgery.
Physical factors that were barriers to engagement in physical activity following CABG surgery were also identified in this review. Fatigue was the most commonly reported physical symptom in this review that limited engagement in physical activity, however there was overall low quality evidence to support this subtheme. Previously, Zimmerman et al. (2002) had found that fatigue was the most prevalent reported symptom at two, four and six weeks following CABG surgery being reported by >50% of participants (n=24) at each timepoint, with fatigue severity being highest at two weeks post CABG and reducing at each subsequent timepoint. Similarily, fatigue has previously been shown to peak between two and four weeks post major abdominal surgery. These findings suggest that the impact of fatigue on physical activity may be highest during the first month following CABG surgery. However, only two of the four studies in this review that reported findings relating to fatigue, explored the impact of fatigue on physical activity during the first month following CABG surgery. More knowledge regarding the impact of fatigue on physical activity, particularly during the first month following CABG surgery, is required for health professionals to know how best to prepare people to manage this fatigue and to balance the competing needs for rest and activity.

Only one study identified in this review reported findings that related to the impact of pain on physical activity during the weeks immediately following discharge from hospital following CABG surgery. The primary purpose of this study was to explore pain management strategies following CABG surgery. The findings indicated that avoiding or stopping an activity were key activity modification strategies for managing post-operative pain. However the findings did not describe any activity modification strategies utilised to reduce pain experiences during physical activity. The identification of such strategies may provide insight into advice that could be provided to people for whom pain is limiting their activity engagement in order to enable participation in physical activity, rather than to simply avoid it.

The findings of this review relating to the impact of gender on physical activity engagement showed there was conflicting evidence. Females have previously been shown to have poorer physical function both pre- and post-operatively compared to males following CABG surgery, even after adjustment for preoperative differences in physical function between males and females. Potential reasons for lower levels of physical function post-operatively in women include the fact that females who undergo CABG surgery are older, more likely to live alone, have a more advanced angina functional class and have more
comorbidities\textsuperscript{108} compared to their male counterparts.\textsuperscript{108, 195} However, only one study identified in this review showed that lower physical function in females compared to males translated into lower physical activity engagement following CABG surgery.\textsuperscript{174}

Some of the findings in the current review suggest that context, for example living alone versus living with a spouse, as well as traditional gender roles, may have played a role in the type and amount of physical activity that females and males engaged in during the first three months following CABG surgery. This suggests that any differences (or lack of differences) in physical activity engagement between males and females following CABG surgery may not only be influenced by biophysiological differences between the sexes, but may also be associated with contextual factors.

Another finding from this review that supports the potential importance of context on physical activity following CABG surgery was that of higher physical activity engagement by those living rurally compared to those living in urban areas. While this could potentially be due to the availability of more open outdoor spaces in rural settings to engage in physical activity, it could also be due to necessity of more outdoor chores to be undertaken by those living rurally. Further research is required to determine the relative impact that contextual, environmental and biophysiological factors have on physical activity engagement following CABG surgery.

In regard to the type of exercise undertaken, walking was the only specific type of exercise identified that was engaged in by participants following CABG surgery and was reported in only three of the included studies.\textsuperscript{25, 180, 188} However, walking outdoors was delayed for many participants for reasons such as fear. In addition, weather was also identified as a barrier to walking outdoors following CABG surgery. This highlights a potential need to provide alternative options for safe exercise that can be performed indoors at various stages of people’s recovery following CABG surgery.

The findings of this review that related to the amount of physical activity that people were engaging in provides insights regarding the realistic advice that should be provided to patients pre/post-CABG in regard to the initiation of exercise and progression of exercise following discharge from hospital after CABG surgery. In particular, factors such as having realistic expectations for low physical activity levels and potentially engaging in shorter
exercise bouts more frequently initially following discharge from hospital, with the expectation for progression over time, including engaging in progressively longer bouts of exercise less frequently over time, should be provided for patients. The review findings also provide evidence that the range and the amount of physical activity engaged in by participants varied widely. This was particularly evident in the findings of Thijs et al. (2019)\textsuperscript{103} and Young et al. (2012),\textsuperscript{172} where a large range in step counts and MVPA respectively were reported at each measurement timepoint. This finding suggests that an individualised rather than a standardised approach to exercise prescription during the early recovery period following CABG is likely necessary to provide realistic and attainable exercise plans for individuals.

In order to develop a realistic individualised plan it is helpful to refer to previous studies to benchmark the typical amount and range of physical activity that people have achieved during the early recovery period post-CABG. However there were some limitations in the way that physical activity was measured and reported in the studies included in the current review. Firstly, the majority of studies measured physical activity by self-report. Self-reported physical activity measures have been shown to be less reliable than objective measures.\textsuperscript{53,196} In addition of the six studies that objectively measured physical activity levels, only one (Thijs et al. 2019\textsuperscript{103}) reported their findings using outcome measures that can be easily related to commonly used measures such as step counts and time in light or MVPA. In addition, no studies reported sedentary time. Given the potential impact of fatigue and the increased need to rest in the early recovery period, understanding typical changes in sedentary time is also helpful when advising people about balancing the need for rest with the need for activity. There is therefore a need for more studies that objectively measure physical activity engagement during the first 12 weeks following CABG surgery.

In two studies in this review, adherence to exercise recommendations was found to be at 40\%.\textsuperscript{184} and 60\%.\textsuperscript{74} This is not overly dissimilar to exercise adherence in the general population, with approximately 49\% of New Zealanders not meeting recommended physical activity guidelines according to the 2018/19 New Zealand Health Survey.\textsuperscript{2} For many people, the need to undergo major open heart surgery may provide a catalyst for behaviour change in regards to engaging in health behaviours to reduce future progression of cardiovascular disease as well as improve overall health and quality of life. However, results from the two studies in this review that reported findings for exercise adherence there appeared to be a
large percentage of people who were not engaging in levels of physical activity recommended for maintaining and improving health. One possibility is that some participants may still have been building up their exercise endurance to meet the physical activity recommendations at six$^{184}$ or 12 weeks$^{74}$ following CABG surgery. Two other possibilities are that some participants were either not interested or not successful in attaining the exercise recommendations. Both these latter two possibilities support evidence for the need for health professionals to work alongside people following CABG surgery to help people to identify and reach their personal health related goals.

3.6 Strengths and limitations

This would appear to be the first systematic review to explore factors that impact on physical activity, as well as the amount and type of physical activity engaged in during the first three months following CABG surgery outside of the traditional supervised cardiac rehabilitation setting. A key strength of this review was the mixed methods approach which allowed the synthesis of findings from a wide range of study designs and approaches. However, the majority of the articles in this review were published more than 10 years ago, were of fair or poor quality and did not have specific aims to explore physical activity engagement following CABG surgery. The amount and strength of evidence for the majority of the themes identified in this review was therefore limited. In addition, while the initial search strategy was broad and the screening process of the literature was robust, the review only included peer reviewed articles written in English and excluded conference abstracts and thesis publications and therefore evidence that may have strengthened the findings of this review may have been missed. There was a higher representation of males compared to females in the included studies. This higher representation of male participants is however similar to the proportion of males who undergo CABG surgery worldwide, including in New Zealand, where 81.5% of isolated CABG procedures were performed on males according to the 2017 New Zealand Cardiac Surgery National Report.$^{197}$

3.7 Conclusion

In conclusion, various sociodemographic, physical, psychosocial and environmental factors that impacted on physical activity during the first three months following CABG surgery
were identified in this systematic review. The barriers and facilitators provide insight into various strategies that health professionals can utilise when preparing and supporting patients to engage in physical activity after their discharge from hospital. In general, there was a limited amount of evidence for each factor that had an influence, with many being supported by low or fair quality evidence. The majority of identified factors were barriers to physical activity and there was a general lack of information regarding factors that may have enabled engagement in physical activity following CABG surgery. There is also a lack of research undertaken to specifically examine factors that impact on engagement in physical activity during the first three months following CABG surgery. Further research exploring the various factors that inhibit and facilitate physical activity during the first three months following CABG surgery is therefore required. Such knowledge will enable health professionals to understand how to best prepare and support people to optimally engage in physical activity during their recovery following CABG surgery. This is likely to improve short term health and quality of life related outcomes for patients recovering from CABG surgery and facilitate a timely return to activities of daily living. The following chapter describes a prospective observational study which was undertaken to address the knowledge gaps identified in this review.
CHAPTER 4 : PERCEPTIONS AND EXPERIENCES OF ENGAGING IN PHYSICAL ACTIVITY DURING THE FIRST 12 WEEKS FOLLOWING CABG SURGERY: AN OBSERVATIONAL STUDY

4.1 Introduction

As discussed in the literature review (Chapter 2), engagement in physical activity during the first three months following CABG surgery provides physical, psychological and health-related quality of life benefits. In relation to CABG surgery specifically, the findings from the systematic review (Chapter 3) showed that while physical activity levels vary, they are initially very low but increase over time and there are a number of barriers to engaging in physical activity during the first three months. In addition, not all people engage in regular exercise during the first three months post-CABG surgery, with several studies finding that fewer than 40% of people adhere to physical activity recommendations during this time.

Understanding the factors that influence physical activity during this time period is important as it enables health professionals to be aware of the various barriers to physical activity and have a better understanding of how to optimally prepare and support people to engage in physical activity once they leave hospital. The barriers described in Chapter 3 included: physical symptoms, such as fatigue and pain; psychosocial factors, such as fear and uncertainty; and environmental factors, such as weather. However the findings from the systematic review also revealed that a detailed description of these factors, including how the impact of these barriers changed over time during the first three months following hospital discharge was lacking.

Moreover, the findings discussed in Chapter 3 also revealed that few studies have explored factors that facilitate engagement in physical activity following CABG surgery. The main facilitating factor identified was motivation. Cleary et al. (2015) identified motivators for physical activity at three months post-CABG. Motivating factors were (in order of reported frequency): “it felt good”; self-motivation; improve health; environment; habit; getting back to previous activities; companionship and enjoyment. The importance of motivation to facilitate engagement in physical activity at earlier time points following CABG surgery is currently unknown.
Only a few studies reviewed in Chapter 3 specifically aimed to explore the influence of such factors on physical activity during the first three months following CABG surgery and the majority of the studies identified were of low or poor quality. There is therefore a need for high quality research, particularly qualitative research during the first three months, that specifically aims to explore factors that influence physical activity in this population. Thus, the primary purpose of this study described in this chapter was to explore people’s perceptions and experiences of engaging in physical activity during the first three months following CABG surgery.

One potential facilitating factor not explored in any of the studies identified in the systematic review, was self-efficacy. Self-efficacy is a person’s perception about their capability to perform an activity.\(^{198}\) In relation to people with CAD, cardiac self-efficacy is a person’s belief in their ability to manage challenges that arise as a result of coronary disease.\(^{199}\) According to Bandura, a persons’ expectation, or belief for success or failure to perform a task, will determine the outcome.\(^{200}\) Self-efficacy has previously been shown to be positively associated with physical activity levels in a cohort of people with chronic disease, including hypertension, diabetes, osteoporosis and heart disease ($\beta=1.01$; OR 2.76 (95% CI 1.39-5.46, $p<0.001$)).\(^{201}\) Although self-efficacy has been shown to have no association with increasing physical activity levels at two and six weeks following MI.\(^{202}\) Conversely, Carroll (1995) explored the relationship between self-efficacy (measured using items relating to walking, climbing stairs, general activities, roles and relationships from the Jenkins Self-Efficacy Expectation Scales\(^{151}\)) and physical activity, in 133 people aged 65 years and older following CABG +/- cardiac valve replacement surgery. The study findings showed that self-efficacy for physical activity increased over time and was significantly associated with engagement in walking and general activities six and 12 weeks post-surgery ($p<0.01$).\(^{26}\) Although these findings suggest facilitation of self-efficacy is a potential strategy to improve physical activity engagement following CABG surgery, Carroll (1995) did not report on factors that contributed to this increase in self-efficacy.

In order to measure cardiac self-efficacy in a group of people awaiting coronary revascularisation, Sullivan et al. (1998) developed the Cardiac Self-Efficacy Scale (CSES).\(^{203}\) The CSES has subsequently been validated in people following acute MI\(^{199}\) and has been
used to evaluate cardiac self-efficacy in other coronary populations, including in those prior to or recovering from CABG surgery. In 2010, Kang et al. showed that cardiac self-efficacy (as measured by the CSES) was the most influential factor impacting on health behaviours (a combination of items relating to health responsibility, physical activity, nutrition, spiritual growth, interpersonal relationships and stress management) ($\beta=0.39$, $p<0.01$) compared to age ($\beta=0.31$, $p<0.01$), education ($\beta=0.17$, $p<0.05$), smoking status (smoker $\beta=-0.016$, $p<0.05$) and receiving patient education ($\beta=0.22$, $p<0.01$) in people with CAD. Therefore, exploration of the potential changes in cardiac self-efficacy, as well as the factors that contribute to self-efficacy in relation to physical activity following CABG surgery, is warranted.

The systematic review (Chapter 3) revealed that a number of studies have previously objectively measured physical activity during the first three months. However, few studies have reported such findings as outcomes that can be readily related to clinical practice, such as step counts and time in light, moderate or vigorous physical activity. In addition it appears that no previous studies have measured sedentary time during the first three months following CABG surgery. Given the potential impact of fatigue on physical activity and the need for rest during the recovery period, consideration of the increased need for time spent being sedentary is required when encouraging engagement in physical activity post-CABG. Having an understanding of the amount of physical activity that people are able to engage in (and the amount of sedentary time required) during this time is important if health professionals are to provide realistic advice and/or have realistic expectations of what people are able to do.

In the context of the thesis, the study described here addressed two elements of the aMRC: 1) identify the need; and 2) determine the problem. The findings from this study will provide insight into the barriers to be addressed, and facilitating factors to be optimised, in a potential programme which aims to facilitate engagement in physical activity following CABG surgery.
4.2 Method

4.2.1 Aim

The primary aim of this study was to explore people’s perceptions and experiences of engaging in physical activity during the first three months following CABG surgery.

4.2.2 Ethics approval

The study was approved by the University of Otago Health Ethics Committee (Ethics approval number H17/024) in April 2017 (Appendix 2). Alongside ethical approval, consultation with Māori was conducted through the Ngāi Tahu Research Consultation Committee, with approval and recommendations being received in March 2017 (Appendix 3). Locality authorisation to conduct the research project within the Southern DHB was also gained from Health Research South (Appendix 4).

4.2.3 Study design

The study was a prospective observational mixed methods study, with the qualitative aspect being the primary method of data collection and analysis. The simultaneous collection of quantitative data (accelerometry, cardiac self-efficacy and health-related quality of life measurement) was undertaken to describe the context within which participants’ perceptions and experiences of engaging in physical activity were placed and to support the qualitative findings. Therefore the study design was primarily qualitative, with a secondary supplemental quantitative aspect, that is a “QUAL + quan” study design. According to Morse in the SAGE Handbook of Mixed Methods in Social and Behaviour Research (2016; Chapter 14; edited by Tashakkori and Teddlie), the inclusion of a supplemental method does not mean that the study needs to be conducted using the principles of the research paradigm of the supplementary aspect. That is, a QUAL + quan study does not need to be powered for the quantitative aspect, since the purpose of the quantitative data is to provide context and support the qualitative findings. Therefore, the current study was designed primarily in accordance with qualitative research paradigm principles.
4.2.4 Participants

Patients admitted to Dunedin Hospital and awaiting CABG surgery were invited to participate in the study. Dunedin Public Hospital is funded by the Southern District Health Board (DHB), which provides public funding for health care over a catchment area covering the lower half of the South Island of NZ and is the only publicly funded hospital in the area that performs CABG surgery. Eligible participants were adults 18 years or older, awaiting either elective or emergency CABG surgery, in Dunedin Hospital. Potential participants were excluded if they were unable to converse in/read English, and/or had another procedure undertaken at the same time as the CABG surgery, for example cardiac valve replacement. Participants were also ineligible if they were admitted to hospital on the day of their operation, as this time frame was deemed insufficient for the person to fully consider their consent for participation and/or allow pre-operative baseline data collection. Consenting participants were excluded from further participation if they sustained a significant intra- or post-operative complication (for example, a stroke) or were transferred to another hospital or care facility rather than being discharged home.

4.2.5 Description of preparation and support received by patients to engage in physical activity post-discharge

As per the hospital protocol for CABG surgery, prior to discharge all participants attended an education session with a physiotherapist about post-discharge physical activity. Verbal and written information were provided and included:

1) Benefits of physical activity;
2) Monitoring exertion during physical activity using rate of perceived exertion (RPE; modified Borg scale\textsuperscript{208}) and the talk test\textsuperscript{209};
3) Warning signs during physical activity;
4) Standardised information regarding resumption of daily activities;
5) A standardised walking programme designed to gradually increase in duration and intensity;
6) Information regarding conventional sternal precautions, including avoiding pushing, pulling or lifting anything heavier than 2-3 kilograms for six weeks.
In the written information booklet provided, space was available for the person to record their short and long term activity goals, as well as an activity diary for the initial six-weeks post discharge.

Following discharge participants received standardised follow up support including: home visits from district nurses during the first 2-3 weeks; a ‘lifestyle clinic’ appointment with a cardiac nurse specialist at approximately four weeks post-operative (only for those living in Dunedin); visits to their general practitioner as required; an outpatient appointment with the cardiothoracic surgical team approximately six-eight weeks post-operative; and physiotherapist and nurse led outpatient cardiac rehabilitation if the participant lived in proximity and chose to attend. Neither the doctoral candidate nor the research supervisors were involved in the health care provided to the participants.

4.2.6 Sampling and recruitment strategy

A convenience sampling method was used, with patients admitted to Dunedin Hospital and awaiting CABG surgery being invited to participate in the study. In the protocol it was intended that the doctoral candidate would interview each participant at multiple time points, and it was assumed that each participant would attempt some level of physical activity engagement surgery (even if it were only basic activities of daily living). On this basis it was estimated that approximately 12-15 participants would be sufficient to provide a richly textured understanding of people’s perceptions of engaging in physical activity during the first three months following CABG surgery. However, the study allowed for recruitment to continue beyond 12-15 participants if data saturation was not reached.

Eligible people were provided with a written invitation to participate in the study (Appendix 5) by a member of the surgical team once the CABG surgery was confirmed and the person had provided informed consent for surgery. People who showed an interest in participating were requested to indicate their interest on the form provided (Appendix 6) and place it in a large envelope in the hospital ward reception area. A study information sheet (Appendix 7) and consent form (Appendix 8) were then provided, and the doctoral candidate also visited the person to answer any questions relating to the study.
To test the study protocol, initial recruitment began in May 2017 with three randomly selected participants. Testing included 1) the feasibility of the doctoral candidate being able to communicate with and follow up participants at four time points after discharge from hospital; 2) ability to pilot the interview questions; and 3) an audit check on the data collected. Since the interviews utilised a semi-structured framework, one of the research supervisors (CS) listened to several of the interviews as an audit check to ensure the appropriate use of additional/probing questions and the avoidance of leading lines of questioning.

Data from the three initial participants were included within the study results and subsequent analysis. Recruitment subsequently continued from August to October 2017. In total, 18 further people met the eligibility criteria during this time period and were invited to participate in the study. Of these people, 11 consented. However following surgery, two participants were subsequently withdrawn from the study due to early post-operative complications prior to the first data collection point. No further drop-outs or withdrawals took place. Therefore, in total 12 participants (three from the initial recruitment in May and nine from the subsequent recruitment in August to October) completed the study protocol.

4.2.7 Data collection

All pre- and post-operative qualitative and quantitative data were collected by the doctoral candidate. The participants were aware that EG was a physiotherapist, who was undertaking the study as part of the requirements for their PhD. A summary of the type of data collected at each timepoint is shown in Figure 4.1.
Figure 4.1 Type of data collected at each timepoint. CSES = Cardiac Self-Efficacy Scale; MOS-SF36 = Medical outcomes study 36-item short-form health survey.

4.2.7.1 Pre-operative data collection:

To describe the study population, demographic data including age, sex, ethnicity, employment status, smoking history and health conditions were collected via a written questionnaire (Appendix 9). Body composition was also assessed by:

1) Body mass index (BMI) (weight in kilograms divided by height in metres squared). Weight in kilograms (kg) was measured and recorded to the nearest 0.1 kg. Height was measured with the participants standing barefoot, looking straight ahead, using a calibrated stadiometer and was recorded to the nearest half centimetre (cm);

2) Waist to height ratio (waist circumference divided by height), with height being measured as previously described and waist circumference measured at the half-way point between the lowest ribs and iliac crest on their right side with a flexible tape measure.

All body composition measures were undertaken using standardised procedures as described by Coombes and Skinner (2014). Baseline measures for health related quality of life (measured using the Medical outcomes study 36-item short- form health survey (MOS SF-36; Appendix 10), and cardiac self-efficacy (measured using the CSES; Appendix 11) were also undertaken pre-operatively.
4.2.7.2 Post-operative data collection:

Qualitative data collection:
Recorded telephone interviews (15 – 25 minutes) were undertaken with each participant at the end of weeks 1, 3, 6 and 12 following discharge from hospital. Each semi-structured interview focussed on the participant’s perceptions and experiences of engaging in physical activity over the previous week/s since discharge from hospital or the previous interview. The interview question guide was as follows:

1) “Tell me about your experiences with physical activity since your surgery/since we last spoke x weeks ago?”
2) “How have you felt when you have been physically active?”
3) “Can you tell me about an activity that you have found easy to do? What was it about the activity that made it easy?”
4) “Can you tell me about an activity that you have found difficult to do? What was it about the activity that made it difficult?”
5) “What things have made it easier to engage in physical activity?”
6) “What things have made it difficult to engage in physical activity?”
7) “What sort of support have you had to encourage you to engage in physical activity?”

As the interviews progressed it became apparent that self-motivation was very important for physical activity engagement. Because we were interested in the sources of this motivation, at week 12 the following questions were added to the interview guide: “How important was it to you to engage in physical activity since your surgery?; Why was it important to you to engage in physical activity following your surgery?”

Quantitative data collection:
Physical activity levels were measured via an accelerometer (ActiGraph 3TGX; attached at the right hip via a clip on the waistband) worn for at least eight hours during the day for five consecutive days during weeks 1, 3, 6 and 12 post-discharge. The ActiGraph 3TGX has established reliability when worn at the hip in free living conditions. Each participant was requested to complete the CSES at the end of weeks 1, 3, 6 and 12 and to complete the MOS SF-36 questionnaire at the end of weeks 3, 6 and 12 post-discharge from hospital.
4.2.8 Data analysis

4.2.8.1 Qualitative data analysis

Interviews were transcribed verbatim by either the doctoral candidate or a professional transcribing service. The interview transcripts were analysed using an inductive thematic analysis as described by Braun and Clarke. Qualitative data analysis was undertaken as an entire data set in order to reflect the participants’ overall experience of engaging in physical activity during the study period. Analysis of the data sets at each time point following surgery (week 1, 3, 6 and 12) was also incorporated into the overall analysis, to reflect any changes in perceptions and experiences over time, during the study period. In this way, analysis could be undertaken cross-sectionally at each time point as well longitudinally over the entire recovery experience. A summary of the inductive analysis process that was undertaken follows. All steps were primarily undertaken by EG, unless otherwise specified.

1) *Data familiarisation:* Prior to data analysis, each transcription was firstly checked for accuracy. Transcripts were then read and re-read. In order to further familiarise with the data sets and to capture the overall journey and experiences of each of the participants, a summary of each participant’s experiences and perceptions of engaging in physical activity at each of the four post-operative time points was written. During this process of checking the data accuracy and writing the participant summaries, initial ideas regarding potential codes were simultaneously noted and recorded.

2) *Generating initial codes:* Systematic coding was then manually undertaken by assigning codes to chunks of data (words, sentences or paragraphs) on a line-by-line basis for each transcript. To check the accuracy and trustworthiness of the coding, one of the research supervisors (CS) independently coded two randomly selected transcripts. A comparison of the codes generated by EG and CS was then made and a discussion regarding similarities and differences in coding was held to reach an agreement in the identification of initial codes. The remaining transcripts were coded by EG, and then discussed with CS and the primary research supervisor (MS) during regular meetings. The codes were entered into four Microsoft Excel spreadsheets (one for each timepoint) and the data extracts from the transcripts was manually collated under the relevant codes.
3) *Searching for themes:* Data extracts for each code were re-checked for similarity in meaning. Codes were then grouped into provisional categories in a Microsoft Excel spreadsheet for each timepoint. To confirm the categories, CS read two randomly selected coded transcripts for each time point and discussed the provisional categories with EG to come to an agreement on the final categories. This was followed by examination for connection and interactions between categories to identify potential candidate themes cross-sectionally at each time point, as well as longitudinally across all time points. The categories were then examined for connections and interactions to identify candidate themes and subthemes.

4) *Reviewing themes:* Next, data extracts were collated into a Microsoft Word table within candidate themes that described the key messages of the entire data set over all time points. The candidate themes were then examined to determine if they formed a coherent pattern. If a coherent pattern could not be identified, the data extracts were reworked to fit with another theme or used to create a new theme.

5) *Defining and naming themes:* EG, in discussion with CS and MS, carried out an ongoing analysis to refine and name each theme. A definition and description for each theme was produced followed by naming of the themes. Themes were checked to ensure they reflected important and relevant findings in relation to the research aim. After this refinement process of themes was completed, EG re-read the entire data set to ascertain that the themes fitted with the original data set.

6) *Producing the report:* An analytic narrative of the themes supported by selected data extracts and (where applicable) accelerometer or questionnaire data was written.

4.2.8.2 Quantitative data analysis

Data were downloaded from the accelerometer and analysed using *ActiLife* data analysis software (version 6, Actigraph, Florida, USA). Wear time validation was performed manually using the cut points for non-wear time, as published by Troiano.²¹⁵ Cut points for light, moderate and vigorous activity from Freedson et al. (1998) were used in the analysis of all physical activity measures.²¹⁶ The mean, standard deviation, median and range for various accelerometer variables, including time in light and MVPA, step counts and sedentary time, was reported for each of the post-operative time points.
Questionnaire and participant demographic data were analysed using appropriate descriptive statistics such as frequency, mean, standard deviation and range. The findings from the quantitative data sets for accelerometer and cardiac self-efficacy were reported in tables. The written descriptions of the findings were integrated into the narrative report, where results from quantitative data were used to explain, support and/or verify qualitative findings. For example, the variation in pain experiences described by participants during the study period was supported by responses to the question from the MOS SF-36 questionnaire: “During the past four weeks how much did pain interfere with your normal work?”

4.3 Results

4.3.1 Participants

As described in Section 4.2.6, 12 people consented to participate and completed the study protocol. Data for all phone interviews, accelerometry and questionnaires were successfully collected at all time points (weeks 1, 3, 6 and 12 following discharge from hospital) for 10 participants. However, Participant 6 was unavailable for the phone interview and did not wear their accelerometer during week one following discharge due to complications with their leg wounds. Participant 12 did not return their accelerometer or questionnaires at week 6 and week 12 but participated in the phone interview at these times. Data saturation was achieved in that no new themes, or categories contributing to the themes, were identified from the interviews from the final few participants.

Baseline characteristics of the study population (n=12) are listed in Table 4.1. The study population represented a range of ages, living localities and work situations. The cohort was however homogenous in regard to ethnicity, with all participants identifying as NZ European. Females were also under-represented within the cohort, with only two of the 12 identifying as female. In addition, only one of the participants lived alone, with the remaining 11 reporting as living with their spouse.
4.3.2 Analytic narrative of results

Two themes that described the experiences of engaging in physical activity during the first three months following CABG surgery were identified: 1) “Navigating a difficult and unfamiliar road to recovery”; and 2) “Still cautious but becoming more confident and able”. Appendix 12 shows the codes and categories, supported with data extracts, for each theme. The two themes are represented by the following quotes from a participant:

Oh it was hard at the start. I hated it. It was hell... But as time progresses, as normal things heal you get so much better. I just feel so much better, mentally and physically. I just feel gosh I can do these things again. (Participant 8, week 6)

‘Cause you don’t know. You know, you just don’t know. It was a totally unknown place. (Participant 8, week 12)

The two themes explore the relationships between physical, psychological and environmental factors that impacted on physical activity during the this time. Figure 4.2 contains a conceptual model showing the relationship between these different factors, and how they contributed to either increased or decreased physical activity engagement. What follows is an analytic narrative for each theme, in which the impact of these factors over time are described as well as their relationship to each other.
Table 4.1 Baseline characteristics of the study population (n=12)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age [years] – M, SD (range)</td>
<td>64.5, SD = 13.6 (42.6 – 82.1)</td>
</tr>
<tr>
<td>Sex – Male/Female</td>
<td>10/2</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>NZ European - n (%)</td>
<td>12 (100%)</td>
</tr>
<tr>
<td>BMI [kg/m$^2$] – M, SD (range)</td>
<td>27.5, SD = 5.1 (19.4 – 35.2)</td>
</tr>
<tr>
<td>&lt;18.5 kg/m$^2$ (n)</td>
<td>0</td>
</tr>
<tr>
<td>18.5 – 25 kg/m$^2$ (n)</td>
<td>4</td>
</tr>
<tr>
<td>25 – 30 kg/m$^2$ (n)</td>
<td>4</td>
</tr>
<tr>
<td>&gt;30 kg/m$^2$ (n)</td>
<td>4</td>
</tr>
<tr>
<td>Waist Height Ratio – M, SD (range)</td>
<td>0.58, SD = 0.1 (0.42 - 0.74)</td>
</tr>
<tr>
<td>Employed Pre-operatively – n (%)</td>
<td>7 (58%)</td>
</tr>
<tr>
<td>Smoking History [pack years] – M, SD (range)</td>
<td>4.9, SD = 10.8 (0 – 36)</td>
</tr>
<tr>
<td>Smoking Status – n (%)</td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>4 (33%)</td>
</tr>
<tr>
<td>Never smoked</td>
<td>8 (67%)</td>
</tr>
<tr>
<td>Comorbidities – n (%)</td>
<td></td>
</tr>
<tr>
<td>Arthritis lower limb</td>
<td>2 (17%)</td>
</tr>
<tr>
<td>Type 2 diabetes mellitus</td>
<td>2 (17%)</td>
</tr>
<tr>
<td>Renal disease</td>
<td>2 (17%)</td>
</tr>
<tr>
<td>Asthma</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>Gout</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>Living Situation – n (%)</td>
<td></td>
</tr>
<tr>
<td>Lives with spouse</td>
<td>11 (92%)</td>
</tr>
<tr>
<td>Lives alone</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>Living Locality</td>
<td></td>
</tr>
<tr>
<td>Urban – city</td>
<td>6</td>
</tr>
<tr>
<td>Urban – small town</td>
<td>5</td>
</tr>
<tr>
<td>Rural</td>
<td>1</td>
</tr>
<tr>
<td>Length of Post-Operative Hospital Stay [days] – M, SD (range)</td>
<td>7.2, SD = 3.0 (5 – 16)</td>
</tr>
</tbody>
</table>

M = mean; SD = standard deviation; NZ = New Zealand; n = number
Figure 4.2 Conceptual model for factors impacting physical activity engagement during the first three months following CABG surgery.
4.3.2.1 Theme 1: Navigating a difficult and unfamiliar road to recovery

This theme describes how engaging in physical activity was perceived to be hard, especially during the first three weeks. The perception of being in unfamiliar territory and feeling uncertain added to the challenge of initiating and progressing engagement in physical activity. This theme also describes strategies that participants utilised to mitigate impact of these difficulties to enable engagement in physical activity.

Participants stated they found physical activity both mentally and physically challenging, especially during the first few weeks. This difficulty was reflected in the physical activity levels, which were low for all participants during the first few weeks (Table 4.2), as well as by limited engagement in activities of daily living (Table 4.3). Prescribed sternal precautions limited the type of activities that participants were able to engage in during the first six weeks, however several participants reported difficulty initially when performing permitted activities, such as turning over or getting in and out of bed or rising from a chair. For the first few days after returning home, most participants only walked indoors, for example getting up to go to the bathroom. While all but one participant had progressed to walking outside at least once by the end of the first week, there was variation in the duration (ranging between 5 and 20 minutes) and frequency (two times/week to three times/day) of these walks.

One of the key reasons for physical activity being “hard at first” was the presence of physical symptoms. Participants reported pain and fatigue that limited physical activity engagement during the first three weeks, with their impact being greatest during the first week.

One of the most common things that people talked about during the first three weeks following discharge from hospital related to feeling fatigued, which was often described as a lack of energy or tiredness.

*I try and get out and go for a walk at least once a day if I can manage the energy to get out and go.* (Participant 4, week 1)
Fatigue impacted physical activity engagement in a variety of ways, including reducing the frequency that people felt like going for a walk, needing to stop during walking, walking slower than normal, and needing to rest more than usual.

The impact of fatigue was greatest during the first week following hospital discharge, with most participants (n=10) describing that fatigue limited their engagement in both walking and basic activities of daily living such as showering or household chores at this time. For example:

*But it’s the tiredness. You get out of bed you’ll go to the loo or make a cup of tea down the hallway and into the kitchen and back again and it doesn’t take much to blow your energy completely out of the water.* (Participant 12, week 1)

Table 4.2 Mean, standard deviation, median and range for physical activity levels at each time point as measured by accelerometer

<table>
<thead>
<tr>
<th>Week 1 (n=11)</th>
<th>Step Counts (steps/day)</th>
<th>Time in Light PA (mins/day)</th>
<th>Time in MVPA (mins/day)</th>
<th>Sedentary Time (hours/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>1,117 (824)</td>
<td>59.8 (39.3)</td>
<td>4.2 (5.1)</td>
<td>9.0 (2.2)</td>
</tr>
<tr>
<td>Median</td>
<td>865</td>
<td>44.2</td>
<td>2.3</td>
<td>8.5</td>
</tr>
<tr>
<td>Min, max</td>
<td>362, 2,889</td>
<td>23.0, 156.0</td>
<td>0.9, 18.7</td>
<td>5.2, 12.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 3 (n=12)</th>
<th>Step Counts (steps/day)</th>
<th>Time in Light PA (mins/day)</th>
<th>Time in MVPA (mins/day)</th>
<th>Sedentary Time (hours/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>2,861 (2,357)</td>
<td>89.4 (50.4)</td>
<td>14.8 (8.2)</td>
<td>6.8 (1.9)</td>
</tr>
<tr>
<td>Median</td>
<td>1548</td>
<td>72.6</td>
<td>4.6</td>
<td>7.4</td>
</tr>
<tr>
<td>Min, max</td>
<td>838, 7,849</td>
<td>37.2, 209.5</td>
<td>1.1, 55.8</td>
<td>3.0, 9.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 6 (n=11)</th>
<th>Step Counts (steps/day)</th>
<th>Time in Light PA (mins/day)</th>
<th>Time in MVPA (mins/day)</th>
<th>Sedentary Time (hours/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>4,759 (3,460)</td>
<td>112.9 (36.9)</td>
<td>26.4 (26.3)</td>
<td>5.4 (1.7)</td>
</tr>
<tr>
<td>Median</td>
<td>3,648</td>
<td>96.5</td>
<td>9.8</td>
<td>5.8</td>
</tr>
<tr>
<td>Min, max</td>
<td>1,520, 12,350</td>
<td>73.7, 168.5</td>
<td>2.0, 75.6</td>
<td>1.4, 7.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 12 (n=11)</th>
<th>Step Counts (steps/day)</th>
<th>Time in Light PA (mins/day)</th>
<th>Time in MVPA (mins/day)</th>
<th>Sedentary Time (hours/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>6,858 (3,738)</td>
<td>168.9 (65.3)</td>
<td>35.8 (29.2)</td>
<td>4.3 (1.7)</td>
</tr>
<tr>
<td>Median</td>
<td>7,539</td>
<td>170.9</td>
<td>35.9</td>
<td>4.0</td>
</tr>
<tr>
<td>Min, max</td>
<td>1,431, 12,742</td>
<td>69.4, 240.5</td>
<td>1.7, 88.7</td>
<td>1.0, 7.1</td>
</tr>
</tbody>
</table>

PA = physical activity; MVPA = moderate to vigorous physical activity; mins = minutes; SD = standard deviation; min = minimum; max = maximum
Table 4.3 Examples of activities of daily living self-reported by participants during interviews

<table>
<thead>
<tr>
<th>Activities of Daily Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1 (n=11)</td>
</tr>
<tr>
<td>Independent with self-cares (showering and dressing) (n=10)</td>
</tr>
<tr>
<td>Make own breakfast, snacks and/or hot drinks (n=5)</td>
</tr>
<tr>
<td>Doing dishes (n=3)</td>
</tr>
<tr>
<td>Walked outside with someone (n=8)</td>
</tr>
<tr>
<td>Walked outside alone (n=2)</td>
</tr>
<tr>
<td>Collecting mail (n=2)</td>
</tr>
<tr>
<td>Week 3 (n=12)</td>
</tr>
<tr>
<td>Light tidying around house (for example wiping benches, picking up light objects) (n=6)</td>
</tr>
<tr>
<td>Watering garden &amp; light weeding (n=3)</td>
</tr>
<tr>
<td>Week 6 (n=12)</td>
</tr>
<tr>
<td>Cooking meals (n=5)</td>
</tr>
<tr>
<td>Vacuuming and cleaning floors (n=5)</td>
</tr>
<tr>
<td>Loading and unloading dishwasher (n=3)</td>
</tr>
<tr>
<td>Washed car (n=1)</td>
</tr>
<tr>
<td>Mowed lawns (n=1)</td>
</tr>
<tr>
<td>Week 12 (n=12)</td>
</tr>
<tr>
<td>Returned to work (n=3 out of 7)</td>
</tr>
<tr>
<td>Heavy gardening (digging) (n=2)</td>
</tr>
</tbody>
</table>

By Week 3, while fatigue severity had reduced for most participants, tiredness persisted for four participants after basic tasks such as showering and light household chores. Three participants described fatigue higher than pre-operative levels only during or after going for a walk.

While the impact of fatigue was greatest during the first three weeks, the level of fatigue and its impact on physical activity that was described by participants varied. The varying levels of fatigue described by participants was supported by the MOS SF36 responses at week 3, where three participants reported feeling tired ‘all or most of the time’, four felt tired a ‘good
bit of the time’, four felt tired ‘some of the time’ and one felt tired ‘a little of the time’. The variable impact fatigue had on participants is reflected by the following descriptions by two participants from week 1:

*It’s a funny thing, because you try and set your mind to do a task. I sort of tried to tidy the kitchen but it was purely an energy level factor. I just couldn’t, yeah I was poked afterwards.* (Participant 11, week 1)

*I’ve got no tiredness at all.* (Participant 2, week 1)

Similarly, while pain experiences impacted physical activity during the first few weeks for all participants, the level of pain and its resulting impact on activity varied amongst participants. Five participants described marked limitations in physical activity due to pain during the first three weeks, with these participants at week 3 responding “quite a bit” in answer to “How much did pain interfere with your normal work inside and outside the house?”, in the MOS SF-36 questionnaire. Location of the pain for these participants varied: sternal pain (2/5), leg wound pain (1/5); and new musculoskeletal pain in the shoulder (1/5) and thoracic spine (1/5) following surgery. The impact sternal pain had during week 1 was described by Participant 5:

*It hasn’t been as much as I would have liked, because I’ve been in a lot of pain. Like I get pain just trying to deep breath ... So yeah it’s not been a good experience at all really.* (Participant 5, week 1)

Interestingly, the two participants who reported severe sternal pain are the only two participants in the cohort who experienced sternal complications. Participant 5 was readmitted to hospital for a sternal infection two weeks following discharge. At week 12 Participant 12 reported retrospectively that they experienced clicking in the sternum during the first weeks, indicating the possible presence of sternal instability, however this was not formally checked or diagnosed by health professionals at the time.

The remaining seven participants described experiencing wound discomfort or tightness which made activities challenging and limited physical activity either moderately (n=3), a little bit (n=3) or not at all (n=1) according to their MOS SF-36 responses at week 3.
Amongst these seven participants, while discomfort from both the sternal and leg wounds was reported in the first three weeks, activity limitations due to discomfort in the leg wound were described more frequently by participants. However, the discomfort described by participants, despite not being painful, still limited engagement in activity by restricting the ease with which activity could be performed. The discomfort and resulting awkwardness during simple activities of daily living, was described by the following participants:

*Earlier in the week I had the broom and I was sort of thinking of pushing the broom around the kitchen floor, it’s not a big kitchen. And I think I did do a couple of swipes but just leant the broom back up again. So pushing the broom was, yeah, no that wasn’t going to happen. Gave up on that … Just a torso movement with the arms I guess, the swing. Well, not pain, but awkwardness in…yeah. Just uncomfortable and awkward.* (Participant 11, week 3)

*Walking’s been a bit difficult, because [the leg wound’s] sort of tightening up. It does stretch eventually but it’s a bit uncomfortable until it does.* (Participant 7, week 1)

One reason for the lack of sternal pain experiences during activity for many participants may have been the avoidance of attempting various activities to comply with the sternal precautions:

*It’s not a bad pain, you know it is just when I think about it … At this stage it hasn’t (stopped me from doing anything) but I haven’t lifted anything heavy enough to try and test it, either.* (Participant 7, week 3)

Indeed, while only three participants noted experiencing severe sternal pain at some point during week 3, the pain was only felt when there was significant pressure or load placed on the sternum. For example, Participant 4 noted severe pain only during coughing and sneezing. Participant 5 reported feeling sternal pain when lifting a pipe weighing approximately 5 kilograms and Participant 12 reported feeling sternal pain following screwing in some tap ends at the local tavern. However, it is important to note that participants 5 and 12 were the same two participants who experienced severe sternal pain during week 1 which, as previously described, may have been associated with underlying
sternal complications. Therefore, it is difficult to accurately determine whether the pain experienced by these participants at week 3 was due to the loading of the sternum or the possible sternal complications, or a combination of the two.

Medical complications, which mostly occurred during the first six weeks following discharge, posed another physical challenge to physical activity engagement. In total eight participants reported experiencing at least one medical complication. Complications included: lower respiratory tract infection (3/12); wound infections (2/12); excessive leg swelling (1/12); pleural effusion (1/12); low blood pressure (1/12) and tachycardia (1/12). Engagement in physical activity was interrupted during these complications due to: increased physical symptoms (such as pain, shortness of breath or fatigue); the need to reduce activity to allow healing; or re-admission to hospital (3/12) where options for engagement in physical activity was more limited than at home. One participant described how their confidence to engage in activity was knocked after an overnight hospital readmission due to tachycardia:

> So that was a wee hiccup in the road. I was a wee bit frightened and a wee bit afraid thinking it is going to happen again ... thinking oh it (physical activity) might bring it on again, but I’ve got past that now. (Participant 8, week 3)

As indicated by the previous quote, alongside physical challenges, participants described how engaging in physical activity during the first half of the study period was also mentally challenging. When participants first arrived home there was a sense of being in unfamiliar territory, with Participant 8 calling it “a totally unknown place”. Being in an unfamiliar situation resulted in most participants experiencing decreased confidence to engage in physical activity, as well as fear of something going wrong. For some participants psychological challenges rather than physical symptoms made it hard to engage in physical activity.

> I think the physical capabilities I’m quite capable of doing it really. Just getting a bit more confidence in order to do it. (Participant 2, week 1)

This challenge to confidence was also reflected in the findings from the CSES questionnaire, where both mean global self-efficacy and self-efficacy to maintain function initially decreased from pre-operation to week 1 post-discharge (Table 4.4).
Table 4.4 Mean and standard deviation for global self-efficacy and self-efficacy to maintain function as measured by the Cardiac Self-Efficacy Scale

<table>
<thead>
<tr>
<th></th>
<th>Pre-op (n=12)</th>
<th>Week 1 (n=11)</th>
<th>Week 3 (n=12)</th>
<th>Week 6 (n=11)</th>
<th>Week 12 (n=11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global self-efficacy</td>
<td>35.4 (9.3)</td>
<td>32.7 (8.6)</td>
<td>33.6 (7.1)</td>
<td>40.4 (7.0)</td>
<td>44.6 (8.6)</td>
</tr>
<tr>
<td>Self-efficacy to maintain function</td>
<td>13.1 (3.9)</td>
<td>9.4 (4.0)</td>
<td>10.1 (3.9)</td>
<td>14.2 (3.6)</td>
<td>16.7 (3.7)</td>
</tr>
</tbody>
</table>

Pre-op = pre-operative

Fear was the most commonly described psychological limitations to physical activity during the first six weeks, with 10 participants describing feeling fearful during this time. Fear was most frequently linked to potential sternal damage as a result of engaging in physical activity.

*The first couple of days it was really quite frosty and I was a bit worried about walking outside and slipping and maybe falling... I don’t want to slide, I want to protect my sternum.* (Participant 2, week 1)

Several participants described how fear of damaging the sternum encouraged adherence to the sternal precautions that had been advised.

*I’m paranoid about splitting my sternum so I can’t do very much with my arms at all.* (Participant 4, week 3)

Other sources of fear were damaging the leg wound (2/12), or that physical exertion would damage the grafted blood vessels or trigger angina (2/12).

*I’m scared that somewhere down the line if I do something too hard well what’s it going to effect? Is it going to affect my chest or my heart or the arteries that they put in, is it strong enough to take this and that?* (Participant 12, week 6)

Being fearful of something going wrong led to participants viewing home as a “safe haven”, with some initial reluctance to walk outside or venture too far from home.
So the first time I was walking outside, you see the house as a bit of a safe haven and the further you walked away you say to myself my god if something happens? (Participant 2, week 1)

And maybe not wanting to go to stray too far I suppose. I don’t know why. It’s not the fact of thinking I’m going to collapse or anything like that, but I guess it’s that safety of your surroundings. (Participant 11, week 1)

As mentioned previously, for several participants, fear of something going wrong was exacerbated when medical complications occurred. For example, Participant 6 described how experiencing significant lower limb swelling during the first week home resulted in fear of doing too much movement:

I’m a wee bit scared of my legs, I don’t want them to burst. (Participant 6, week 3)

Decreased confidence and feeling fearful resulted in participants being cautious about physical activity engagement. Having a cautious approach meant participants were often reluctant to attempt new activities.

Plus of course because ... I’ve been deliberately not sort of charging into it because I don’t want to cause any damage. (Participant 5, week 1)

I’m basically not attempting anything that I think I might hurt myself. So I’m just being, like I think I’ve said the last couple of times, I’m just being cautious. (Participant 2, week 6)

Participants described a variety of strategies or factors that helped mitigate the physical and psychological challenges to physical activity engagement during the first few weeks. These included activity modification, self-motivation and having support.

While sometimes physical symptoms or being cautious resulted in avoiding certain activities, many participants described modifying the way that they performed an activity in order to be
able to do it. Examples of such activity modification included moving slowly and not reaching too far away from the body when performing tasks such as wiping benches.

As long as I don’t do anything stupid and don’t move too fast … Your walking’s not fast obviously. As long as you take your time and do things the way your body tells you to do them you’re fine. (Participant 12, week 3)

The fact that most participants were initially walking more slowly than normal may partially explain the limited time spent in moderate to vigorous physical activity (MVPA) during the first three weeks (Table 4.2).

Many participants also described how, because of physical and psychological challenges, they needed a great deal of self-motivation or will-power to engage in physical activity during the first three weeks. Participant 5, who experienced severe sternal pain at times during the first few weeks, described their psychological struggle which resulted in a need for self-motivation to engage in physical activity as follows:

It’s affected my mental attitude I’m sure, I’m not as positive as I was... So hopefully once things start to recover a bit better, you know you’ll be on the up and up. But at the moment it’s a struggle … I can say this, it’s been a hell of a journey. I think I’m teetering. I feel like I’m teetering at the top. Am I on the downhill run or have a got to go up a bit, climb up a bit further? I don’t know... I had a struggle to force myself to get up and go out and do that walk. And yeah I really had to put my mind to it, you know ‘cos I really didn’t want to go. (Participant 5, week 3)

Participants also described how support from their spouse, family or friends helped them to engage in physical activity, especially during the first few weeks.

I think having someone at home. I think mentally and physically if you were by yourself I think it would be jolly hard. I think you need that confidence and positivity coming from the wife or your partner or whoever it may be. I wouldn’t like to do this by myself. (Participant 2, week 1)
Support from a spouse or family was provided in a number of other ways including: encouragement; accompanying on walks for safety and confidence; and/or assistance with activities of daily living, including getting in and out of bed and dressing.

There were, however, several occasions where well-intentioned support received from a spouse restricted physical activity engagement by either not allowing the participant to do something, or by doing everything for them:

*She’s very restrictive on what I am allowed to do. She didn’t think I could do the dishes the last couple of days and I think I could’ve.* (Participant 10, week 1)

*She’s helping me with pretty much everything. Getting food and drink and coffee and things like that.* (Participant 3, week 1)

4.3.2.2 Theme 2: Still cautious but becoming more confident and able

This theme describes the changes in physical and psychological factors that contributed to participants finding engagement in physical activity easier over time. While participants felt more confident and physically able over time, this theme also describes how some physical and psychological challenges to physical activity were still present even up to week 12 following discharge.

Whilst there was some variation, participants generally engaged in more physical activity at each subsequent time point. This increase in physical activity was seen in the progression of engagement in ADLs (Table 4.3) as well as the accelerometer findings, with all measures showing improvement at each subsequent timepoint for most participants. (Table 4.2). For example, time in MVPA increased at each subsequent timepoint for seven participants. Two participants had a decrease in MVPA between weeks 6 and 12, due a perception that walking for exercise was no longer required since they were ‘back to normal daily activities’. Two participants were unable to increase time in MVPA after week 3 due to having lower limb arthritis. In relation to ADLs, while all participants engaged in progressively more demanding activities over time, the actual time point at which participants resumed certain activities also varied. For example, Participant 4, the only participant in this study who lived
alone, commenced vacuuming at week 3, whereas most participants began this or similar activities at week 6.

Improvements in physical symptoms and psychological factors contributed to participants finding physical activity easier over time:

Yeah probably because I’m in less pain and I’m feeling better in myself and I’m getting about more. (Participant 5, week 6)

The reduction in physical symptoms over time meant participants found it not only easier to perform activities, but also to sustain physical activity for longer periods. For example, at week 6 all participants reported pain and fatigue had reduced making it easier to engage in physical activity.

When I have a shower or do anything now, I don’t have the tightness in the chest so much ... So consequently I feel as though I’m walking faster and everything else I’m doing is happening a lot quicker. (Participant 9, week 6)

Ninety percent of the time I feel like doing stuff ... just some days I just feel more tired than others. (Participant 8, week 6)

However, pain continued to have an impact when people began engaging in upper limb activities that involved loading, for example digging or putting weight through their arms on a bicycle. The four participants who, despite the sternal precautions, had attempted such activities prior to week 6 described experiencing pain in the sternum during these activities. While some stopped activity with the onset of pain, others kept going but modified the performance of activity to minimise pain. For example, participant 4 modified the way they shovelled dirt to minimise the pain experienced.

If I do too much with my arms and that I still get bloody chest pains... I (don’t stop) just change the way I’m digging. Usually if I’m reaching a little bit or you know sometimes if you just swap hands and work the other way, it’s sort of usually alright. (Participant 4, week 6)
By week 12, after the sternal precaution period had ended, more participants were engaging in loaded upper limb activities. However, most of these participants reported occasional discomfort in the sternum if they had “done too much”.

*Still if I do a wee bit too much, it hurts a bit ... just my chest mainly ... Well there’s the odd different thing, just stretching different parts of my body and stuff. Or bending, putting too much weight on my arms and stuff like that. Yeah, pushing and pulling and lifting bits and pieces. Still gives a wee bit of trouble ... Like I can do the lifting but my chest lets me know when I’ve done it.* (Participant 7, week 12)

Often the onset of this discomfort was not until several hours after the activity. Sometimes cumulative loading on the sternum resulted in discomfort, rather than a single heavy lift.

*Sometimes after I come back I’ve felt maybe I’ve hit too many [golf] balls today, feel a bit uncomfortable in the chest.* (Participant 2, week 12)

While the impact of physical symptoms had markedly reduced by week 6, a new physical limitation emerged at this time, with many participants beginning to notice they had lost fitness compared to their pre-operative levels.

*That’s because I’m not used to walking that far since I’ve had the op. I’ve got very unfit.* (Participant 1, week 6)

Several participants first noticed physical deconditioning had occurred when they first attempted walking up slopes or hills. Five participants were particularly concerned about perceived loss of strength in their arms and legs. This was also described throughout the study period by the participants who were more active:

*The fact that I was in the hospital for like three weeks before I even had the operation. It just took everything away from me, my arms and my muscles, especially my legs. Yeah, they were all sort of just frizzled up.* (Participant 9, week 6)
By week 12, while most participants reported their strength and fitness was starting to improve, none felt they were back to their baseline level of fitness or ability to engage in exercise.

*I’m definitely not back to my physical fitness level that I was at or anywhere close to it. Nowhere near it … Yeah look it’s work fitness, it’s upper body strength and fitness that part of it there.* (Participant 12, week 12)

Changes in psychological factors also contributed to physical activity feeling easier over time. The biggest psychological change was that at each time point participants described feeling more confident to engage in physical activity.

_Every week there’s more things that I feel confident in doing._ (Participant 6, week 12)

The observed increase in confidence over time was supported by the findings from the CSES questionnaire, with both mean global self-efficacy and self-efficacy to maintain function increasing each subsequent time point post-operatively (Table 4.4).

A key contributor to increased confidence over time was participants’ feeling a sense of mastery as a result of successful incremental experiences with physical activity engagement. Such mastery experiences were described as early as week 1:

_Just every day the progress enables me to do something different. It’s not always noticeable. This morning I stood up and went for a hanky in my pocket. [My wife] said well a week ago you wouldn’t have been able to stand up like that, quickly ... it’s very subtle the changes and you only really see them when you look back._ (Participant 1, week 1)

Other factors occasionally described by participants as contributing toward increased self-efficacy included:

Positive physiological feedback following single or multiple bouts of activity:
Today I wasn’t feeling really good when I started off but by the time I was finished I was feeling alright. It seems to be the thing, sometimes you don’t feel too good but the best thing to do is to get active and do something. (Participant 4, week 6)

Just puffed out the first few days but the more I do the better it gets, pretty much. (Participant 7, week 1)

And vicarious experiences from talking with others who had had a similar operation:

Everybody that I’ve spoken to that have had the operation before me … they are all very physically active and doing and things so I know it will come right. (Participant 6, week 6)

And they come and visit and talk about what their experiences are like some of them um they had either family or whatever and they’ve had the same problem and they’ve overcome it and they’ve just got back to their normal lives again and so it’s been really good the fact that they’ve been able to come and do that. (Participant 10, week 12)

Input from health professionals, when available, was also highly valued by participants and increased their confidence in undertaking physical activity. Two participants had started attending cardiac rehabilitation by week 12 and appreciated the support and guidance from the physiotherapist running the programme. A further three participants’ described how their confidence to engage in physical activity increased after having received “clearance” at their follow up appointment with the surgeons, as described by Participant 8:

Yeah, I think I’m in a better mental state of mind ... I just think now I know I can do these things now. I’ve had the all clear (from the doctor) so ... Meant quite a lot. Yeah. ‘Cause you don’t know. You know, you just don’t know. It was a totally unknown place. (Participant 8, week 12)
The importance of receiving guidance from health professionals was also seen by two participants who said they wanted advice from their surgeon, in order to feel more confident about engaging in more strenuous activities. For example, Participant 2 said:

*I’m not trying anything too strenuous. I’m sure I can, I’d like to have a chat to the surgical guys just to see what I could be doing. I’m sure I could do a lot more than I’m doing.* (Participant 2, week 6)

However, while all participants saw at least two health professionals following discharge (general practitioners, n=12; district nurse, n=12; cardiac surgeon, n=8; cardiac nurse specialist (via phone), n=2), support and input from health professionals around engagement in physical activity was minimal. Indeed, most participants reported that when they saw a health professional, physical activity was either not mentioned, or when it was it was mainly around checking on activity rather than providing any specific guidance or advice. For example, these participants said:

*Um, I haven’t seen any health professionals in that side of it.* (Participant 12, week 3)

*Ah she (doctor) queries, she doesn’t actually help but just queries. Yeah just queries how’s it going and what I’ve been doing.* (Participant 5, week 6)

One participant expressed that they would have liked more guidance from health professionals about how to progress their physical activity.

*It probably would have been more communication with the hospital and that side of it and a physio or something like that, you should be in a course and say you have to go so you can be with others so you can learn where to go and how much you can do. Because I’ve had that huge gap between having the operation, getting to the hospital and then seeing the hospital again. It should have been a shorter space. And I think the follow up needs to be more.* (Participant 12, week 12)

While guidance from health professionals was still required throughout the study period, as physical symptoms decreased and confidence increased, participants described needing less support from the people around them as time went on. By week 6 participants no longer
needed physical assistance to perform activities or have someone accompany them on walks (however they did still value company on walks as it made it more enjoyable).

Similarly, by week 6 they no longer described having to force themselves to engage in physical activity. However over the latter half of the study period, participants still expressed an ongoing need for more self-motivation. To identify the driving forces behind their desire and motivation for engaging in physical activity, participants were asked at week 12 about the things that had motivated them to engage in physical activity since their discharge from hospital. All participants were able to identify specific motivating factors for engaging in physical activity. The motivating factors varied amongst participants but included general health and wellbeing, living longer, being there for their family and returning to work. For example, the following participants said:

*Just so everything heals up properly and I get a bit fit again and can get back to work.* (Participant 7, week 3)

*I want to be here for my family. And I want to feel good I suppose. I had a feeling that I didn’t feel good and so now I feel good and I want to feel good. And just enjoy life you know enjoy what I’ve got and the time I’ve been given and yeah.* (Participant 11, week 12)

*Ah just my own wellbeing. And I think it’s going to keep my fit and my heart my body fitter. It’s just all about, it’s taken me a wee while to get my head around it but I’m all about making sure that I live longer. And I see that as one way of helping me live longer.* (Participant 12, week 12)

Four participants reported that they enjoyed exercise and that exercise was an important part of their daily routine prior to their heart attack. These participants were motivated to get back to engaging in their usual exercise. As Participant 8 said:

*It is one of the most important things in my life. I just think it’s a good mental place to be. Yeah. Keep healthy. Just keep well and you can yeah live well. And be physically fit as part of that, I guess.* (Participant 8, week 12)
However, despite increasing confidence and being motivated to improve their health, many participants remained cautious and reluctant to push themselves right up until week 12:

*I’m just being careful I think more than anything and not trying to go too far too fast…I’m one of these people that used to always push myself so what I want to do is not push myself, I’ll just take it easy and ease myself into the other things.* (Participant 9, week 12)

*Mmmmm [thinking], I’ll just get back into that (gym) slowly, I think. I don’t want to push myself. I’m just very cautious.* (Participant 8, week 12)

While the overall level of fear associated with physical activity had reduced by week 12, for many participants a persisting underlying fear of doing damage, especially with loaded upper limb activities, contributed to the ongoing cautious approach. For example, at week 12 - six weeks after the sternal precaution period had finished - four participants were still avoiding heavy lifting due to fear of sternal damage.

*I don’t want to strain it and do any damage. If I pick it up and I think it’s too heavy I just put it down again.* (Participant 6, week 12)

*I’m looking forward to a day perhaps in January when I’ll chuck a pack on my back and go for a walk in the hills but I haven’t been doing anything strenuous about my chest and lifting stuff … I’m still holding off on that because I can still feel slight pain or whatever in my chest at different times so I’m just wary of that so I’m just being careful I think more than anything and not trying to go too far too fast.* (Participant 9, week 12)

Another contributing factor to the ongoing cautious approach was feeling uncertain. Uncertainty about physical activity was most frequently reported from week 6 onwards, when people began thinking about engaging in more challenging activities. Things people felt uncertain about included:

1) How to reintroduce lifting or other loaded upper limb activities;
I suppose I’ve been a wee bit reluctant to ah, lift too much weight in case its’ going against the rules that was all. So I don’t really know how much I could lift if I want to. But ah, you find out whether you lift and see if it hurts, or what you do. (Participant 12, week 6)

2) What other types of exercise they could do apart from walking (for example strengthening exercises);

They (arms) just feel a wee bit um, yeah. Like they’re not, not as, not as they were. So, I don’t know what to do. What can I do to strengthen your chest muscles? Could I, at that twelve-week mark, could I go back to the gym and just, do light stuff? Or, do you not think, you think it’s too early? ... Can I do exercises like, lower body stuff on the floor, you know? Can I do any of that, like leg raises or bridges or, what can I do? (Participant 8, week 6)

3) How to get back into work;

I kind of get a bit frustrated because I think I need to recover and my work was physical and it’s like I just like don’t know even know how the heck I even get back into that system. (Participant 11, week 6)

4) Where to go to for guidance when it was needed;

Yeah if you said, and it does say it in that booklet, you know you should be doing this and you should be doing that, it doesn’t tell you, ok what happens if something else goes wrong, where do you go and how do you find out the difference and where you should be. (Participant 12, week 12)

On several occasions, fear and uncertainty together contributed to feeling cautious about activity engagement during the second half of the study period. This relationship between fear, uncertainty and feeling cautious was described by those participants who engaged in the least and those that engaged in the most physical activity during the study period, as
described by Participants 2 (one of the most active) and 5 (one of the least active) in the following quotes:

“I’ve been very careful, I’ve taken my time. I didn’t want to push anything just in case I did any kind of damage. I was a bit frightened ‘cause I didn’t know who to turn to ask. (Participant 2, week 12)

I don’t think I’m quite up to being able to do (upper limb) exercise yet. I’m a bit worried about my chest I don’t want it splitting open or anything. See they did say not to lift anything over 4 kg but I don’t know for how long that restriction is in for. (Participant 5, week 6)

4.4 Discussion

To our knowledge, this is the first qualitative study focused primarily on exploring peoples’ perceptions and experiences of engaging in physical activity during the first 12 weeks following CABG surgery. Through exploring people’s perceptions and experiences, various physical, psychological and environmental factors that impacted on physical activity over a 12-week period, in this cohort of participants, were identified. The themes not only described the changing impact that physical, psychological and environmental factors had over time, but also the associations and relationships between many factors, for example the presence of fear and uncertainty resulting in people feeling cautious and needing support from whānau (a Māori language term to describe immediate and/or extended family and/or collective of people or families who live together in the same area) and health professionals. The main findings from this study were that physical activity engagement was perceived to be difficult, especially during the first few weeks, but that it got easier over time as physical symptoms reduced and physical capability and confidence increased. Despite confidence increasing over time, being in unfamiliar territory meant that psychological factors, in particular fear and being cautious, had an impact on physical activity engagement throughout the study period. The study findings also identified the importance of self-motivation, support and sources of self-efficacy (that is, mastery experiences, vicarious experiences, verbal persuasion and positive physical and psychological feedback) as facilitators that enabled participants to overcome the challenges to physical activity that they faced. Preparing people to cope with
these physical and psychological challenges, and by facilitating enabling factors to physical activity may help people to engage in physical activity with greater confidence and enable earlier return to activities of importance.

The experience of physical activity feeling difficult at first was supported by the objective accelerometer findings, with mean physical activity levels being very low initially followed by an improvement at each subsequent timepoint. Both the median step count and range at weeks 1, 3 and 6 in this study were in line with those reported by Thijs et al. (2019), who measured physical activity at weeks 1, 2 and 5 post-discharge following CABG surgery. The relative consistency of findings between the two studies gives some confidence that the level of physical activity engagement of the cohort in the current study may be representative of others recovering from CABG surgery. Tudor-Locke et al. (2008) define sedentary activity as being either ‘basal activity’ (< 2,500 steps/day) or ‘limited activity’ (between 2,500 and 4,999 steps/day). Both the mean and median step counts at weeks 1, 3 and 6 in the current study (Table 4.2) fall within these sedentary classifications. Even at week 12, when the majority of wound healing has taken place and physical symptoms have subsided, both the mean and median step counts fall within Tudor-Locke et al’s (2008) ‘low active’ category (5,000 – 7,499 steps/day), well short of the ‘active’ category (10,000 – 12,499 steps/day). The mean step counts at week 12 in the current study (6,858 steps/day) are also lower than 90 participants of comparable age (mean 63.5, SD 10.1) post-MI who continued to exercise after completing a cardiac rehabilitation programme (mean 9,252.5 steps/day).

The wide range in physical activity values observed in the current study, and also by Thijs et al.(2019), are likely at least in part, to be influenced by differences in physical capability. Indeed it has previously been shown that pedometer determined physical activity is inversely related to age, and adults with co-morbidities that limit mobility and/or physical endurance display lower step counts per day compared to healthy adults. In both the current study and the one by Thijs et al., a wide range of ages (42 – 82 years and 50 – 82 years respectively) and co-morbidities were represented within the study populations. However, while the physical capability of participants varied, most of the factors identified in the current study had a perceived impact on physical activity engagement regardless of the individual participants’ physical capability. For example, ‘feeling cautious’ was described by not only
the participant who, due to severe hip osteoarthritis, had the lowest physical activity levels at each timepoint, but also by the participant who had the highest level. These findings suggest that interventions to support physical activity engagement, for example by helping people overcome fears and uncertainties which contribute to feeling cautious, may facilitate people to become more physically active by week 12 post-CABG.

Physical symptoms, primarily fatigue and pain, were one of the key reasons why engaging in physical activity felt hard at first. While there was a large variation in participants’ individual experiences relating to the level of impact caused by physical symptoms, for all participants’ fatigue and pain had their greatest impact during the first few weeks.

The finding that fatigue was a key limitation to physical activity engagement for many participants during the initial weeks following discharge from hospital, is similar to the findings from a qualitative study by King et al. (1988), who reported that between weeks one and eight post-CABG, participants identified fatigue as the key reason for not doing as much physical activity as they thought they should be able to do. Our findings add to those of King et al. by showing the changing impact of fatigue over time. Additionally, our findings showed that fatigue not only limited the ability to engage in sustained physical activity, but also necessitated the need for increased rest. These findings therefore highlight the need for people to balance the need for rest with the need for physical activity, especially during the first three weeks following hospital discharge.

As identified in the systematic review (Chapter 3) only two published studies have explored the impact of pain on physical activity following CABG surgery. One of these studies by Cleary et al. (2015) found that pain was the least most frequently reported barrier to physical activity at 12 weeks post-CABG surgery. The finding from the current study that the impact of pain decreased over time and had little impact by week 12 therefore supports the results of Cleary et al.’s. The other study, by Sethares et al. (2013), explored strategies to manage pain post-CABG surgery and found that while pain medication was the primary pain relieving strategy, activity modification (avoiding activity or stopping activity) was the second most frequently reported strategy to reduce pain. The findings from the current study add to those of Sethares et al. by showing that modifying the way an activity was performed so that
they *could* do the activity, rather than avoiding it completely, was also reported by many participants. Such modifications included keeping arms close to the body during loaded and unloaded activities and moving slowly. Swanson and LaPier (2014) demonstrated a reduction in forces through the arms when activities were performed more slowly. Reduced force generation is a possible reason why participants in the current study experienced less discomfort in the chest when performing arm and trunk movements slowly.

While both pain and fatigue are common and largely unavoidable symptoms following CABG surgery, patients can be advised about how to better manage these symptoms in order to minimise their impact on physical activity. Such advice could include pacing, balancing the need for rest with the need for activity, adhering to pre-emptive pain relief as prescribed by their doctor and activity modification strategies that enable participation in physical activity with less discomfort.

Another key finding from the current study was the self-report by the majority of participants that they had a cautious approach to engagement in physical activity throughout the first three months following CABG surgery. The study by Ali et al. (2017), described in Chapter 3, found that feeling cautious, or reluctant, was the biggest barrier to physical activity engagement at 6 weeks post-CABG. Similarly, Cleary et al. (2015) reported that some participants took a cautious approach to engaging in exercise and strenuous activities at 12 weeks post-CABG. Novel findings from our study were that feeling cautious was described by participants consistently throughout the first 12 weeks, and that the cautious approach was driven by uncertainty and fear.

In addition, the findings of the current study relating to fear not only confirm but add to the findings from previous studies. Moore (1995) described how several female participants, who lived alone were not walking outside at three weeks post-discharge, because they were afraid that something would go wrong. Our study showed similar findings, in that during the first three weeks the majority of participants (both males and females) needed someone to accompany them when walking outside due to a fear of falling and/or of something going wrong. While Ali et al. (2017) found that ‘fear of aggravating their heart condition’ was a common barrier to physical activity, in the current study the main source of fear was
causing damage to the sternum (and occasionally the leg wound), with fear of damaging the heart and grafted blood vessels being reported far less often. This fear of damaging the sternum may have stemmed from the advised sternal precautions, which may have instilled a general belief in participants that physical activity can or will cause damage. Indeed, several participants described not engaging in upper limb activities during the first 6 weeks due to the fear of damaging the sternum. A novel finding of the current study was that this fear persisted well after the sternal precaution period had ended, with many participants describing fear of engaging in loaded upper limb activities even at week 12, six weeks after the advised sternal precautions period.

In the past decade, traditional sternal precautions have been criticised in the literature for being overly restrictive, and unnecessarily limiting physical activity engagement in the light of evidence to support early implementation of upper body activities and exercise. However, even less restrictive protocols, such as KYMITT guidelines still include a warning that doing certain movements under load could damage the healing sternum and as such may still create a fear of physical activity causing damage. Indeed, two studies, Holloway et al. (2020) and Katijahabe et al. (2018), both found that physical activity engagement did not increase with the implementation of less restrictive precautions. While this lack of difference may have been due to a ceiling effect in the measures used to assess physical functioning, the findings of the current study support the suggestion that a fear of physical activity causing damage may override any lessening of restrictions. Indeed, the study by Katijahabe et al. found that there was no significant difference in the levels of kinesiophobia between the traditional and less restrictive sternal precaution groups. In light of the findings from these studies and the current one, there may be a need to expand the advice around sternal precautions to reduce fear and encourage people to engage in upper limb activities with increased confidence. It is proposed that in future, when advising patients about sternal precautions, health professionals should place an emphasis on the following: the positive benefits of physical activity; reassurance that engaging in physical activity within recommended guidelines following CABG surgery is safe; provision of appropriate guidelines for reintroducing loaded upper limb activities and exercises; and provide alternative ways to perform upper limb activities in order to reduce sternal loading (such as performing activities slowly or keeping loads close to the body when lifting).
Uncertainty was another factor that made people cautious about engaging in physical activity in our cohort. Uncertainty regarding physical activity during the first six weeks following CABG surgery has been reported previously. Areas of uncertainty previously reported included: how to manage physical limitations to physical activity; where to ask for help; how fast to walk when exercising and when to start lifting. All of these areas of uncertainty were also expressed by participants in the current study cohort. In addition, some novel areas of uncertainty were identified in the current study that need to be addressed when supporting people to return to activity. They include how to reintroduce upper limb activities or exercise after the sternal precaution period has ended; what other types of exercises to perform apart from walking; when to return to work; how to progress exercise; and how to modify physical activity expectations when set back by the occurrence of medical complications. The findings from the current study also add to the knowledge from published studies by showing that the participants expressed more uncertainty at six and 12 weeks compared to during the first six weeks following surgery.

The presence of increased uncertainty after six weeks post operation suggests that this may be a good time to provide further support and guidance from health professionals. Evidence for the potential benefit of follow up support from health professionals in the current study was seen in the increase in confidence to engage in physical activity after receiving the “all clear” from the surgical team at around six weeks post-discharge. However, overall, support for engagement in physical activity from health professionals was minimal for most participants following discharge, mainly due to participants not having access to a supervised outpatient cardiac rehabilitation programme. The observation, in the current study, that only two of the 12 participants accessed support from health professionals by attending cardiac rehabilitation, is in line with global trends. The primary reason for non-attendance at cardiac rehabilitation in the current cohort was that for seven of the 12 participants there was no supervised cardiac rehabilitation programme available in their local town or within easy travelling distance. This highlights an inequity in that both service provision and access to follow up support were unavailable to those in the current cohort living outside of the main city. Such inequities could be addressed in the following ways: including more in-depth discussions around physical activity engagement during existing follow up visits with health professionals; utilising telehealth; and/or the provision of alternative funded referral options.
(such as private practice physiotherapists working in the community) for those unable to access hospital-based outpatient cardiac rehabilitation programmes.

An important finding from results of the current study was the increase in confidence and self-efficacy to engage in physical activity over time. Higher self-efficacy has previously been shown to be associated with increased physical activity, following CABG surgery.\(^{26}\) According to Bandura’s theory of self-efficacy, mastery experiences, vicarious experiences, verbal persuasion and positive emotional and physiological states are four sources of self-efficacy belief.\(^{198}\) Mastery experiences, or reports of engaging successfully in incrementally more physical activity with increasing confidence, was reported at all time points by most participants. In contrast, positive physiological feedback, vicarious experiences and verbal persuasion (by either spouses or health professionals), were described by only some of the study cohort. Designing interventions that facilitate these sources of self-efficacy may increase confidence to engage in physical activity following CABG surgery. Indeed it has previously been shown that vicarious experiences (provided through peer support) resulted in significantly increased self-efficacy for physical activity and self-reported physical activity engagement at weeks six and 12 post-CABG (p<0.01).\(^{150}\)

Another key facilitator of physical activity in the current study was the importance of support from spouses, family and/or friends, and the need for personal motivation, especially during the first few weeks following discharge. The importance of support from family and/or friends highlights the need for including social support planning when preparing people for discharge from hospital. However, the findings showed that spouses and family unnecessarily restricted participants engagement in physical activity at times. While such actions were no doubt undertaken with the best intentions, it highlights the importance of ensuring that family and friends are well informed about the safe resumption of physical activity and how to provide appropriate encouragement and support.

The role of personal motivation as a facilitator of physical activity was another important finding from the current study. According to Bandura’s Social Cognitive Theory,\(^{190}\) outcome expectations about the expected costs and benefits of behaviour and the personal goals that people set for themselves are two factors that are core determinants that mediate engagement.
in a health behaviour. Bandura also stated that “Motivation is enhanced by helping people to see how habit changes are in their self-interest and the broader goals they value highly.”

Indeed, participants in the current study described how their motivation to engage in physical activity was underpinned by positive beliefs about the importance and value of exercise to reach their personal health and life related goals. Including family or friends in discussions about physical activity engagement and encouraging the person to reflect on their own personal values and motivations to engage in physical activity are tools that could be used to further empower the person to engage in physical activity during the early recovery period post-CABG surgery.

While physical activity engagement got easier over time, none of the participants felt that they were back to their previous level of physical activity engagement at three months post-surgery. This observation supports the findings of Sjoland et al. (1997), who measured perceived physical function and quality of life in 2,121 participants at 3 months, and 1 and 2 years post-CABG surgery. These authors found that while the largest improvement in perceived physical function took place between pre-operative and 3 months post-surgery, there were still further small improvements at 1 and 2 years (p<0.05 for the improvement between 3 months and 2 years only). However, the findings from Sjoland et al., did not provide any insight into the reasons why perceived function was not fully restored within three months. In the current study, the main reasons for not being back to normal physical activity engagement were a perceived loss in strength and fitness (which resulted in increased dyspnoea on exertion), and remaining cautious about engaging in physically demanding activities, including heavy lifting.

Also, in the current study, participants’ concerns about the perceived loss of strength highlighted the absence of information regarding resistance exercise in their exercise guidelines, which instead focused primarily on aerobic exercise (walking). Based on these participants’ concerns, it would be helpful to add upper and lower limb resistance exercise to the recommendations currently provided. However, as described in the literature review (Chapter 2), while resistance exercise following median sternotomy has been shown to attenuate loss in lean muscle mass, there is a general lack of evidence for the safety of upper limb resistance exercise during the first three months following median sternotomy.
More certainty about the safety of such exercises following CABG surgery may also reduce the caution for engaging in loaded upper limb activities that the participants in the current study described.

4.5 Study strengths

A key strength of this study was the use of both qualitative and quantitative methods, which enabled the observation of the participants’ perceptions at the same time as objectively measuring their physical activity levels, self-efficacy and health-related quality of life. The collection of objective data as a supplemental method allowed us to identify the context of physical activity engagement in which the participants’ experiences were seated, as well as allowing use of triangulation to support and confirm several of the key factors influencing physical activity identified from the analysis of the participant interviews. Another strength of this study, which contributed to the quality of the data, was being able to observe the longitudinal pattern of themes by making observations over multiple time points. This allowed observation of an unfolding story in real-time rather than a single snapshot that relied on the participant’s memory.

While a sample size of 12 was at the lower end of the range of what was initially estimated sample size range, the depth and quality of responses gained during the interviews meant the research team was confident the data obtained were adequate to provide a meaningful and rich understanding of the phenomenon.

4.6 Study limitations

The main limitation was that while the study cohort included a range of ages and geographical locations, the sample was not representative of the NZ population in regard to sex, ethnicity and living situations. Importantly there was no representation from Māori, the indigenous people of Aotearoa New Zealand, in the study cohort. It is also unknown why some people who were eligible and were invited declined to participate. Therefore, there may be particular perspectives not represented by the study findings. For example, those who inherently dislike or do not value physical activity may not have wanted to participate. In
addition, all participants had their surgery at one hospital using one standard protocol for discharge preparation. Therefore, while many of the findings had similarities with the findings from studies in the literature, the results from our study may be limited in their generalisability to other people undergoing CABG both within New Zealand and globally.

4.7 Conclusion

The findings of this study have built on the findings from systematic review in the previous chapter, by providing more detailed insights into the physical, psychological and environmental factors that impact on physical activity engagement during the first 12 weeks following CABG surgery. In doing so we have also successfully addressed two aspects of the aMRC framework: identifying the problem (for example, impact of physical symptoms, presence of fear, uncertainty and feeling cautious) and determining the needs (for example, the need for self-motivation and the need for follow up support from health professionals). The findings have also given insights into strategies that could be included as part of a comprehensive programme that aims to facilitate physical activity engagement following CABG surgery.

The next chapter explores current practice for the ways NZ hospital services prepare and support people to engage in physical activity following CABG surgery. The study includes an exploration of how current practice addresses the barriers and promotes the facilitators for physical activity that were identified in the systematic review (Chapter 3) and the observational study described above.
CHAPTER 5 : PREPARATION AND SUPPORT FOR PEOPLE WHO HAVE UNDERGONE CABG SURGERY TO ENGAGE IN PHYSICAL ACTIVITY FOLLOWING DISCHARGE FROM HOSPITAL: A SURVEY OF CURRENT PRACTICE IN NEW ZEALAND

5.1 Prologue

The findings of the literature review described in Chapter 3 demonstrated that there was a range of physical, psychological and environmental barriers (and to a lesser extent facilitators) to physical activity during the first three months after people leave hospital following CABG surgery. However the amount and strength of evidence for many of the barriers and facilitators identified in the literature review was limited. A prospective observational study was therefore undertaken (Chapter 4), which provided greater insight into barriers and facilitators to physical activity engagement, including the relationship between these factors and how barriers and facilitators changed over time. Together these studies have provided insight into how health professionals might optimally prepare and support people to engage in physical activity during the first three months following discharge from hospital. It is largely unknown however, whether hospital services in NZ currently include such strategies in their health service delivery.

This chapter (Chapter 5) reports on the results of a survey completed by health professionals to determine current practice in NZ for the preparation and support for engagement in physical activity following discharge from hospital after CABG surgery. In the overall context of the thesis and intervention development, the current chapter fulfils two of the requirements of the aMRC framework for developing interventions: 1) examining current practice; and 2) problem identification.

5.2 Background and purpose

Prior to discharge from hospital, people who have undergone CABG surgery are advised about managing their health care and engaging in health promoting behaviours, such as physical activity, in order to facilitate their recovery. However, as identified in Chapter 4, because of the various physical and psychological challenges that people face (especially
during the first six weeks following discharge) physical activity engagement is generally perceived by these individuals as being difficult at first. This perceived difficulty is also reflected in physical activity levels, which decline immediately post-surgery followed by a gradual increase.\(^{24}\) Engagement in physical activity during the first 6-8 weeks is also limited by adherence to the sternal precautions, which are advised with the intention of reducing the risk of delayed union of the sternum. To optimise return to physical activity following CABG surgery, and to initiate engagement in regular exercise if previously physically inactive, people need to be advised how to safely progress their engagement in both exercise and activities of daily living.

As part of the education about engaging in physical activity after leaving hospital, it is important for health professionals to prepare people to face potential barriers, as well as provide opportunities to enhance facilitating factors. The findings from Chapters 3 and 4 identified specific examples of things to include when preparing people to engage in physical activity. These were: advice on strategies for managing physical symptoms such as fatigue and pain; incorporating resistance exercise into physical activity recommendations; and activating motivation for physical activity by facilitating people to reflect on their values and beliefs regarding physical activity. However, whether current clinical practice incorporates such strategies when preparing people to engage in physical activity is largely unknown.

Another potential strategy for facilitating physical activity engagement identified in Chapter 4 was the provision of follow up support. It was proposed that guidance, encouragement and reassurance from health professionals would be of value to help people overcome any fear and uncertainty, thereby enabling them to engage in physical activity with greater certainty and confidence. Indeed, in the study by Acar et al. (2017), lack of regular follow up by a health professional was one of only two independent predictors of non-adherence to recommended exercise (OR=2.95, 95% CI: 1.01-8.61, p<0.05) for people who had undergone coronary artery revascularisation (CABG or percutaneous coronary intervention) at least six months previously.\(^{189}\) However, as discussed in Chapter 1 (section 1.2.4), low attendance rates of outpatient cardiac rehabilitation programmes,\(^{42}\) the potential gap between hospital discharge and the commencement of outpatient cardiac rehabilitation,\(^{38}\) limited availability of home based cardiac rehabilitation programmes\(^{39}\) and the potential lack of input regarding physical activity from general practitioners all indicate that provision of follow up support may be limited following CABG surgery. In addition, to our knowledge, there is no evidence
in the literature that describes the optimal provision of follow up support specifically for physical activity engagement during the transition period following hospital discharge after cardiac surgery. Such knowledge is required to provide a clearer picture of the level of support that is currently available in the real-world setting.

Limitations in the provision follow up support mean most people who have undergone CABG surgery need to self-manage their recovery without support during the initial weeks and months after returning home. Health professionals can support people by equipping them with the required knowledge and with help to develop the skills required to self-manage. Indeed, SMS is recommended in many cardiac rehabilitation guidelines, including the most recent guidelines from the American Association of Cardiovascular and Pulmonary Rehabilitation and the European Association of Preventive Cardiology. Effective SMS involves working alongside the person to provide them with the necessary skills to make autonomous person-centred decisions, take action, access and utilise resources, problem solve and work towards their health and well-being goals in order to return to, and/or improve their functional capacity. Equipping the people who have had CABG surgery with such skills and support may prepare them to cope with potential barriers and enable them to engage in physical activity with more confidence and certainty during the initial weeks and months following hospital discharge.

Alongside SMS, the most recent cardiac rehabilitation guidelines include the need for behaviour change strategies to facilitate engagement in healthy lifestyle behaviours, including physical activity engagement. The health and quality of life benefits of physical activity for those following CABG surgery are well-established and were discussed in Chapter 2. However, adherence to physical activity recommendations post-CABG is low, with adherence rates reported in the literature ranging from 59% at 6 weeks, 22-40% at 3 months or 23% at 6 months post-operative. These findings indicate the potential need to include behaviour change strategies in the preparation and follow-up support in order to facilitate engagement in regular exercise following CABG surgery.

While incorporation of behaviour change strategies and SMS is recommended, whether such strategies are implemented in clinical practice when preparing and supporting people to engage in physical activity following CABG surgery (particularly outside of the supervised cardiac rehabilitation setting) is unknown. In a systematic review of psychosocial
interventions aimed to increase physical activity outside of the cardiac rehabilitation setting, we identified that self-management principles and behaviour change techniques were poorly utilised in the design of the interventions. Current practice needs to be further explored to determine whether self-management principles and behaviour change techniques are utilised when preparing and supporting people to engage in physical activity following CABG surgery outside the supervised cardiac rehabilitation setting.

The aim of this study was therefore to examine the current practice in hospitals in NZ to prepare and support adults to engage in physical activity following discharge from hospital after CABG surgery. It was envisaged that the findings of this study would help to determine if there is a need to develop guidelines for practice and/or specific interventions to facilitate engagement in physical activity following CABG surgery.

5.3 Methods

5.3.1 Ethics approval

The study was approved by the University of Otago Health Ethics Committee (Ethics approval number D19/349) in December 2019 (Appendix 13). Alongside ethical approval, consultation with Māori was undertaken through the Ngāi Tahu Research Consultation Committee, with approval and recommendations being received in October 2019 (Appendix 14). It was originally intended to include hospitals in Australia in the study sample. However a condition of ethical approval was that locality authorisation had to be sought and gained from each site before sending the questionnaire. Due to constraints around time and resources, the decision was made to limit the sample to survey only hospitals within NZ. Therefore, in accordance with the ethics requirements, locality authorisation to conduct the research project was sought from each identified hospital site in NZ prior to sending the study invitation and questionnaire.
5.3.2 Study design

The study was a cross-sectional survey. This study design was chosen as it enabled the measurement, observation and/or comparison of many variables of interest pertaining to preparing and supporting people to engage in physical activity at multiple sites.

5.3.3 Survey instrument

A written questionnaire was designed to explore current practice for the preparation and support that is provided to patients who have undergone CABG surgery to facilitate their engagement in physical activity following discharge from hospital. The questionnaire was divided into the following sections:

1) Professional information
2) Clinical setting
3) Services provided to prepare patients who have undergone CABG surgery to engage in physical activity following discharge from hospital
4) Sternal precautions when engaging in physical activity following CABG surgery
5) Advice regarding engagement in aerobic and resistance exercise following CABG surgery
6) Advice regarding engagement in activities of daily living following CABG surgery
7) Services provided to support patients who have undergone CABG surgery to engage in physical activity following discharge from hospital.

Items relating to the utilisation of BCTs and self-management principles were also incorporated into the questionnaire. The BCTs included in the current survey were derived from the study by Abraham and Michie (2008). This study developed a theory-linked taxonomy of 26 generally applicable behaviour change techniques to promoting physical activity behaviour. Questions in the current survey relating to self-management principles were derived from core self-management principles as described by Lorig and Holman (2003): problem solving; decision making; taking action; partnership with health professionals and resource utilisation.
As motivation and self-efficacy were also identified as important facilitators of physical activity engagement (Chapter 4), questions regarding the exploration of intrinsic motivation and facilitation of self-efficacy were included as well. The questions relating to motivation were framed to reflect the exploration of the more autonomous forms of motivation as described by Deci and Ryan. Questions relating to physical activity engagement self-efficacy were framed using reference to the four sources of self-efficacy as described by Bandura’s theory of self-efficacy.

5.3.4 Pilot testing of the questionnaire

Prior to distribution of the survey to hospitals across NZ, a group of potential participants to pilot the questions was identified through the local cardiorespiratory physiotherapy interest group. The physiotherapists (n=5) who were either working at the time or had worked within the previous six months on the cardiothoracic surgical wards at Dunedin Public Hospital or Mercy Hospital, Dunedin were invited to participate. Note: this group excluded the most senior physiotherapist, who may have been eligible to participate in the main study. A study invitation (Appendix 15), information sheet (Appendix 16) and consent form (Appendix 17) were posted to the identified physiotherapists. Consenting participants were then posted a copy of the survey questionnaire along with an additional short questionnaire asking about the face validity of the survey (Appendix 18). These questions related to how easy the survey was to use and understand; how long it took to complete; and if participants thought that it captured all relevant information. Based on the feedback from the pilot group, amendments to the survey were made prior to the invitation to participate being sent to health professionals in relevant hospitals across NZ. These amendments included minor wording changes and reordering of the sections to improve the clarity and flow of the questionnaire. No major revisions to the content or nature of the questions were required. A final copy of the questionnaire is found in Appendix 19. The survey responses from the pilot group were not included in the analysis of the main study.

5.3.5 Hospital identification

A complete list of all public and private hospital sites across NZ that provided cardiac surgery services in 2019 was compiled from information obtained from the Australian and
New Zealand Society of Cardiac and Thoracic Surgeons and an internet search of all hospitals with cardiothoracic surgical facilities throughout NZ. Where necessary phone calls to hospital administrators/physiotherapy clinicians were also undertaken to confirm that cardiac surgery services were provided. As previously described, locality authorisation procedures were undertaken at each site to gain permission before sending the questionnaire to each identified hospital.

5.3.6 Participants

Inclusion criteria
The person invited to participate in the study and complete the questionnaire on behalf of their hospital service was “the most experienced health professional at each hospital that had primary responsibility for preparing inpatients, who had undergone CABG surgery, to engage in physical activity following their discharge from hospital”.

Exclusion criteria
Hospitals without current inpatient cardiac surgery services for adults. Of note, participants completing the survey were not excluded based on number of years’ experience in the role.

Recruitment
Because of the expertise that physiotherapists have in the assessment and facilitation of people’s mobility and physical activity following cardiac surgery, it was anticipated that physiotherapists would comprise the majority of the health professionals who met the inclusion criteria. Thus, in the majority of cases a study invitation (Appendix 20), information sheet (Appendix 21), consent form (Appendix 22) and a copy of the questionnaire were addressed to the ‘the physiotherapy team working on the cardiothoracic surgical ward’. The study invitation requested that the physiotherapist who had the most experience working with patients following CABG surgery on the cardiothoracic surgical ward be the one to participate in the study. However, in order to ensure that the person completing the questionnaire was indeed the person best positioned to answer the survey, if physiotherapists at a particular hospital were not the health professionals primarily responsible for the preparation of patients as described, they were requested to pass on the study invitation to the health professional who was. If there were similarly experienced health
professionals in the hospital setting who could complete the questionnaire, the decision about who will complete this questionnaire was at the discretion of the health service delivery team.

In some instances, while not specifically requested, the health professional that the hospital approved to complete the survey on behalf of their service was nominated as a result of the locality authorisation process. In such instances the study information was sent directly to the nominated health professional. These individuals received the same instructions as others i.e. if they were not the most senior health professional primarily responsible for preparing people for physical activity engagement prior to discharge, they were requested to pass the information on to the appropriate person.

The questionnaire included a unique site identification number. This allowed the doctoral candidate to track the responses to the survey and to identify non-responders in order to send reminder notices. A replica of the contents in the package was sent to those who had not responded within one month after the date on which the initial invitation was sent. In accordance with the study protocol if there was no response after another two months, a third and final pack would be sent. Any site with no response after three invitations was deemed as a nil response to the study invitation.

5.3.7 Data collection

*Questionnaire:* Consenting participants were requested to complete the questionnaire on behalf of their hospital services. The questionnaire instructions requested that participants consult with their colleagues as required if they were unsure about how to respond to any of the questionnaire items.

*Written resources provided to patients:* Participants were also invited to provide a copy of the written information and/or a link to online resources regarding engagement in physical activity that their hospital service provided to patients post CABG surgery and prior to their discharge from hospital. The patient information and/or resources were gathered to supplement the data collected in the questionnaire to cross check 1) the type and amount of physical activity that was advised for patients to engage in following discharge; and 2) the
self-management and behaviour change strategies utilised in the preparation of patients to engage in physical activity following discharge from hospital.

5.3.8 Data analysis

All closed questions of nominal/categorical form and open responses from the completed questionnaires were transposed by the doctoral candidate into a Microsoft Excel (2018, version 16.16.12) spreadsheet. The transposed data were subsequently checked by the primary research supervisor (MS) for accuracy.

Simple descriptive statistics such as frequency distributions were used to summarise findings from the categorical data. Where there were missing responses in the questionnaires only the completed responses were analysed, using a reduced ‘n’ value for that question.

Open responses regarding suggested amount, type, intensity and timing of exercises; the type and timing of activities of daily living; and the self-management strategies utilised gathered in the questionnaires and/or from the patient information handouts, were grouped and analysed for specific examples as well as for similarities and differences amongst the information provided by different hospitals.

5.4 Results

5.4.1 Responses

In total, 11 hospitals were identified that provided cardiac surgery services in NZ in 2019. Locality approval to send the questionnaire was received from nine out of 11 hospitals (5/5 public hospitals and 4/6 private hospitals). Completed surveys were received from all nine hospitals, giving a survey response rate of 100%, and providing an overall representation rate of 82% of all hospitals in NZ that provide cardiac surgery services. The respondents who completed the survey on behalf of their hospital service comprised seven physiotherapists and two nurses.
In regard to the average number of adults who underwent CABG surgery at their site per week, four respondents reported there were five or fewer, and five respondents reported six to ten people/week who had CABG surgery. The reported typical post-operative length of hospital stay at all sites was 5-7 days (5 days (n=3); 5-7 days (n=3); 5-6 days (n=2); 6 days (n=1)).

5.4.2 Preparing people who have undergone CABG surgery to engage in physical activity following hospital discharge

All respondents reported that prior to hospital discharge they prepared patients who had had CABG surgery to engage in physical activity post discharge either ‘all’ (n=8) or ‘most of the time’ (n=1). The majority of respondents (n=6) reported that physiotherapists were the health professionals primarily responsible for preparing people to engage in physical activity. One respondent reported that nurses were primarily responsible for preparing ‘routine’ patients and physiotherapists for ‘non-routine’ patients. One respondent reported that nurses, physiotherapists and occupational therapists were jointly responsible and one respondent reported that the nurse and doctor were jointly responsible for preparing patients to engage in physical activity following discharge.

Information about engaging in physical activity was primarily provided by written handouts (‘always’ n=8; ‘most of the time’ n=1) and face to face conversations (‘always’ n=7; ‘most of the time’ n=2). Two respondents reported on the use of pre-recorded videos to deliver information about physical activity ‘most of the time’, one respondent reported using the Heart Foundation NZ website but ‘rarely’, and one respondent reported ‘always’ referring people to use an activity tracker App.

The majority of respondents (n=6) reported that typically information about engaging in physical activity following discharge was first provided pre-operatively (n=6). All respondents reported that post-operatively, prior to a patient’s discharge, a face to face conversation was held to prepare the patient to engage in physical activity after leaving hospital. The reported typical duration of such conversations varied: 6-10 minutes (n=2); 11-20 minutes (n=4); 21-30 minutes (n=1); and 30-40 minutes (n=2). During such a
conversation, respondents reported that they requested a support person for the patient be present: ‘always’ (n=2), ‘most of the time’ (n=4), ‘sometimes’ (n=2) or ‘rarely’ (n=2).

5.4.3 Type of information provided to patients

Table 5.1 shows the frequency of the provision of various types of information about physical activity. All respondents reported ‘always’ providing information about warning signs and symptoms during physical activity, however only seven sites included such information in their patient handouts. The majority of respondents reported providing information about the short and long term benefits of physical activity following CABG surgery. The type and frequency of short and long term benefits included in the patient handouts is reported in Figures 5.1 and 5.2. Six sites reported informing people about the consequences of both engaging in and not engaging in physical activity all (n=5) or most (n=1) of the time, however only two sites included examples of consequences of not engaging in physical activity in their patient information handouts. According to the respondents, information about common barriers to physical activity engagement following CABG surgery was the item least frequently provided. Five sites included information about barriers to physical activity in their patient handouts. These barriers included: weather (n=3), pain (n=2), fatigue (n=2), joint problems (n=1) and steep roads/paths (n=1).

Table 5.1 Provision of information about physical activity following CABG surgery

<table>
<thead>
<tr>
<th>Information provided, n</th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short term health benefits of PA†</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Long term health benefits of PA</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Consequences of both engaging and not engaging in PA†</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Common barriers to PA following CABG surgery</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Warming signs and symptoms during PA</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

PA = physical activity; CABG = coronary artery bypass graft surgery; † = 1 missing response
Figure 5.1 Frequency of information provided regarding short-term benefits of physical activity following CABG surgery.

Figure 5.2 Frequency of information provided regarding long-term benefits of physical activity following CABG surgery.
5.4.4 Recommended sternal precautions during physical activity

Eight out of nine respondents reported they ‘always’ provided conventional sternal precautions (weight limits to loaded upper limb activities for a set period of time no matter how the activity or movement was performed). The remaining respondent reported they ‘sometimes’ advised on sternal precautions and recommended that activities be guided by pain rather than by weight restrictions. Five respondents reported always using “Keep Your Move in the Tube” guidelines\textsuperscript{117} when providing information about sternal precautions. All five sites that always used the guideline also provided conventional sternal precaution advice (Table 5.2).
### Table 5.2 Sternal precautions advised to patients to undertake during physical activity

<table>
<thead>
<tr>
<th>Variable, Frequency</th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
<th>Advised time period (frequency)</th>
<th>Information provided/weight restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sternal support when coughing or sneezing</strong></td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>&lt;4 wks n=2 4-6 wks n=4 7-8 wks n=0 9-12 wks n=2 Pain limiting n=2*</td>
<td>NA</td>
</tr>
<tr>
<td><strong>No unilateral arm movements</strong></td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>&lt; 4 wks n=0 4-6 wks n=3 7-8 wks n=1 9-12 wks n=3</td>
<td>Avoid push, pull or lift with one arm &gt; 2kg (n=2) Avoid unilateral arm movement &gt;90º shoulder flexion or for sustained periods (n=1) No reaching across the body causing shoulders to twist (n=1)</td>
</tr>
<tr>
<td><strong>Conventional sternal precautions</strong></td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>&lt;4 wks n=0 4-6 wks n=4 7-8 wks n=0 9-12 wks n=4 Pain limiting n=1</td>
<td>Up to 2 kg n=3 2-5 kg n = 4 6-10 kg n=1 Pain limiting only (no weight restriction) n=1</td>
</tr>
<tr>
<td><strong>‘Keep Your Move in the Tube’ sternal precautions</strong></td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>&lt;4 wks n=0 4-6 wks n=3 7-8 wks n=0 9-12 wks n=2**</td>
<td>Weight limits when ‘moving outside of the tube’: Up to 2 kg n=2 2-5 kg n=1 6-10 kg n=1 Missing response n=1**</td>
</tr>
<tr>
<td><strong>Instructions for reintroducing upper limb activities after sternal precautions are lifted</strong></td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>Booklet provides examples of upper limb activities (n=5) ‘If activity causes pain then stop’ (n=4) ‘then wait one week before attempting again’ (n=1) ‘Gradually increase weight you can lift’ (n=1)</td>
</tr>
</tbody>
</table>

Wks = weeks; NA = not applicable; kg = kilograms. *One site reported both 4-6 weeks or until no longer painful. **responses for only n=5 sites that always utilised ‘Keep Your Move in the Tube’.
5.4.5 Advice provided to patients regarding engagement in exercise following CABG surgery

Respondents stated that their hospital service provided advice regarding engagement in aerobic exercise following CABG ‘always’ (n=7) or ‘most of the time’ (n=2). Examination of patient handouts revealed that walking was the predominant form of aerobic exercise recommended for patients to engage in following discharge from hospital (n=9). Five hospitals also advised patients that cycling, and four hospitals advised that swimming were suitable forms of aerobic exercise, however only one of the hospitals provided specific guidance around the time to commence and how to progress such a programme. All but one respondent stated that they ‘always’ provide information regarding the intensity of exercise that people should engage in, with one responding that they only did this ‘sometimes’.

According to the information provided in the patient handouts, seven hospitals advised patients to monitor their exercise intensity by using both the talk test and the modified Borg scale (0 – 10 scale). One hospital only stated ‘at a pace that’s comfortable for you’ and one hospital did not include information about how to self monitor intensity in their patient handout. All respondents stated that they ‘always’ advised patients regarding the amount of aerobic exercise to engage in following their discharge from hospital. Advice regarding the amount of exercise to engage in was predominantly through the provision of a walking schedule that gradually increased in either time (n=7), distance (n=1) or time and distance (n=1). A summary of the walking schedules advised at each of the hospital sites (including the frequency, duration/distance and intensity) is reported in table 5.3. Two sites provided general guidelines regarding progressing walking as an exercise and seven sites provided a walking schedule/prescription. However the patient handouts for all seven of these sites also included statements that informed people to progress gradually and/or to progress at their own pace.

The majority of sites advised on upper limb and spinal range of movement exercises ‘always’ or ‘most of the time’. Upper limb and spinal range of movement exercises included in patient handout materials are reported in Table 5.4. In contrast, the majority of sites ‘never’ or ‘rarely’ advised or recommended patients to undertake lower limb range of movement or resistance exercises, upper limb resistance exercises, or spinal resistance exercises (Table 5.4).
Table 5.3 Summary of the schedules or guidelines provided by hospital services for walking for exercise

<table>
<thead>
<tr>
<th>Site number</th>
<th>Frequency</th>
<th>Distance/time</th>
<th>Intensity</th>
</tr>
</thead>
</table>
| 1 and 6     | 1 x/day   | Day 1-5: 10 mins  
              Day 6-8: 15 mins  
              Day 9-11: 20 mins  
              Day 12 onwards: 25 mins  
              Increase total walk time by 5 mins every 3 days; aim to be walking for 40 mins by 3-3.5 wks post d/c | RPE 2-3/10 until can walk for 15-20 mins, then RPE "middle of range"  
Talk test |
| 2           | 2-3 x/day initially  
Not stated when to progress to 1 x/day | Start 200-300 m  
Gradually increase aiming for 1 km within 2 weeks | RPE scale provided but recommended RPE not stated.  
“Gradually increase intensity. Once can walk 15-20 minutes continuously increase intensity by walking a bit faster or adding a gentle slope.” |
| 3           | Wk 1-4: 2 x/day  
Wk 5:1-2 x/day  
Wk 6 onwards: 1 x/day | Wk 1: 10 mins  
Wk 2: Up to 15  
Wk 3: Up to 20  
Wk 4: Up to 25 mins  
Wk 5: Up to 30 mins  
Wks 6-8: 30 mins daily  
“Progress at your own pace” | “Pace comfortable to you” |
| 4           | Can split into 2-3 x/day | Gradually increase until can walk 15-20 min on flat then gradually incorporate slopes and hills. Build up to 30 mins | Starting RPE 3/10; talk test  
Increase speed or distance, but not both at same time |
| 5           | Frequency not stated apart from saying “walk little and often” | Wk 1: 5 mins  
Wk 2: 7 mins  
Wk 3: 11 mins  
Wk 4: 18 mins  
Wk 5: 23 mins  
Wk 6: 30 mins  
All sessions start and finish with 2-3 mins additional to the recommended times above.  
“Everybody is different and it is important that you set your own pace” | Wk 1-6: RPE 3-5/10  
Wk 6 onwards: 6-8/10 for short bursts  
Talk test |
<table>
<thead>
<tr>
<th>7</th>
<th>Frequency not stated</th>
<th>As for site 5</th>
<th>Wk 1-6: RPE 3-5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wk 6 onwards: 5+/10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Talk test</td>
</tr>
<tr>
<td>8</td>
<td>Wk 1-3: 2 x/day</td>
<td>Minimum time:</td>
<td>RPE 3-6/10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wk 1: 5-10 mins</td>
<td>Talk test</td>
</tr>
<tr>
<td></td>
<td>Wk 4-5: 1-2 x/day</td>
<td>Wk 2: 10-15 mins</td>
<td>Pace recommendations:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wk 3: 15-20 mins</td>
<td>Wk 1: Stroll</td>
</tr>
<tr>
<td></td>
<td>Wk 6 onwards:</td>
<td>Wk 4: 20-25 mins</td>
<td>Wk 2: Comfortable</td>
</tr>
<tr>
<td></td>
<td>1 x/day</td>
<td>Wk 5: 25-30 mins</td>
<td>Wk 3: Steady</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wk 6: 30 - 40+ mins</td>
<td>Wk 4: Stride out</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Progress or ease off as you feel necessary; ask yourself ‘do I feel that I have recovered 30 mins after exercise?’”</td>
<td>Wk 5: Brisk</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wk 6: Stride out/brisk</td>
</tr>
<tr>
<td>9</td>
<td>Wk 1-2: 2 x/day</td>
<td>Wk 1: 5-10 mins/500-600 m</td>
<td>RPE 3-4/10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wk 2: 10 mins/1.5 - 2 km</td>
<td>Talk test</td>
</tr>
<tr>
<td></td>
<td>Wk 3 onwards:</td>
<td>Wk 3: 20 mins/ 2 km</td>
<td>“Start on flat, as feel stronger and more confident gradually introduce gentle slopes”</td>
</tr>
<tr>
<td></td>
<td>1 x/day</td>
<td>Wk 4 :25 mins</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wk 5: 30 mins/ 2.5 km</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Handout states that this is a guide only</td>
<td></td>
</tr>
</tbody>
</table>

Mins = minutes; RPE = rate of perceived exertion; d/c = discharge; wk = week; wks = weeks; m = metres; km = kilometre
Table 5.4 Summary of guidelines provided by hospital services for recommended ranges of movement and resistance exercise

<table>
<thead>
<tr>
<th>Variable, frequency</th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
<th>Exercises in patient handouts (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinal range of movement exercises</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>Cervical rotation (n=5) Thoracic rotation (n=5) Thoracic side flexion (n=3) Cervical flexion/extension (n=3) Cervical side flexion (n=2)</td>
</tr>
<tr>
<td>Upper limb range of movement exercises</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>Shoulder shrugs/elevation (n=5) Bilateral shoulder flexion (n=5) Unilateral shoulder flexion (n=2) Elbow circles, short lever (n=3) Horizontal adduction (n=1) Shoulder abduction (n=) Shoulder rotation (n=1)</td>
</tr>
<tr>
<td>Lower limb range of movement exercises</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>None found in patient handouts</td>
</tr>
<tr>
<td>Spinal strength exercises</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>7</td>
<td>Pelvic tilts (after week 6) (n=2)</td>
</tr>
<tr>
<td>Upper limb resistance exercises</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>None found in patient handouts</td>
</tr>
<tr>
<td>Lower limb resistance exercises</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>None found in patient handouts</td>
</tr>
</tbody>
</table>
5.4.6 Advice provided to patients regarding activities of daily living

All respondents reported ‘always’ in regard to providing information on engagement in ADLs when preparing patients to engage in physical activity following their discharge from hospital; 8/9 sites provided standardised advice with set examples of time frames for the various household activities that could be reintroduced ‘all’ (n=7) or ‘most’ (n=1) of the time. There was a range of time periods that the different sites used to advise people about returning to activities (Table 5.5). Six sites included information in their written handouts regarding when various recreational activities that could be commenced. Three respondents reported they ‘always’ provided individualised advice regarding progression of ADLs, and five provided individualised advice ‘sometimes’. All respondents reported providing information on how to self-monitor symptoms during activities ‘all’ (n=8) or ‘most’ (n=1) of the time. Examination of written handouts revealed that five sites provided information on using the level of pain to determine engagement in ADLs (for example, ‘if it hurts stop’); two sites advised using breathlessness, and one site advised using both pain and breathlessness to guide ADL engagement. In regard to managing fatigue when determining physical activity engagement, eight sites reported providing advice regarding the need for increased periods of rest during the first few weeks ‘all’ (n=7) or ‘most of the time’ (n=1). Examination of the patient handouts revealed that three sites included written information about needing more rest during the first week following discharge. One site included information that warned against too much rest or activity initially.

5.4.7 Health professionals responsible for determining physical activity recommendations

Physiotherapists were the health professionals most frequently reported by respondents to be involved in determining sternal precautions as well as recommendations for exercise and ADLs. Several respondents reported however that sternal precautions and physical activity recommendations are determined collaboratively by the interprofessional team (Table 5.6).
Table 5.5 Timeframes suggested by hospitals for patients to return to activities of daily living following CABG surgery

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time frame when activity can be commenced, frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal cares (showering, dressing)</td>
<td>Week 1 (n=9)</td>
</tr>
<tr>
<td>Washing dishes</td>
<td>Week 1 (n=5)</td>
</tr>
<tr>
<td></td>
<td>Week 2 (n=4)</td>
</tr>
<tr>
<td>Light meal preparation</td>
<td>Week 1 (n=4)</td>
</tr>
<tr>
<td></td>
<td>Week 2 (n=4)</td>
</tr>
<tr>
<td>Dusting</td>
<td>Week 1 (n=2)</td>
</tr>
<tr>
<td></td>
<td>Week 2 (n=4)</td>
</tr>
<tr>
<td></td>
<td>Week 3 (n=2)</td>
</tr>
<tr>
<td>Hang out washing</td>
<td>Week 4 (n=3)</td>
</tr>
<tr>
<td></td>
<td>Week 6 (n=6)</td>
</tr>
<tr>
<td>Light gardening (light weeding/planting, hosing)</td>
<td>Week 2 (n=1)</td>
</tr>
<tr>
<td></td>
<td>Week 3 (n=3)</td>
</tr>
<tr>
<td></td>
<td>Week 4 (n=3)</td>
</tr>
<tr>
<td></td>
<td>Week 6 (n=2)</td>
</tr>
<tr>
<td>Vacuuming/mopping</td>
<td>Week 4 (n=1)</td>
</tr>
<tr>
<td></td>
<td>Week 6 (n=4)</td>
</tr>
<tr>
<td></td>
<td>Week 8 (n=2)</td>
</tr>
<tr>
<td>Heavy gardening (digging)</td>
<td>Week 6 (n=1; light digging)</td>
</tr>
<tr>
<td></td>
<td>Week 12 (n=3)</td>
</tr>
<tr>
<td>Wash car</td>
<td>Week 4 (n=3)</td>
</tr>
<tr>
<td></td>
<td>Week 6 (n=3)</td>
</tr>
<tr>
<td>Mow lawns</td>
<td>Week 6 (n=1)</td>
</tr>
<tr>
<td></td>
<td>Week 8 (n=1)</td>
</tr>
<tr>
<td></td>
<td>Week 12 (n=3)</td>
</tr>
</tbody>
</table>
Table 5.6 Health professionals responsible for determining physical activity recommendations

<table>
<thead>
<tr>
<th></th>
<th>Physiotherapist</th>
<th>Nurse</th>
<th>Surgeon</th>
<th>Interprofessional team</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sternal precautions</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Nurse, physiotherapist and surgeon (n=1)</td>
<td></td>
<td></td>
<td>Physiotherapist and surgeon (n=1)</td>
<td>Not stated (n=1)</td>
</tr>
<tr>
<td>Exercise</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Physiotherapist and surgeon (n=2)</td>
<td></td>
<td></td>
<td>Nurse and physiotherapist (n=1)</td>
<td></td>
</tr>
<tr>
<td>Activities of daily living</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>1 (nurse, physio and surgeon)</td>
<td>2</td>
</tr>
</tbody>
</table>

5.4.8 Utilisation of behaviour change techniques to facilitate engagement in physical activity

Table 5.7 shows the frequency of various behaviour change techniques either utilised by health professionals, or that the health professionals encouraged patients to utilise, in order to facilitate engagement in physical activity following discharge from hospital.

5.4.9 Facilitation of self-management of physical activity engagement

Table 5.8 shows the frequency of use by the hospital services of a range of strategies to prompt or facilitate self-management for physical activity engagement following discharge from hospital. ‘Ensuring patients know how to access resources’ was the most frequently utilised strategy (‘always’, n=6; ‘mostly’, n=3). On examination of the patient handouts, seven sites included contact details of health professionals for patients to access support from if required post discharge. Five respondents reported using shared decision making and prompting the person to come up with a plan for physical activity ‘all’ (n=3) or ‘most’ (n=2)
Table 5.7 Frequency of use of the 26 common behaviour change techniques to promote physical activity engagement as identified by Abraham and Michie (2008).145

<table>
<thead>
<tr>
<th>Behaviour change technique, frequency</th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set graded tasks for exercise and activities of daily living</td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Provide instructions about how to engage in PA</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Provide information about health-behaviour link</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Prompt self-monitoring of PA:</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>- Activity diary for 10 days (n=1), 12 days (n=3), two weeks (n=1) or six weeks (n=1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prompt the person to practise engagement in PA in preparation for discharge*</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Model or demonstrate the activities or exercises you want the person to engage in</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Teach the person strategies and techniques to reduce their stress and anxiety</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Consequences of both engaging and not engaging in PA*</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Prompt specific goal setting for PA:</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>- Create their own goals for PA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Plan for how, when, where or with whom they will engage in PA</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Use time management planning to fit PA into their everyday routine</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Prompt identification of barriers to PA engagement and plan ways to overcome them</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Provide opportunities for social comparisons such as videos or stories of other persons engaging in PA</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Prompt</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---</td>
<td>----</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Prompt person to state their intention to engage in PA</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Provide information about what others think about engagement in PA following CABG surgery</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Provide rewards (e.g. praise or material rewards) linked to performance of PA**</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Provide feedback on performance**</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Provide general encouragement to engage in PA (following discharge)**</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Identify situations that may cause potential relapses or failures relating to PA and develop a plan to avoid and/or manage these situations</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Prompt person to independently review and/or reconsider their PA engagement goals</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Motivational interviewing to facilitate engagement in PA</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Plan social support to engage in PA e.g. activity/walking “buddy”</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Indicate how the person may be an example or role model for others in regard to engagement in PA</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Facilitate the person to agree on a written, signed behaviour contract for PA engagement</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Teach person to use prompts or cues to remind them to engage in PA*</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Prompt self-instruction and/or self-encouragement to support engagement in PA*</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

PA = physical activity; *=1 missing response; ** n=3 responses in these items due to only three hospitals providing follow up support for physical activity engagement.
of the time. There were only two examples found in the patient handouts of prompting people
to develop a plan for physical activity: identify an appropriate route for walking (n=1) and
plan to include a companion for walking outdoors until confidence increased (n=1). Four
respondents reported prompting patients to problem solve by identifying and finding ways to
overcome potential barriers to physical activity ‘all’ (n=2) or ‘most’ (n=2) of the time.
Information that encouraged problem solving to overcome barriers included in the patient
handouts were: having a contingency plan for bad weather (n=1); having a plan to avoid steep
streets (n=1); and having someone to drive the person to a flat area for walking if required
(n=1).

Respondents also reported on facilitating partnerships with health professionals to encourage
physical activity engagement by referral to a supervised cardiac rehabilitation programme
‘all’ (n=7) or ‘most’ (n=1) of the time. All respondents from the public hospital sites reported
referring patients to either a cardiac rehabilitation programme held at their own facility, or a
cardiac rehabilitation programme provided by another service provider either within their
own DHB or another DHB (depending on the living locality of the patient). None of the
private hospitals operated their own cardiac rehabilitation programmes, but were able to refer
any patients to a cardiac rehabilitation programme operating within the public health system.
Facilitating physical activity engagement through partnerships with health professionals
outside of the cardiac rehabilitation setting was less frequently reported with the majority of
sites either ‘never’ (n=3) or ‘rarely’ (n=2) providing such follow up support. Reasons
provided by respondents for not providing follow up support were: such a service is not
funded (n=3); no community or outpatient services provided by the hospital (n=2); patients
referred to community or outpatient services provided by another hospital (n=2); no
perceived need to support patients following discharge from hospital (n=1); and only people
having difficulty with physical activity are provided with support following discharge (n=2).
Only three sites indicated that they provided follow up support for physical activity
engagement outside of the cardiac rehabilitation setting ‘all’ (n=2) or ‘most of the time’
(n=1). Follow up support for physical activity engagement was provided by these sites in the
following ways:

Site 7: Follow up phone call or online videoconference call by nurse at week 1 and
physiotherapist at week 3 post discharge;
Site 8: Phone call from cardiac nurse specialist on day 1, day 10 and 3-4 weeks post
discharge;
Site 9: Phone call from ward nurse at week 1 post discharge.

One site reported that patients were ‘never’ provided with follow up support for physical activity engagement by their hospital service, however they did indicate that patients were followed up either face to face or via a phone call by a cardiac nurse educator at week 6 post discharge, but it was unclear whether physical activity engagement was addressed during the follow up session or not.

Table 5.8 Frequency of strategies utilised to facilitate self-management of physical activity

<table>
<thead>
<tr>
<th>Variable: questionnaire item, frequency</th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem solving:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify barriers to engagement in PA and plan ways to overcome them</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Take action:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prompt person to create a plan for how, when, where or with whom they will engage in PA</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Decision making:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilise shared/collaborative decision making about PA with the person</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Partnerships with health professionals:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Referral to cardiac rehabilitation</td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Provide follow up support specifically for PA engagement outside of cardiac rehabilitation setting</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Resource utilisation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensure that the person knows where to access resources and support regarding PA engagement following discharge</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

PA = physical activity
5.4.10 Exploration of sources of intrinsic motivation for engagement in physical activity

Few sites (n=2) reported frequently exploring factors that contributed to intrinsic motivation to engage in physical activity, such as people’s beliefs, values and knowledge relating to physical activity engagement or their previous experience with physical activity engagement (Table 5.9).

5.4.11 Facilitating self-efficacy for engagement in physical activity

Facilitating mastery by prompting people to recognise their own successes in physical activity and facilitating physiological cues by prompting people to reflect on how they felt during and after physical activity were utilised ‘all’ or ‘most of the time’ by the majority of sites. Provision of vicarious experiences (through role modeling from peers) or verbal persuasion from health professionals outside of the supervised cardiac rehabilitation setting were less frequently utilised (Table 5.9).

5.5 Discussion

Chapter 5 comprises the outcomes of the first comparison of NZ services and practices for preparing and supporting people who have had CABG surgery to engage in physical activity following their discharge from hospital. The findings resulted from a collation of the material provided by nine of the 11 NZ hospitals providing CABG surgery for adults. According to Babbie (2004) a response of over 70% is considered very good. This indicates that the response rate to this survey was strong and therefore it is likely that the results are a reasonable reflection of the practice of hospital services for CABG in NZ. The results once published [deidentified], will allow NZ hospitals to benchmark their service provision with responses from other centres in NZ, and against findings relating to engagement in physical activity following CABG surgery as described in the literature.

5.5.1 Preparing people to engage in physical activity following discharge

Recognition by the hospital services of the importance of preparing people who have had CABG surgery to engage in physical activity is reflected in the finding that all nine hospital
Table 5.9 Exploration and/or facilitation of various contributors to intrinsic motivation and self-efficacy for physical activity

<table>
<thead>
<tr>
<th>Variable: questionnaire item, frequency</th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exploration of motivation for physical activity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explore the person’s knowledge and beliefs about PA</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Explore the person’s values about why PA is important to them</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Explore the person’s previous experience with PA engagement</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Facilitation of self-efficacy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mastery experiences: Prompt patient to reflect and recognising own successes in PA</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Physiological feedback: Prompt patient to reflect on how they feel (physically and/or emotionally) during or after PA</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vicarious experiences: Provide opportunities for social comparisons with peers through stories or videos</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Verbal persuasion: Provide general encouragement for PA from health professionals through follow up support**</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

PA = physical activity. ** n=3 responses due to only three hospitals providing follow up support for PA by physiotherapists or nurses outside of the cardiac rehabilitation setting.
services prepared people for discharge and self-management by providing written documentation and having a face-to-face conversation about physical activity ‘all’ or ‘most of the time’. This recognition by the health professionals of the importance of needing to prepare people is likely due to the known benefits of physical activity following CABG surgery. Indeed all sites provided information about the short and long-term benefits of physical activity in their written handouts. In contrast, fewer hospital sites provided information about the potential barriers to physical activity following CABG surgery or information about how patients should manage these potential barriers. This indicates that barriers to physical activity may be less well recognised when considering the need to prepare people to engage in physical activity following CABG surgery. Previous studies have revealed a range of physical, psychosocial and environmental barriers to physical activity engagement during the first few months following CABG surgery, including pain, fatigue, fear, uncertainty, feeling cautious, lack of support, lack of motivation, and unfavourable weather conditions. In Chapter 3 we also identified these same barriers in the first three months following hospital discharge. The importance of addressing barriers is recognised by most recent European Association of Preventive Cardiology cardiac rehabilitation guidelines, which include addressing barriers to physical activity in their recommendations. In summary, informing people about the potential barriers that they may encounter and including the opportunity for a health professional to collaboratively plan and discuss with the person about how they might manage these potential barriers may be of benefit when preparing people to engage in physical activity following their discharge from hospital.

5.5.2 Recommendations for sternal precautions during physical activity

The advice to patients provided by most sites included the use of conventional sternal precautions, where a weight restriction is imposed for a specific time period on all activities that involve use of the upper limbs. There was however a wide variation in both the weight limits and the time periods for which these restrictions were advised (Table 5.2). Variations in the advice provided about conventional sternal precautions has also been reported by others, most recently in 2015. The current findings suggest that in clinical practice there remains an absence of universally accepted best practice recommendations or guidelines and/or varying interpretations of the literature regarding sternal precautions. A key
difference in the findings of the current study and previous surveys is the use of pain as the recommended limiting factor to upper limb activities. In the current study, only one out of nine sites stated that they recommend using ‘pain’ to limit loaded activities rather than a specific load. This finding is similar to that of Tuyl et al. (2012) which reported that only three out of 30 responding hospitals in Australia utilised pain limitations when advising sternal precautions, with the majority of hospitals utilising load limitations to upper limb activities.\footnote{114} However, in the more recent survey by Balachandran et al. (2014), which also explored recommended sternal precautions in Australia, a greater proportion of cardiac rehabilitation settings utilised ‘pain’ as the limiting factor during loaded upper limb activities during the first six weeks (29/77; 38%), rather than implementing a particular load restriction.\footnote{46} While the findings from Tuyl et al. (2012) and Balachandran et al. (2014) indicate a possible trend towards less restrictive sternal precautions in Australia, such a move towards removing load restrictions in NZ is not apparent in the findings of the current study.

A novel finding in the current study was the apparent combining of some elements of less restrictive sternal precautions with conventional sternal precautions. Just over half (five out of nine) of the respondents reported advising patients to follow the KYMITT guideline.\footnote{117} However, all five of these sites also included conventional sternal restrictions (limiting upper limb loading for a certain time period no matter how the movement was performed) in their advice to patients. It was not possible from the responses to the survey questions to determine how each of these approaches to sternal precautions were combined when advising patients, since conventional precautions and KYMITT are contradictory in regard to the type of upper limb activities that they allow people to engage in. It may be that instead of utilising the KYMITT principles to allow more freedom to engage in loaded upper limb activities, advising patients to use both approaches together may in fact add additional restrictions by only allowing load limited upper limb activities to be performed “inside of the tube”.

5.5.3 Recommendations for engaging in exercise following CABG surgery

In the current study, information regarding engagement in aerobic exercise following CABG surgery was provided at all sites. Walking was the predominant mode of aerobic exercise recommended (Table 5.3). This is likely due to walking being an activity that most people can perform. As well, walking requires minimal equipment and does not present a barrier to
exercise in the same way that ‘lack of transport’ and ‘financial cost’ do. In addition, exercise programmes based around walking have been shown to be both safe and efficacious during the first month following CABG surgery.  

However, walking outdoors is often associated with other barriers such as ‘unfavourable weather conditions’, ‘walkability of the local environment’ and ‘musculoskeletal pain’. In the current study only four sites addressed such barriers to walking outdoors by providing alternative exercise or solutions in their written information handouts. For example, one site suggested that people who live on a steep street should initially have someone drive them to a flat road or path to take a walk. Another site suggested if the person had joint problems that limit walking, non weight bearing exercise such as cycling should have been undertaken instead. In their written information four sites mentioned avoiding weather extremes when exercising, and one site included an additional suggestion about exercising indoors (exercycle) or finding a dry space to walk if it is wet, cold or frosty outdoors.

Surgical wound pain, fatigue, fear and decreased confidence are additional barriers that people may face during the early recovery period following CABG surgery. However, few hospital sites acknowledged these potential barriers and the majority did not provide strategies for managing such barriers in their information handouts. For example, only two of the nine hospital sites addressed managing pain and fatigue as part of their advice around engaging in walking or other exercise following CABG surgery.

In summary it may be beneficial for health professionals to go beyond just advising what type and quantity of aerobic exercise to perform and to include information that addresses potential barriers to engaging in such exercise. Prompting people to develop a plan to address these barriers by including it in the written information and/or during the face to face conversation may be beneficial to optimally prepare people to engage in physical activity following their discharge from hospital. Such planning will also facilitating building the person’s skill and self-efficacy in problem-solving as a self-management skill prior to discharge.

In the current study, all hospital sites that provided information regarding exercise intensity advised people to engage in light or moderate intensities. This advice is consistent with the
findings of a systematic review by Doyle et al. (2019) that explored the safety and efficacy of exercise following CABG surgery.79 Of the studies in the review that investigated exercise interventions during the first three months post surgery, most utilised a moderate intensity in their exercise prescription. In the current study, eight out of nine sites provided a recommended set schedule for walking frequency and duration. As for exercise intensity, there was reasonable consistency regarding walking frequency, with the majority of the sites advising a walking frequency of two times per day initially and gradually reducing to once per day as exercise duration increased. This advice is consistent with the systematic review of exercise interventions by Doyle et al. (2019), in which twice daily exercise was utilised in the majority of exercise interventions during the first month following CABG surgery.79 However in the current study there was a wide variation in the recommended initial walking time or distance and rate of progression of walking duration recommended. For example, one site advised people to walk up to 20 minutes by Day 11, whereas others suggested aiming to reach this target by week 3 or 4 (Table 4.3). Duration of exercise in the interventions the systematic review by Doyle et al. (2019) also varied widely, ranging between 3 and 60 minutes duration.79 Few studies have previously observed exercise duration achieved by people recovering from CABG surgery outside of structured exercise interventions. Results of one such observational study by Schulz et al. (2005) found that during the first six weeks following CABG surgery, males and females engaged in exercise on average 1-2 times/day, reducing to on average 5 days/week by three months. Exercise duration at various timepoints were: week two 11.2 and 14.9 minutes, week four 19.4 and 27.9 minutes, week six 25.2 and 20.9 minutes and three months 37 and 29.8 minutes for females and males respectively.104 Examination of the recommended walking frequencies and durations from the current study revealed that sites 3, 8 and 9 include frequencies and progressions similar to those described by Schulz et al. (2005).104 However while these recommendations may be what the “average” person can engage in, given that there is a wide range of ages and physical abilities likely to be represented by those undergoing CABG surgery, it may be helpful in future to include principles of initiation and progression alongside any set walking schedules so that people have the knowledge of how to progress at their own pace if required.

Studies have previously shown that there is a loss in lean muscle mass and strength following CABG surgery.88 In addition, low muscle strength90 and frailty91 have been associated with poorer outcomes following cardiac surgery. In addition, a systematic review by Pengelly et al. (2019) found there was a trend toward greater improvements in physical and functional
recovery following median sternotomy when resistance training was combined with aerobic training compared to aerobic training alone. Several guidelines recommend that resistance exercise be included in cardiac rehabilitation programmes. However in the current study, relatively little information was provided by any site to people regarding engagement in resistance exercise following CABG surgery. The authors of the aforementioned systematic review suggested that the prioritisation of aerobic training over resistance training is preferred in order to avoid contradicting advice around conventional sternal precautions and because there is a lack of evidence in the literature regarding the safety of upper limb resistance exercise during the first 12 weeks following median sternotomy. Indeed, the systematic review by Pengelly et al. (2019) reported that no study identified in their review that implemented upper limb resistance exercises included the assessment of sternal instability as a potential adverse event. The cardiac rehabilitation guidelines (2020) of the European Association of Preventive Cardiology suggest 30-70% of 1-RM for the upper body and 40-80% of 1-RM for the lower body when prescribing resistance exercises. The guidelines also state that such upper limb exercise can be commenced when the chest is stable, and provide a suggested time frame of around six weeks post-operative. Similarly, the American College of Sports Medicine guidelines (2018) stipulate that while low-load upper limb activities should be encouraged, individuals with median sternotomy should aim to advance and progress through a pain-free range of movement before focusing on regaining or improving muscle strength and endurance. In the current study described in this chapter, range of movement exercises for the upper limb, cervical spine and thoracic spine were provided by all hospital sites in their written handouts. This is in line with the ACSM’s recommendations. However, there was no information provided by any of the participating sites regarding progression onto resistance exercise once full pain-free range of motion has been achieved or once sternal stability had been achieved. It is therefore suggested that the provision of information regarding the safe commencement of resistance exercise be included in patient information handouts, particularly for those who are unable to attend supervised cardiac rehabilitation programmes, and therefore unable to access such advice.

5.5.4 Return to activities of daily living

While most sites provided recommendations about the time when it is safe to resume a range of daily activities, there was a wide variation between the hospital sites in regard to the
number of weeks post-CABG before activities could be resumed. For example, the recommended time to return to vacuuming or mopping type activities ranged from week 4 to week 8. Previous studies by Banner et al. (2012) and King et al. (1988) each reported that most participants felt comfortable to resume domestic activities by six weeks post-CABG.\(^{179}\) and Moore et al. (1995) reported that 70% of female participants were able to sweep and vacuum by three weeks post-CABG (even though none of the male participants reported doing these activities by the same time).\(^{188}\) This suggests that the earlier time of four weeks recommended by some sites in the current study is likely to be feasible and safe, particularly if people are advised to keep their arms “in the tube” when first commencing such activities.

While the majority of sites that provided recommendations regarding timeframe to return to gardening activities recommended waiting 12 weeks before returning to digging, there was less consistency regarding recommendations for returning to light gardening (ranging from week 2 to week 6) and mowing the lawns (ranging from week 6 to week 12). Wilson-Barnett et al. (1981) had reported in their study published 40 years ago that the majority of participants were engaging in heavy daily tasks such as gardening by eight weeks post-CABG, however it was not clear whether gardening activities in this study referred to light work such as hosing and light weeding or heavy work such as digging.\(^{25}\) In 2008, Adams et al. investigated the safety of performing six 20-minute simulated lawn mowing sessions in 13 participants 3-7 weeks following uncomplicated CABG surgery. Upper limb forces during the simulation ranged between 36-46 lb (16-21 kg) – much higher than the 2-10 kg limits frequently utilised in clinical practice. The authors found that there were no adverse effects in regard to either arrhythmias or sternal complications.\(^{111}\) While these findings need to be confirmed with a larger study sample, they suggest that, for patients who have an uncomplicated recovery following CABG surgery, advising a return to heavy activities, such as lawnmowing at the earlier time period of six weeks may be safe. Further research is required in order to determine the optimal timeframes for safe return to a range of activities of daily living following CABG surgery and to provide recommendations that are more consistent.
International guidelines and specific NZ guidelines for cardiac rehabilitation and secondary prevention guidelines\textsuperscript{33, 35, 36, 233} take account of the fact that services should be person-centred and aim to motivate and empower people to self-manage and engage in health related behaviours such as physical activity. However, there have been relatively few studies undertaken that have specifically explored the effect of person-centred interventions, including behaviour change and/or self-management interventions, aimed to increase physical activity engagement during the early recovery period following CABG surgery.\textsuperscript{45} The findings of the current study provide a benchmark regarding the implementation of such strategies in current clinical practice in NZ tertiary hospital settings when preparing people who have had CABG surgery to engage in physical activity following their discharge from hospital.

The implementation of self-management strategies has previously been shown to increase physical activity in people with a variety of health conditions. For example, King et al. (2010) found that in a cohort of 463 adults with T2DM, self-efficacy, problem solving and support was independently associated with exercise adherence (measured by the Community Healthy Activities Model Program for Seniors self-report questionnaire), explaining 19\% of the variance.\textsuperscript{234} Sniehotta (2006) found that action planning in combination with coping planning (problem solving) resulted in significantly more exercise per week (mean 178.9 minutes) compared to usual care (mean 95.4 minutes) at two months post discharge from cardiac rehabilitation (p<0.01).\textsuperscript{235} In the current study however, the facilitation of self-management skills was not universally addressed across all hospital sites. For example, only four out of nine sites prompted people to identify barriers to activity and plan ways to overcome them ‘all’ or ‘most of the time’. Prompting people to take action through the development of a physical activity action plan and collaborative decision making were reported to be used ‘always’ or ‘mostly’ by five out of 9 sites.

Providing opportunities for partnership with health professionals following hospital discharge was primarily achieved in the current study by the provision of a referral to an outpatient cardiac rehabilitation programme. However, it is widely acknowledged in the literature that uptake and attendance at cardiac rehabilitation is limited\textsuperscript{42, 236} due to a range of factors.
including distance and lack of transportation. In the current study only two hospitals provided follow up support for physical activity engagement outside of the traditional cardiac rehabilitation setting ‘all of the time’. These findings highlight a lack of consistency for the provision of follow up support by hospital services across NZ. While the majority of sites provided contact details for the health professionals in the written information handouts, the onus for accessing this support lay with the patient and therefore depended on the persons’s ability and confidence to access this support. The lack of follow up support highlights the importance of optimising the time spent preparing people to self-manage their engagement in physical activity prior to their discharge from hospital, as well as a gap in service provision once the person leaves hospital.

However, it should be acknowledged that in the current study the surveys were completed by staff working at the hospital sites that provided the cardiac surgery, and thus may not reflect any provision of follow up support potentially provided by health professionals at regional hospitals/health centres and/or from other district health boards that some persons may have access to after discharge following surgery. Therefore the findings of the current study relating to the provision of follow up support can only be seen to apply to people living in the five district health board catchment areas within which the nine hospital services represented by the survey responses reside. Regardless, the finding that follow up support outside of supervised cardiac rehabilitation is not provided by the majority of hospital services that provide cardiac surgery in NZ suggests that such follow up support is not part of the standard pathway of care post-CABG surgery. Current inequity of access to health services by various groups, such as those living rurally, along with the increasing availability of technology to deliver health services remotely, provide both the incentive and opportunity to provide alternative ways of accessing health services and enabling partnership with health professionals. Such alternatives would improve equitable access and reduce gaps in service provision and may lead to improved health through increased physical activity participation for those unable to access or who choose not to access traditional cardiac rehabilitation programmes.
5.5.6 Utilisation of behaviour change techniques

Alongside self-management support, the incorporation of BCTs to empower people to engage in health-related behaviours such as physical activity is another key component of comprehensive cardiac rehabilitation. As previously described in Chapter 2 (section 2.11), the systematic review previously undertaken by our research team, explored the use of BCTs in studies that have aimed to increase physical activity and/or physical function during the first 12 weeks post-CABG surgery. Examination of the included studies in the review revealed that the most effective strategies for facilitating physical activity engagement (at least in the literature to date) appear to be: 1) providing information via structured pre-discharge education, with face to face, verbal explanations appearing to add to the effectiveness, 2) interventions that address coping with barriers to physical activity and 3) individualised, person-centred peer support post-operatively. Of these, only providing pre-discharge information (delivered via face to face and written handouts) was utilised by all hospital sites in the current study ‘all’ or ‘most of the time’. Indeed, the top three most commonly utilised BCTs in the current study all were focused toward providing information or instructions. In contrast, as previously discussed, facilitating people to problem solve in order to address barriers were only used ‘all’ or ‘most of the time’ by four out of nine sites in the current study.

As stated above, the final element previously shown to be effective is providing individualised, person-centred peer support post-discharge. As previously discussed, follow up support for physical activity (outside of supervised outpatient cardiac rehabilitation) was provided by only two sites ‘all of the time’. When support was provided it was by health professionals, not peers. The only specific interaction with peers according to our survey was opportunities for social comparison with their peers through stories or videos, which was provided by three sites ‘all’ or ‘most of the time’. Regarding individualisation of the preparation and support provided, there appeared to be a greater utilisation of structured, non-individualised delivery of care compared to person-centred, individualised approaches. For example, providing information, which was provided most commonly in the current survey, is a relatively structured and passive strategy that may contain little individualisation or active involvement of the patient. Indeed of the eight most commonly utilised BCTs in the current study, six of these were relatively didactic techniques requiring little active
participation from the individual. In addition, the only BCTs that required individualisation and/or active participation by the individual that were ‘always’ utilised by the majority of sites were: self-monitoring of physical activity (using an activity diary) and practising engagement in physical activity prior to discharge. Therefore there appears to be potential for increasing the scope of clinical practice to utilise strategies that are more individualised, person-centred and that empower the patient to take an active role in their recovery planning and monitoring.

5.5.7 Facilitating motivation

In Chapter 4 the importance of self-motivation to engage in physical activity following discharge from hospital was identified. These findings suggested that strategies to explore and enhance motivation for physical activity may be of benefit for people following CABG surgery. Several items in the current survey looked at how frequently the exploration the person’s motivation for exercise was included as part of standard practice at the hospital sites across NZ. These items included exploring patients’ knowledge, values and beliefs about physical activity, as well as their previous engagement in physical activity. Exploration of such factors could be utilised to determine an individual’s intrinsic motivation (that is, an inherent enjoyment of physical activity) or introjected or identified regulation (that is, the knowledge or belief that physical activity will help them to achieve their health and recovery goals).\(^1\) For those lacking intrinsic motivation, facilitating people to reflect on the reasons that physical activity can benefit their health and well-being may increase physical activity engagement. Indeed, a cross-sectional survey of 3,133 participants by Alkerwi et al. (2015) found that those who viewed physical activity as important were significantly more likely to meet the WHO recommended physical activity guidelines than those who viewed physical activity as less important (\(p<0.0001; \ OR=0.57; \ 95\% \ CI \ 0.46-0.71 \ and \ OR=0.39; \ 95\% \ CI: \ 0.30-0.52, \ respectively\).\(^2\) However, in the current study, neither exploration of factors that contribute to motivation for physical activity (such as values and beliefs about physical activity) or motivational interviewing (a person-centred technique designed to find internal motivation to elicit behaviour change)\(^3\) were commonly undertaken by the majority of sites. A recent pilot study found motivational interviewing with older adults following CABG surgery to be acceptable and feasible, and the authors concluded that motivational interviewing may be a promising strategy for supporting physical activity engagement in this
Indeed, motivational interviewing has been shown to improve physical activity levels in other populations, including post myocardial infarction, and in long term cancer survivors. Therefore, implementation of such interventions prior to, or following, discharge may be beneficial to mobilise the person’s motivation to engage in physical activity. However, given that the majority of respondents in the current survey indicated that the typical time spent having conversation with inpatients when preparing them to engage in physical activity was 20 minutes or less, lack of time may be a barrier in clinical practice for implementing such strategies.

5.5.8 Facilitating self-efficacy

In Chapter 4 self-efficacy was also discussed in relation to the way that people lacked confidence initially. While their self-efficacy increased over time the participants remained cautious about engaging in physical activity throughout the first three months. These findings suggest that strengthening self-efficacy may help to counter barriers such as lack of confidence and feeling cautious. Four items in the survey explored utilisation of strategies that could be used to facilitate the four sources of self-efficacy as described by Bandura. Facilitating reflection on mastery experiences and physiological feedback were used ‘always’ or ‘most of the time’ by the majority of hospital sites. The survey was not designed in a way that enabled information to be gathered regarding how such reflections were facilitated, although it may have been through the use of activity diaries, which were also used by the majority of sites ‘all’ or ‘most of the time’. In contrast, verbal persuasion and vicarious experiences were reported to be used by only two and three sites respectively ‘all’ or ‘most of the time’. In regard to verbal persuasion, a limitation with this survey item was that the question only asked about verbal persuasion by health professionals, and did not explore whether whānau or friends were advised about the importance of providing encouragement. Given that the majority of sites ‘always’ request that a support person be present during the ‘discharge talk’, it may be that such advice is provided at that time. Despite these limitations, the findings suggest that there may be scope for increasing the use of strategies that facilitate the four sources of self-efficacy in clinical practice, particularly in regard to verbal persuasion and vicarious experiences, when preparing and supporting people for physical activity engagement post-discharge.
5.5.9 Strengths of the study

While the overall number of responses was small, a strength of the current study was the high response rate, which included representation of all public hospitals in NZ that provide cardiac surgery services and four of the six private hospitals. In addition, while authors of several previous studies had investigated clinical practice regarding the implementation of sternal precautions, the current study is the first survey of clinical practice that describes how health professionals prepare people to engage in a wider range of physical activity than just upper limb activities.

5.5.10 Limitations of the study

While the survey responses represent a response rate of 82% from the hospital sites that provide cardiac surgery services in NZ, the services provided by satellite health service providers outside of the main centres were not included in the sampling frame for this study. Therefore the findings regarding the provision of follow up support post discharge may not be wholly reflective of practice across regional NZ. Also, the results for each hospital service were dependent on one person’s answers. While participants were encouraged to ask their colleagues if there was some doubt about a particular area, it is possible that some of the participants’ responses may not be truely representative of their hospital’s services, for example, if they were not familiar with an area of practice included in the questionnaire. In addition, the questionnaire specifically asked about the current practice in relation to patients who had an uncomplicated pathway to recovery after CABG surgery. Thus the findings of this survey are not generalisable to those who have complications subsequent to CABG surgery that may require additional support from health professionals e.g. a referral to community physiotherapy services for assistance with mobility.

Another limitation is that while this survey gathered information about how hospital services prepare and support people to engage in physical activity, it did not focus on why, that is the context in which such preparation and support is provided. Having a greater insight into the context is required to better understand the potential barriers that health services may face when changing or expanding clinical practice. Such understand is necessary when designing
interventions to ensure that the intervention can be implemented in the real world setting. In addition, the survey did not gather any information about the effectiveness of any of the strategies that were utilised by hospital services. Information about the effectiveness (or perceived effectiveness) of the various strategies may have provided insight regarding which strategies are valued as important and useful by clinicians.

5.6 Conclusion

This chapter reported on the findings of a survey examining the current practice in NZ for preparation and support for people who have undergone CABG surgery to engage in physical activity following hospital discharge. In regard to the aMRC framework, Chapter 5 has addressed two elements: 1) examine current practice and context (although as previously discussed the survey design meant there was limited ability to examine context in detail); and 2) problem identification. Novel findings from this study relating to the latter element included:

- The identification of inconsistencies between hospitals in information provided to patients about resumption of activities of daily living and exercise;
- Potential gaps in the preparation and support of patients, including: 1) addressing barriers to physical activity; 2) information about resistance exercise; 3) facilitating patient motivation and self-efficacy for physical activity; 4) lack of follow up support outside the supervised cardiac rehabilitation setting; 5) facilitating self-management skills; and 6) incorporation of BCTs that allow for more individualised care and facilitate the patient to have more active involvement in their recovery planning.
- The combination of conventional sternal precautions with the less restrictive KYMITT guideline when advising patients about upper limb activity engagement.

The inconsistencies, gaps and opportunities identified in this chapter provide evidence for the need for guidelines for clinical practice and/or interventions to optimise the preparation and support of people who have had CABG surgery to engage in physical activity following hospital discharge. The next chapter describes the development of such an intervention.
6.1 Prologue

The overall purpose of the final study (Chapter 6) was to develop a programme that aimed to facilitate physical activity engagement during the first 12 weeks following CABG surgery. It was proposed that the programme would consist of written resources (for example, information, people’s stories and tools for reflecting on progress) and a framework for the provision of support (for example, from health professionals, whānau, or others who have had CABG surgery). The findings described in Chapters 2 – 5 contributed to the development of the programme by addressing four of the six elements of the aMRC framework for developing interventions: problem identification, systematically identify the evidence, determine the needs and examine current practice and context. Contributions to these aMRC elements were summarised in the conclusions of each chapter. Some gaps in knowledge, however remain for two of these elements. Firstly, the survey on current practice described in Chapter 5 was not designed to explore the clinical context such as the challenges that clinicians face to prepare and support people to engage in physical activity. Thus a key aim of the study described in Chapter 6 was to further examine current practice to identify challenges to service delivery to determine the capacity available in the clinical setting for implementing the potential programme. This information is important as it will help to ensure that the programme is able to be implemented in the real-world clinical context. The second knowledge gap to be addressed in Chapter 6 was to identify health professionals’ perceptions for the need for change as that had not been established in the observational study (Chapter 4) which only focused on the perspectives of patients.

To develop the programme, as well as addressing these knowledge gaps, the two final elements of the aMRC framework need to be addressed: identifying theory and process and modelling. The theory selected to inform the programme development, and the method selected for process and modelling of the intervention design are described in section 6.2.
6.2 Introduction

6.2.1 Identifying theory

The principles of self-management and person/whānau centred care were identified as key theoretical principles to underpin the programme development. Both person and whānau centred care are core principles of physiotherapy practice and are endorsed by the Physiotherapy Board of New Zealand and Physiotherapy New Zealand. Two behaviour theories were also identified as being potentially relevant to facilitating physical activity engagement following CABG surgery and were selected to inform the programme development. These were the Self-Determination Theory (SDT) as described by Deci and Ryan and Bandura’s self-efficacy theory.

Three key facilitating factors for physical activity engagement: self-motivation, self-efficacy and support, were identified in Chapter 3. Two of these factors (self-efficacy and support) have similarities to two of the three fundamental psychological needs that, according to the SDT, support one’s attempt to master or engage in a new situation: the need for competence and relatedness. Deci and Ryan (2002) defined these needs as follows:

- Competence refers to feeling effective in one’s ongoing interactions with the social environment and experiencing opportunities to exercise and express one’s capacities. The need for competence leads people to seek challenges that are optimal for their capacities.
- Relatedness refers to feeling connected to others, to caring for and being cared for by those others, to having a sense of belongingness both with other individuals and with one’s community.

The third fundamental psychological need according to Deci and Ryan (2002) is autonomy, which they define as:

- Being the perceived origin or source of one’s own behaviour. Autonomy concerns acting from interest and integrated values.

Deci and Ryan went on to describe how autonomy is often confused with independence (that is, not relying on external sources or influence). The SDT view however considers antagonism between autonomy and dependence to be unnecessary, and that a person can enact behaviours that have been requested or advised, provided that the behaviours are...
endorsed or valued by the person. Indeed, the need for support expressed by participants in the study in Chapter 4 showed that partnership with health professionals, rather than independence, was the approach preferred by many participants during the initial months following hospital discharge. Deci and Ryan describe how health professionals can support autonomy by using non-controlling or autonomy supportive language, for example using positive feedback to affirm competence, and allowing people to choose their own outcome goals and how they want to get there, rather than telling them what they should or should not do. Therefore, another key reason for selecting the SDT was its apparent alignment with the principle of self-management support where individuals and their whānau work in partnership with health professionals (thus upholding the value of relatedness), while maintaining person/whānau centred care (whereby the autonomy of the individual is valued).

The final reason for selecting the SDT was that sources of motivation are a fundamental element of this theory. According to the SDT, the more fully a regulation (or the value underlying it) is internalised, the more it will be the basis for self-determining behaviour. Or, in the context of the current study, the more that someone personally agrees that physical activity is either inherently enjoyable or that it will benefit their health and well-being, the more likely they will engage in physical activity. To expand on this concept, the SDT describes motivation, as depicted in figure 6.1 overleaf, as a continuum, ranging from ‘amotivation’, (where there is a lack of intention to act); to ‘extrinsic motivation’ - ranging from ‘external motivation’ (being motivated to obtain a reward or avoid punishment); to ‘integrated regulation’ (where the benefit of a behaviour is congruent with personally endorsed values and goals); and finally ‘intrinsic motivation’ (where a behaviour is performed because the person finds it inherently enjoyable). In the observational study (Chapter 4), participants described their underlying sources of motivation to be either: 1) they had always enjoyed engaging in physical activity and was already a regular habit prior to surgery, or 2) they recognised and valued the benefits that physical activity provided to their health and recovery related goals. In the context of SDT, these sources of motivation would align with intrinsic regulation and identified regulation (where the benefit of a behaviour is identified as being congruent with personally endorsed goals or values) respectively. A systematic review by Teixeira et al. (2012) which examined the relationship between key SDT constructs and physical activity behavioural outcomes found that more autonomous sources of motivation were consistently and significantly related with higher MVPA levels compared to less autonomous forms of motivation. In addition, while intrinsic motivation
was more predictive of long-term exercise adherence, identified regulation more strongly predicted initial/short term physical activity engagement compared to intrinsic motivation, however the difference between identified regulation and intrinsic motivation were not significant. Therefore, the facilitation of identified regulation (by prompting people to reflect on the benefits of physical activity and how physical activity can help them to reach their recovery goals) will be included in the programme. Such facilitation may be particularly helpful for those who do not inherently find physical activity enjoyable and therefore are less intrinsically motivated to engage in physical activity.

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<th>Type of Motivation</th>
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<th>Quality of Behaviour</th>
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<td>Extrinsic motivation</td>
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<td>Intrinsic motivation</td>
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Figure 6.1 The self-determination theory continuum of motivation. Adapted from Deci and Ryan (1982). Figure 1.1, pg 16.

The other theory selected to inform the programme development was the self-efficacy theory, a central component of Bandura’s Social Cognitive Theory. As previously stated, self-efficacy was identified as a potential facilitator of physical activity in the observational study (Chapter 4). According to Bandura, there are four sources of self-efficacy: mastery experiences, positive emotional and physiological states, vicarious experiences and verbal persuasion. All these sources were described by the study cohort in Chapter 4. However, some were described more frequently than others. For example, increasing feelings of
mastery and confidence to engage in physical activity was described at each successive
timepoint by nearly all participants. In contrast, reflecting on positive emotional and/or
physiological states was reported only on several occasions. Therefore such reflections may
be an underutilised tool to build on self-efficacy for physical activity. Bandura also describes
the way self-efficacy controls how much effort a person invests and how persistent a person
is when dealing with obstacles and adverse experiences. Indeed, self-efficacy has been
shown to mediate the relationship between motivation and physical activity in people with
stable heart failure. This may mean that while motivation is an important facilitator for
physical activity during the early recovery period following CABG surgery, self-efficacy
may be necessary for people to initiate and maintain a sustained effort to engage in physical
activity, especially in the face of physical and psychological barriers. Therefore, in the
development of the programme, the inclusion of strategies that facilitate each of the four
sources of self-efficacy were prioritised.

6.2.2 Modelling process and outcomes

Modelling process and outcomes requires a logical approach to selecting components to
include in the programme. The authors of the aMRC framework have acknowledged that
there is no uniform way to do this. Hardemann et al. (2005) suggested that including
stakeholders (recipients and providers) may increase the usefulness and applicability of the
intervention in the clinical setting. Therefore, in the process of prioritising, selecting and
refining the programme design, it was decided to consult both with people who had
previously had CABG surgery as well as the health professionals responsible for their care
during the first 12 weeks following surgery.

Secondly, to ensure a robust and reasoned process for the programme design (including
reducing the risk of researcher bias in the design process) the ‘Behaviour Change Wheel’
(BCW) guide for designing interventions, (Figure 6.2), developed by Michie et al. (2011) was
implemented. The BCW method was developed to allow non-specialists in human
behaviour to design interventions that change behaviour. The authors of the BCW also
acknowledged its potential utility within the wider MRC framework. The BCW provides a
systematic and theoretically guided process for the types of interventions that would be
expected to be effective, given a particular behaviour in a specific population and context. In
brief, this process involves the following: defining the problem in behavioural terms; identifying target behaviours or conditions that could bring about the desired outcome; identifying what needs to change for the target behaviour or condition to occur; identifying theory-informed practical applications to facilitate these changes; and identifying potential modes for delivering these practical applications.

Figure 6.2 The Behaviour Change Wheel reproduced with permission.\textsuperscript{139} Green = sources of behaviour; Red = intervention functions; Grey = policy categories.

The BCW core model of behaviour is known as “COM-B” (figure 6.3) – which stands for ‘capability’, ‘opportunity’, ‘motivation’ and ‘behaviour.’ The model acknowledges that behaviour requires an interaction between all these components. The overall aim of the thesis was to create a psychosocial programme to equip people with the required knowledge, skills and support to progressively engage in physical activity during the first three months following CABG surgery. The various barriers and facilitators identified in Chapters 3 and 4 of this thesis led to the recognition of the importance of having the psychological capability.
(including having the knowledge and skills required to make decisions about activity engagement), as well as social opportunity (including support from family/whānau and health professionals) in order to engage in physical activity. In addition, the findings of Chapter 4 highlighted the importance of motivation, especially in order to overcome physical barriers such as pain and fatigue. In addition, there are similarities with the two behaviour theories selected to inform the programme development and the BCW. For example ‘capability’ has relevance to the SDT concept of ‘competence’, as well as two sources of self-efficacy, ‘mastery experiences’ and ‘positive emotional and physiological states’. ‘Opportunity’ (in particular social opportunity) has relevance to the SDT concept of ‘relatedness’, and the sources of self-efficacy ‘verbal persuasion’ and ‘vicarious experiences’. Finally ‘motivation’ is related to the sources of motivation as described by the SDT. Thus the BCW appeared to be a relevant and appropriate method to guide the selections for programme components that equip people with the required knowledge, skills and support that will enable them to attain the capability, opportunity and motivation to engage in physical activity.

A description of how person-centered care, behaviour change techniques and self-management work together in autonomy supportive interventions that aim to improve health outcomes was provided in Chapter 2, section 2.9. Figure 6.3 outlines how these concepts work together along with the COM-B model in order to facilitate self-management for engagement in physical activity in the current programme.

Figure 6.3 Relationship between person centered care, behaviour change, COM-B and self-management for physical activity following coronary artery bypass graft surgery
The BCW for designing interventions is an eight-step process. The first four steps are around understanding the behaviour. Steps 1, 2 and 3 were able to be determined from the findings in Chapters 1 to 4 and are described as follows:

Step 1. Define the problem in behavioural terms
Through exploration of the literature (Chapters 1, 2 and 3) and our own investigation (Chapter 4 observational study), we identified that engaging in physical activity following CABG surgery was hard, especially during the first three – six weeks of recovery. A range of physical, psychosocial and environmental factors contributed. Importantly, due to feeling fearful and uncertain, people had a cautious approach to physical activity engagement during this time. Additionally, there was an evident need for support and self-motivation during the early recovery period. Therefore, techniques and/or strategies designed to provide support, facilitate motivation and reduce fear and uncertainty to enable to engagement in physical activity with increased confidence are needed.

Steps 2 and 3. Select and specify the target behaviour.
The selected target behaviour was the graded return to both daily activities and engagement in exercise during the first 12 weeks following CABG surgery. In recognition of individual differences in physical capability, healing and recovery experiences (such as the impact of pain and fatigue), and personal activity goals, we determined not to define the amount of physical activity to be engaged in at any particular time point. Specific target behaviours for an individual were instead identified and these included: 1) initial short bouts of activity several times/day interposed with rest periods, followed by a gradual increase in the duration of activity with a concomitant reduction in the frequency of bouts, (ideally maintain at least once/day if possible) alongside a gradual reduction in sedentary time; 2) a gradual and timely return to daily activities and activities of importance (taking into account time for healing and physical capability); and 3) initiation of regular exercise habits (ideally meeting recommended physical activity levels by week 12, or optimal levels of regular exercise engagement depending on the person’s physical capability and/or comorbidities).

Step 4: Identify what needs to change.
The final step focusing on understanding the behaviour is identifying what needs to change. The aim of this step was to identify the sources of behaviour that would facilitate a person to
engage in physical activity following CABG surgery. While this could potentially be determined utilising the findings from the observational study in Chapter 3, we decided instead to determine these sources of behaviour in a new study sample for three reasons. Firstly, the Theoretical Domains Framework (TDF)\textsuperscript{245} was selected to map the sources of behaviour in this study. The TDF is a framework established by synthesising key behaviour change theories that were developed by psychologists and researchers.\textsuperscript{246} The TDF has 14 domains,\textsuperscript{245} which fit under the broader sources of behaviour in the COM-B model (Figure 6.3). Michie et al., the authors of the BCW, suggest using the TDF domains when identifying what needs to take place or change for a behaviour to occur.\textsuperscript{139} While it would have been possible to map the themes from the observational study (Chapter 4) to the TDF domains, doing so may have led to gaps when identifying the relevant domains, since the TDF domains were not originally considered during the analysis process. Therefore it was determined that analysing a new data set through the “lens” of the TDF would create a more robust platform from which to make decisions regarding the programme design. Secondly, making decisions about the programme design based on sources of behaviour identified in another group of participants may result in the selections for the programme components and mode of delivery that lacks relevance to the stakeholders being consulted. Thirdly, by identifying the sources of behaviour in a new sample it provided an opportunity for triangulation, whereby various factors that influence physical activity engagement could be confirmed in another population. By doing so we could be more confident that the programme would be relevant to the wider target population.

The next two steps of the BCW focus on identifying programme options, with appropriate intervention functions and policy categories being identified in steps 5 and 6 respectively. The final steps, 7 and 8, focus on identifying the programme content and implementation options by identifying behaviour change techniques and mode/s of delivery respectively. A detailed description of steps 5 – 8 is in the method section 6.6.5.

In selecting the BCW it is important to acknowledge the terminology of the approach and how it fits with the aim and underlying principles of our programme. Michie et al. (2014) defined a behaviour change technique as “an active component of an intervention designed to change behaviour.”\textsuperscript{139}(p 146) The term “behaviour change” could therefore be seen as attempting to get someone to comply or adhere to a recommended behaviour. Such attempts
Figure 6.4 Theoretical domains framework domains linked to COM-B components. Figure from Michie et al. (2014)\textsuperscript{139} used with permission. Green = COM-B sources of behaviour; Yellow = TDF domains. Soc = social influences; Env = environmental context and resources; Id = social/professional role and identify; Bel Cap = beliefs about capabilities; Opt = optimism; Int = intentions; Goals = goals; Bel Cons = beliefs about consequences; Reinf = reinforcement; Em = emotion; Know = knowledge; Cog = cognitive and interpersonal skills; Mem = memory, attention and decision processes; Beh Reg = behavioural regulation; Phys = physical skills.

could be seen to be counter to the principle of autonomy that underpins concepts relating to self-management and person-centred care, as well as the SDT. For the purpose of this study, while for some people changing behaviour in regard to physical activity habits may indeed have been relevant, the overall purpose for all intended recipients of the programme was to provide optimal conditions to facilitate the behaviour i.e. facilitate the person to engage in physical activity following hospital discharge. Therefore, in the context of this study, we regarded the behaviour change techniques as techniques that aimed to facilitate physical activity engagement. Other concepts that promote autonomy, such as empowering people to
make their own decisions, offering choices and encouraging people to determine their own recovery goals, have been utilised in the delivery of the programme.

6.4 Aims of the study

In summary, the overall aim of the study described in this chapter was to develop a programme (including resources to support the delivery of the programme) to facilitate people to initiate and engage in physical activity during the first three months following CABG surgery. The specific aims to enable achievement of the overall aim were:

1) To determine the specific sources of behaviour (capability, opportunity and motivation) that need to occur to facilitate physical activity engagement during the first three months following CABG surgery.
2) To determine the perceptions of health professionals regarding the need for the programme and potential challenges in the clinical context to be considered in the design of the programme.
3) To identify potential structure, content and modes of delivery of the programme.
4) To determine the preferences of stakeholders (former patients and health professionals) to guide the final selections for the structure, content and mode delivery of the programme.

The intended outcomes from putting the programme into practice would be: 1) to facilitate people to engage in physical activity during the first three months following CABG surgery to enhance people’s short term physical recovery; and 2) to initiate exercise behaviours that are important as part of long-term health management. The programme framework also allowed for an individualised and person-centred approach by considering peoples’ personal goals for engaging in activities that are of importance to them, as well as for their short- and long-term health related goals. It was anticipated that the potential programme developed may be especially beneficial for people living in rural settings, or to any person who does not have easy access to support from health professionals and/or are unable to attend outpatient cardiac rehabilitation services.

Note: While the term “programme” rather than an “intervention” has been used to describe the framework of service delivery and resources being developed, the terms “intervention
functions” and “intervention components” used in the method and results sections refer to specific terms from the BCW method.

6.5 Method

6.5.1 Study overview

The study utilised a systematic process with a mixed methods design through a series of quantitative (surveys) and qualitative (interviews and focus groups) strategies. There were six phases in this study. Phase 1 included requirements for step 4 of the BCW process. Phase 2 included requirements for steps 5-8 of the BCW, with phases 3-6 contributing to refining selections relating to steps 7 (intervention components/BCTs) and 8 (mode of delivery) (Figure 6.4).

Phase 1: Interviews and focus group
Interviews with people who had previously had CABG surgery (known hereafter as ‘former patient participants’), were undertaken to determine the specific sources of behaviour required to optimally enable physical activity engagement (step 4 of the BCW). Following the interviews, a focus group (with health professional participants) was undertaken to determine: 1) their perceived challenges to preparing people to engage in physical activity following CABG surgery; 2) their perceived need for a programme that prepares and supports people to engage in physical activity; and 3) their perceived capacity to implement such a programme. The information from this focus group also provided the background context for phase 2, where the research team was required to make decisions for the programme design based on criteria such as affordability and practicability.

Phase 2: Initial programme development
In this phase the doctoral candidate, in consultation with her research supervisors, undertook the initial planning for the programme design by undertaking steps 5-8 of the BCW process:

- Step 5 Identification of intervention functions;
- Step 6 Identification of policy categories;
- Step 7 Identification of potential behaviour change techniques;
- Step 8 Identification of potential modes of delivery.
Further detail regarding the methods for steps 4-8 of the BCW is described in sections 6.5.5.2 and 6.5.5.3.

Phase 3: Feedback from former patient participants was via a survey followed by a focus group (with former patients and health professionals) to determine the end users’ preferences and ideas regarding the potential programme components and modes of delivery developed in phase 2.

Phase 4: Development of the programme structure, including the content and design of any resources to be included in the programme, was undertaken as determined from the feedback received in phase 3.

Phase 5: Feedback from former patients via a survey followed by a focus group (with former patients and health professionals) was gathered to determine the end users’ preferences and ideas regarding the prototype programme materials and overall programme structure developed in phase 4.

Phase 6: Refinement of the programme structure and resources based on the feedback received in phase 5 (Figure 6.4).

6.5.2 Ethics, Māori consultation and locality authorisation

Prior to commencing the study, ethics approval was gained from the University of Otago Human Ethics Committee (19/171, Appendix 23) and locality authorisation was sought from the Southern DHB Health Research Office (Appendix 24). Māori consultation with the Ngāi Tahu Research Consultation Committee was also undertaken (Appendix 25).

6.5.3 Participants

6.5.3.1 People who have previously undergone CABG surgery (former patients)

Inclusion criteria: Adults (≥18 years of age) who had undergone CABG surgery at Dunedin Public Hospital in the previous two years and lived in the Southern DHB catchment area.
This time period included people who had their surgery after March 2018, and therefore the sample for this study included a different group of people to that from the observational study in Chapter 4.

Exclusion criteria: People who underwent cardiac valve surgery or mixed CABG and valve surgery.

Estimated required numbers of former patient participants:

*Phase 1:* Participant interviews – n = 20. While a rich description was obtained from a sample of 12 participants in the previous observational study (Chapter 4), the current study had some differences, which led to a slightly higher target sample size. Firstly, the participants were only interviewed at one time point (as opposed to four different time points in the previous study). Secondly, the participants were interviewed up to two years following their surgery (as opposed to during the first three months following surgery) and therefore, due to the potential for reduced recall of their experience, it was expected that less rich descriptions would be described in the participants’ responses.
Figure 6.5 Study outline schema for the development of the programme. BCW, behaviour change wheel.
**Phases 3 and 5:** Survey – n = 30; Focus groups n = 2.

The surveys explored ideas, preferences and acceptability of the programme during its development. We aimed to recruit at least 30 participants for the surveys to ensure that this end user group had been adequately consulted. According to the New Zealand Cardiac Surgery Report published in 2016, \(^{247}\) 113 isolated CABG surgeries were performed in 2015 at Dunedin Public Hospital in that year. This gave a potential target population of approximately 226 people for a period of two years. A 15% response rate was therefore required, to reach a sample size of 30 people, and was therefore considered a feasible target to attain.

**6.5.3.2 Health professional:**
A group of health professionals from a range of disciplines in the Southern DHB that worked with people following CABG surgery were purposively identified and invited to participate in the study. These health professionals included: 1) one senior physiotherapist from the cardiothoracic inpatient surgical ward; 2) two cardiac nurse educators, (one from Dunedin and one from Invercargill); 3) two senior physiotherapists involved in the supervised outpatient cardiac rehabilitation programme in Dunedin; 4); a district nurse representative, who had experience visiting people in their homes following CABG surgery; and 5) a member of the cardiothoracic surgical team (registrar or consultant).

**6.5.4 Recruitment**

**6.5.4.1 Former patients**
Advertisements (Appendix 26) were placed in local community papers in Otago and Southland in mid-March 2020 and subsequently in mid-May 2020. Advertisements were also sent to two long term maintenance cardiac rehabilitation community organisations in Dunedin for inclusion in their electronic newsletters. It was originally intended that advertisements would be provided to various organisations across Otago and Southland for placement on their notice boards. These organisations include Heart Foundation NZ offices, offices of community groups such as the Pacific Trust, providers of outpatient cardiac rehabilitation services, general practices and Māori and Pacific health providers. However, due to the nationwide COVID-19 lockdowns at alert level 4 (25th March 2020 – 27th April 2020) and subsequently level 3 (28th April – 13th May) with a subsequent move to level 2 it
was deemed inappropriate to contact these organisations during this time. It was also intended that if a range of ages, sex, ethnicities and living localities was not represented by the consenting participants, that purposive sampling techniques would be undertaken. In particular, representation of Māori and Pacific peoples was desirable due to the increased burden of cardiovascular disease on these population groups in New Zealand, compared to other groups. Inclusion of people living rurally was also desirable due to potential inequity of access to health care services available to such populations. Purposive sampling techniques intended to be undertaken included identifying people through hospital records or through outpatient cardiac rehabilitation providers. However, as there was a hold on research being conducted through the Southern DHB during alert levels 2-4, purposive sampling through hospital records and services was not possible.

Potential participants who expressed an interest in participating in the study, were requested to respond to by email or phone to a dedicated research email address and phone number at the School of Physiotherapy, University of Otago. Potential participants were then contacted by the primary researcher to ensure they met the eligibility criteria. Eligible potential participants were subsequently posted or emailed (depending on their preference) a study information sheet (Appendix 27) and consent form (Appendix 28). Participants were requested to return their signed consent form by pre-paid post or email and were given options about their participation: interview, focus groups and/or questionnaires. Another option for publicly sharing their experiences with others in the programme resources was included in the consent form, however it was stated that this would only be undertaken if it was decided by participants to be a valuable and useful tool for inclusion in the programme. Consenting participants were posted or emailed a questionnaire to collect demographic data (Appendix 29). For some participants posting mail was not an option (due to difficulties with postage during the early stages of the Covid-19 lockdown) and email was not desirable to the participant. In these situations, demographic data were collected verbally at the beginning of the interview.

6.5.4.2. Health professionals

Upon return to alert level 1 in September 2020, a telephone call or email was made by the doctoral candidate to administrators or service managers of allied health, cardiothoracic surgical and district nursing services to identify potential participants from amongst physiotherapists, nurses and doctors as described above. A study invitation (Appendix 30),
participant information sheet (Appendix 31) and consent form (Appendix 32) were then emailed to each of the identified health professionals. Of the identified health professionals, all provided consent to participate apart from a cardiac nurse representative from Invercargill due to staffing shortages and time pressures on staff at the time of the study. Consenting health professional participants were emailed a survey (Appendix 33) to collect demographic data (for example sex and ethnicity) and professional information (for example health profession, area of work and number of years’ experience). This information was examined prior to the focus group session to assess if there was an acceptable range of health professions and ethnicities represented in the group and to determine if further purposive sampling was required. To ensure cultural sensitivity and relevance in the development of the programme, the research team considered it desirable to also include Māori amongst the health professional participants. As none of the consenting health professional participants identified as Māori, the research team contacted the service managers and the Māori health team office at Dunedin Public Hospital to seek assistance in identifying Māori physiotherapists, nurses and doctors who had worked with patients, either on the cardiothoracic surgical ward, following discharge from hospital or in cardiac rehabilitation programmes following CABG surgery. One potentially eligible individual was subsequently identified, however they declined to participate in the study due to other commitments.

6.5.5 Data collection and analysis

6.5.5.1 Phase 1: Interviews and focus groups (step 4 of the BCW)

Interviews with former patients
Participants who consented to participate in the interviews were contacted by telephone or email by the primary researcher to organise a time for a semi-structured interview of approximately 30 – 40 minutes duration. The participants were informed that they were able to have a support person or wider whānau present during the interview. Support people were able to contribute to the interview (with the participant’s permission). Informed consent was gained from all those participating in the interview. It was originally intended to conduct these interviews face-to-face (kanohi te kanohi) either at the School of Physiotherapy, Dunedin, at the participant’s home, or at another place mutually agreed between the participant and researcher. For participants living outside of Dunedin the primary researcher intended to travel to the participants’ place of residence as required. However, due to the
Covid-19 alert levels as previously described, all interviews were conducted either by telephone or by online videoconferencing using the ‘Zoom’ platform, depending on each participant’s preference.

Each interview began by asking the participant to verbally describe their recovery following CABG surgery to help understand the wider context of their recovery and how their experience of engaging in physical activity fitted within this context. This was followed by questions about their experiences of engaging in physical activity, what helped or hindered physical activity and the type of support they needed and/or received. The questions asked were:

- What were the most important things to you during the first three months of your recovery?
- How did physical activity help or hinder with these things that were important to you?
- What did you find worked for you or helped you during your recovery after your surgery?
- What did you find helped you to engage in physical activity during the first three months?
- What did you find made it hard for you to engage in physical activity during the first three months?
- What support did you receive to engage in physical activity during the first three months following discharge from hospital, either by family/whānau, friends or health professionals?
- How important or helpful was the support that you received? Why?
- Were there any particular times where you would have liked or needed more support following discharge from hospital after your surgery? What sort of support would have been helpful?

Supplementary and probing questions were asked depending on each participant’s response.

Each interview (including those undertaken via Zoom) was audio-recorded using a Sony 4GB digital voice recorder and transcribed verbatim either by the doctoral candidate or a professional transcription service. A copy of the transcript from a participant’s interview was sent to them to check for accuracy and to add to if they desired.
Thematic analysis of the interviews was undertaken using the Framework Method.\textsuperscript{251} Since the purpose of the interviews in phase 1 was to undertake a behavioural analysis by identifying factors that influence physical activity and to categorise these under the TDF domain headings, a combined inductive and deductive approach to analysis was required. The Framework Method can be applied to inductive, deductive or combined approaches to qualitative analysis.\textsuperscript{252} The Framework Method has also been used in previous studies which have performed behavioural analysis deductively using the TDF domains.\textsuperscript{253,254} For this approach, following transcription checking, familiarisation with the data was undertaken by the doctoral candidate through re-listening to the audio recordings and re-reading the transcripts. During this process, contextual and reflective notes and potential ideas for codes were recorded in a field journal. The transcripts were then inductively coded by the doctoral candidate by labelling sentences or larger chunks of data with specific codes relating to physical, psychological or environmental factors that influenced physical activity engagement during the first three months following surgery. As mentioned previously in section 6.2.2, one of the challenges of creating a programme that facilitates physical activity engagement following CABG surgery is the heterogeneity of the target population, with CABG recipients representing a wide range of ages, physical capabilities, life contexts and goals for physical activity engagement. As a result, during the coding process as many sources of behaviour as possible were deliberately included in the behavioural analysis to ensure that the final programme included components that met the needs of as many people as possible. The wide range of resulting codes was discussed with the research supervisors at several stages during the coding process, with the codes then being refined or condensed where necessary. Each transcript was then checked and re-coded as required to ensure the resulting analytic framework of codes was applied to all transcripts in the same way. Charting of data was then undertaken by transferring the data onto an Excel spreadsheet, with each participant interview allocated a row and each code allocated a column. Coded data from the transcripts were then transferred into the relevant cells. Data collated under each code were then checked for similarity in meaning. Finally, interpretation of the data was conducted deductively by categorising or grouping codes under the relevant TDF domain headings.

Member checking was subsequently undertaken by sending a summary of the identified sources that facilitated or inhibited physical activity to former patient participants for confirmation regarding the relevance of the identified sources. Participants were also
requested to document if they thought any potential sources or influences of physical activity were missing and to describe them.

**Focus group with health professionals**

Following the analysis of the interviews, one focus group of 90 minutes duration was held. Participants were provided with the option of participating in person, at the School of Physiotherapy, Dunedin or via Zoom. The focus group was led by the doctoral candidate, with one of the research supervisors (MS) being present to take field notes and ask additional questions if the need arose. The focus group began by the doctoral candidate providing a brief 10-minute summary of the results from the participant interviews. This was followed by a discussion prompted by the following questions:

- What do you think are the strengths of the way that people are currently prepared to engage in physical activity during the first three months following CABG surgery?
- What do you think are the challenges or limitations to preparing people to engage in physical activity during the first three months following CABG surgery?
- What do you think are the strengths of the support that people currently receive from health professionals to engage in physical activity during the first three months following CABG surgery?
- What do you think are the challenges or limitations to providing follow up support to people during the first three months following CABG surgery?
- What are your thoughts about the capacity of the services provided by your profession and the services provided as an inter-disciplinary professional service to address the challenges or limitations identified in the preparation or support of these patients?

The focus group session was recorded, transcribed and analysed by the doctoral candidate using the General Inductive Approach as described by Thomas (2006). This method of analysis was selected because the purpose of analysis in this study was to evaluate and describe, rather than interpret the underlying meanings and create a narrative for the perceptions and preferences of the participants. The General Inductive Approach is an appropriate approach when the research questions are essentially evaluative. In this process, the focus group transcript was first transcribed. Familiarisation through close reading of the text was followed by initial coding of the transcript (including the development of definitions for each code). The clarity and accuracy of the codes was subsequently undertaken by having one of the research supervisors (LH) independently code the transcript.
using the codes and definitions developed by the doctoral candidate. A check was then undertaken to determine the extent that the second coder (LH) allocated the same text segments to the codes as the first coder (EG). The codes were then categorised into overarching themes by the doctoral candidate, with the final themes being decided following discussion with the research supervisors.

6.5.5.2 Phase 2: Initial programme development

Behaviour change wheel steps 5 and 6: Identify intervention functions and policy categories

The doctoral candidate identified relevant potential intervention functions and policy categories to be used in the programme design. Intervention functions are “broad categories of means by which an intervention can change behaviour.” (p.110)\textsuperscript{139} The BCW provides nine options for possible intervention functions: education, persuasion, incentivisation, coercion, training, restriction, environmental restructuring, modelling and enablement. The BCW identifies for the programme developer which intervention functions are likely to be effective in bringing about changes in the various identified sources of behaviour (i.e. capability, opportunity and motivation) (Appendix 34). In selecting appropriate intervention functions, the APEASE criteria (affordability, practicability, effectiveness/cost-effectiveness, acceptability, side-effects/safety, equity)\textsuperscript{139} were applied. Some of the themes identified from the focus group with health professionals guided the application of the APEASE criteria.

Policy categories are ways that the authorities or service providers can support and enact the programme. The BCW provides seven policy functions to choose from: communication/marketing; guidelines; fiscal; regulation; legislation; environmental/social planning; and service provision. The BCW also provides recommendations for which policy categories are likely to be appropriate for supporting the various intervention functions (Appendix 35).\textsuperscript{139} The APEASE criteria were again applied in the selection of policy categories. Again, some of the themes identified from the focus group with health professionals guided the research team’s application of the APEASE criteria.

Behaviour change wheel step 7: Identify intervention components

The final step in phase 2 was to identify potential intervention components, or BCTs. The BCW provides BCTs appropriate for each intervention function, as determined by a consensus of experts. In selecting the BCTs, particular focus and consideration was given to
techniques that had similarity to SMS principles e.g. problem solving, self-monitoring, action planning and support/partnership with health professionals. As in the previous steps, the APEASE criteria were considered when identifying potential BCTs. However the initial list of potential BCTs was intentionally kept long as the final selection of included BCTs was intended to be done in consultation with the study participants (phase 3). For each identified BCT, an intervention component (that is, a practical application for how the BCT would be applied in the required context) was developed.

6.5.5.3 Phase 3: Determining participant perspectives regarding proposed components and mode of delivery of the programme (step 8)

Following the development of the ‘long list’ of potential BCTs for inclusion in the programme, a questionnaire was developed with the purpose of seeking participants’ ideas regarding the perceived acceptability and usefulness of the selected BCTs and intervention components. A 5-point Likert scale was used for each questionnaire item, with participants being requested to rank the perceived usefulness each intervention component from the following options: ‘extremely helpful’, ‘very helpful’, ‘somewhat helpful’, ‘a little bit helpful’ and ‘not at all helpful’.

Behaviour change wheel step 8: Identify mode of delivery

The questionnaire also sought information regarding each participant’s preferences for the mode of delivery of the programme. The BCW method includes the identification of mode of delivery as the final step in the process. However, it was of interest to find out early in the process about the participants’ preferences regarding how the programme should be delivered. In that way, feedback about the mode of delivery of the programme could be sought from participants without the additional burden of further questionnaires or focus groups to determine their preferences. A range of options related to the mode of delivery, including preferences for written or online resources and provision of follow up support, was therefore included in the first questionnaire. Items relating to preferences regarding the mode of delivery required participants to rank their preferences from amongst the options provided. Opportunity for open responses were also available on the questionnaire if the participant wished to provide any additional comments or suggestions.
Prior to sending the survey to former patients the questionnaire was pilot tested with a consenting participant who was not eligible to be included in the main study (because they had their surgery more than two years previously). The pilot testing was undertaken by having the participant complete the questionnaire with the doctoral candidate in the room, with the participant being able to comment or ask for clarification on the questionnaire items as required. Items requiring clarification were noted by the doctoral candidate and following the pilot test a range of changes was made to the phrasing of various statements and questions to improve the clarity of the items.

Quantitative data from the survey data were collated onto a Microsoft Excel spreadsheet and analysed using simple descriptive statistics such as frequency. Open responses were collated and presented at the focus group so that the comments were considered as part of the decision making for the programme design.

Following the analysis of the survey data, a 90-minute focus group session comprising the health professional participants and two former patients who consented to participate, was held. As for the previous focus group, all participants were given the option of attending in person or via Zoom. The purpose of this focus group was to discuss the questionnaire results and reach a consensus on what intervention components and modes of delivery would be included in the programme. During these sessions, the doctoral candidate presented intervention components recommended for potential inclusion (based on more than 50% or more of the survey respondents stating that the practical application would be either ‘extremely’ or ‘very helpful’), and those recommended for potential exclusion (based less than 50% of respondents stating that the practical application would be ‘extremely’ or ‘very helpful’). A summary of the ranked preferences for the modes of delivery was also presented to the group. The goal of the group discussion was to reach consensus amongst the group about which BCTs and intervention components to include, and what modes of delivery to utilise. If consensus was not reached by the group, the final decision on whether to include or exclude a practical application, or which mode of delivery to utilise, was made based on the majority responses to the questionnaire.
6.5.5.4 Phase 4: Development of the programme outline and resources

Once the ‘short list’ for practical applications was developed and final decisions regarding the mode of delivery were made, a draft programme outline and associated resources were developed by the doctoral candidate in consultation with her supervisors. While apps and web-based resources were proposed as potential resources, budget limitations did not allow for the development of such resources at the time. Therefore the focus in the study was on developing written resources that may be used in the future to support the delivery of the programme. It was determined in advance that if there was sufficient demand for apps, web-based resources, cost for production would be an integral part of any future requests for research grants.

6.5.5.5 Phase 5: Determining participant perspectives regarding proposed programme outline and resources

Once the draft of the written programme resources were developed, former patient participants were posted a paper copy, along with a second questionnaire and a summary of the final decisions on the intervention components that would be included in the programme (based on the initial survey and previous focus group session outcomes). The questionnaire requested participants to provide feedback on the written resources, as well as the summary. As for the first questionnaire, the evaluative survey included tick boxes, Likert scales and opportunities to provide comments on the written resources developed in relation to the following areas:

- Presentation and layout
- Content
- Perceived usefulness to facilitate engagement in physical activity

The survey data were grouped and analysed, as previously described for the first survey. Following this a fourth and final 90-minute focus group was held with the same focus group participants. Two weeks prior to this focus group session, participants had been sent copies of the written resources and the proposed outline of the programme. As for the previous focus group session, the doctoral candidate provided feedback to the group regarding the questionnaire results before facilitating a general discussion regarding any changes that the
group perceived as being necessary to make. If a consensus was not reached regarding any aspect of the programme outline or written materials, the majority responses obtained from the completed questionnaires determined the final decision. If the questionnaire responses were not able to guide the decision, then the doctoral candidate (in consultation with her supervisors) used their discretion based on their knowledge of the evidence base in the literature.

6.5.5.6 Phase 6: Refinements to programme materials

The consensus decisions from the focus group sessions and/or questionnaire responses were used to make any necessary changes to the programme outline and written resources.

6.6 Results

6.6.1 Participants

Twenty-three people who had previously undergone CABG surgery consented to participate in the study. Of these people, 13 consented to participate in an interview, focus groups (if required) and complete questionnaires; and eight consented to participate in an interview and complete questionnaires; one consented to complete the questionnaires only; and one consented to participate only in an interview. A summary of the demographic variables for these participants is found in table 6.1.

Six health professionals consented to participate in the study. All six identified as NZ European. The health professionals included a cardiac nurse educator (20-29 years’ experience), a senior inpatient cardiorespiratory physiotherapist (5-9 years’ experience), two outpatient cardiorespiratory physiotherapists (30+ and 2-4 years’ experience), a cardiothoracic surgical registrar (10-14 years’ experience) and a district nurse (5-9 years’ experience).
Table 6.1 Demographic variables for participants who had previously undergone CABG surgery

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<tr>
<td></td>
<td>Male n=21</td>
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<tr>
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<tr>
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<td>Retired/unemployed n=10</td>
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</tbody>
</table>

6.6.2 Phase 1: Focus group findings

While the interviews with former patients occurred before the first focus group with the health professionals (because of delays in being able to recruit health professional participants due to the Covid-19 alert level restrictions), the findings from the initial focus group will be presented first in this chapter, so that the interview findings flow better with the results relating to the subsequent BCW steps.

Themes relating to various strengths, problems and capacity limitations related to preparing and supporting people to engage in physical activity, as perceived by health professionals, were identified. A table containing a summary of these strengths, needs and capacity limitations, along with supporting quotes is provided in Appendix 36. A narrative summary of these themes follows.
Theme 1: Strengths of the current service delivery

The health professional participants described seven strengths relating to the way that people were prepared and supported to engage in physical activity. These included the ‘discharge talk’, provision of written information about physical activity and including family members during the discharge talk. Continuity of patient care, for example, being seen by the same physiotherapist during the inpatient stay when possible, was another identified strength as it provided a greater opportunity to develop rapport and trust and increased the potential for individualised advice if the physiotherapist knew the patient well. Having multiple health professionals, for example the physiotherapist, nurse and doctor, providing positive messages about physical activity engagement was a strength as it reinforced the importance of physical activity to patients. Facilitating people to progressively resume physical activity engagement during the inpatient stay was an important way of increasing patient confidence prior to their discharge. Regarding follow up support, the outpatient cardiac rehabilitation programme provided at the main regional hospital was also identified as an important way to increase a patient’s functional capacity and confidence to engage in physical activity.

Theme 2: Perceived patient needs for service delivery

Two perceived patient needs were described by the health professionals. Firstly there was an acknowledgement of the wide variation of: 1) people’s capacity for physical activity, 2) people’s life context for which they will be engaging in physical activity; and 3) people’s recovery trajectories following hospital discharge. The group therefore identified a need for individualisation regarding the preparation and support that people require to engage in physical activity. However there was also acknowledgement of the lack of individualisation that is currently provided, with a focus on didactic sharing of information in either one-on-one or group settings. The group also described a perceived need for the provision of follow up support by health professionals to better support physical activity engagement. Reasons for needing to provide follow up support included: 1) the difficulty of adequately preparing people prior to hospital discharge due to the inability to predict individual recovery experiences; 2) the potential need for those who live alone for more encouragement and support; and 3) the need to provide additional reassurance and/or guidance if uncertainty regarding physical activity engagement arises.
Theme 3: Problems related to service delivery

Four problems were identified by the health professionals, in relation to preparing and supporting physical activity engagement following hospital discharge. Firstly, while there was a perceived need for individualisation when preparing patients for discharge, there was also acknowledgement of the lack of individualisation that is currently provided, with a focus on didactic sharing of information in either one on one or group settings. Secondly, several problems relating to accessing follow up support were described: 1) A lack of equity regarding access to outpatient cardiac rehabilitation in the DHB region was acknowledged, with only those who live in or close to the main city having access to such a programme; 2) While outpatient cardiac rehabilitation programme was the main means by which ongoing support for physical activity was provided, there were few alternative options for follow up support currently provided - for example, while participants attend a lifestyle risk factor clinic approximately four weeks post discharge, the cardiac nurse educator acknowledged that physical activity engagement was only minimally addressed; and 3) The final problem identified related to the climate of contracting services and resources being a challenge to providing follow up support - for example, the cardiac nurse educator and a physiotherapist (each with more than 20 years’ experience) described how following cardiac surgery 15-20 years ago a referral to community physiotherapy and a district nurse was routine practice. The current model of care now includes referrals to community physiotherapy only if there are mobility concerns, and to a district nurse only if there are wound complications needing ongoing attention. In addition, where the cardiac nurse educator had an example of a previous clinical care pathway for district nursing that included assessment of physical activity, the district nurse described how physical activity is no longer on the clinical care pathway and is not one of the factors that they would routinely address with their patients.

Theme 4: Capacity limitations and/or challenges to service delivery

The health professionals identified two service-related factors, three environmental factors and four patient related factors that were perceived as capacity limitations or challenges to preparing and supporting people.

The first service-related factor was the recognition of having finite resources with which to prepare and support people. The key limiting resources were limited time available and
financial restrictions meaning that more staff could not be employed to increase the services beyond what is currently provided. The second service-related factor arose when multiple health professionals (e.g. more than one physiotherapist) are involved in the person’s inpatient care, which means reduced time available to develop a rapport and get to know the patient, which in turn makes it difficult to individualise the advice provided or physical activity planning.

The environmental challenges included delivering information in a busy and noisy ward environment, which make it difficult for the patient to hear and/or concentrate. Differing perspectives between the patient and their family members was another potential challenging factor identified, with health professionals describing situations where either: 1) families are very protective and restrict the patient’s physical activity engagement, or 2) the family tries very hard to encourage the person to engage in activity, but the patient is unwilling to do so. The final environmental challenge was technology limitations in relation to the limitations in providing follow up support via online videoconferencing to those with limited internet access (including people living rurally or those unable to afford internet services).

The health professionals also described four patient-related factors that they perceived as challenges to preparing patients to engage in physical activity prior to hospital discharge. The first was the observation that people often have a decreased capacity to concentrate and retain information during the early recovery period following CABG surgery. An example of people not retaining information was described by the physiotherapist with 30+ years of experience, who has had patients having a second/repeat CABG surgery saying “Oh if only you gave us this information last time”, when the physiotherapist knew that they had been provided the same information the first time around. Secondly, the health professionals described the perception that knowing about physical activity may not be as important to some patients prior to discharge compared to other things, such as knowing about medication. It was perceived by the health professionals that some participants may not take on board as much information about physical activity if it is not a priority to them at that time. The third patient-related challenging factor was a range of skills in literacy, where it was acknowledged that written resources are of limited value for those with low levels of literacy skills. The final patient-related challenge to preparing people to engage in physical activity was the difficulty in predicting individual recovery trajectories, making it hard to provide firm guidance for progression with physical activity.
6.6.3 Phase 1: Interviews with former patients (Step 4 of the BCW: Identify what needs to change)

Through the examination of the recovery experiences described by former patient participants, a variety of behaviours that influenced physical activity engagement during the first 12 weeks following CABG surgery were identified. These behaviours were confirmed by member checking, and subsequently ascribed to 13 of the 14 TDF domains (Table 6.2). The only TDF domain that did not have any identified behaviours ascribed was ‘Social/professional role and identity’. The number of identified behaviours within each TDF domain varied between one and four. The TDF domains with the most identified behaviours were skills (n=4), knowledge (n=4), behavioural regulation (n=4), physical opportunity (n=4), reinforcement (n=3) and social influences (n=3). A copy of the questionnaire used for member checking to confirm the identified behaviours is found in Appendix 37.
Table 6.2 Links between COM-B model, Theoretical Domain Framework domains, identified target behaviours, intervention functions, policy categories and behaviour change techniques

<table>
<thead>
<tr>
<th>COM-B Component</th>
<th>TDF Domain (definition)</th>
<th>Identified Target Behaviours (BCW Step 4)</th>
<th>Supporting Quotes</th>
<th>Intervention Functions (BCW Step 5)</th>
<th>Policy Categories (BCW Step 6)</th>
<th>BCTs (BCW Step 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Capability</td>
<td>Skills (An ability or proficiency acquired through practice)</td>
<td>Engage in progressive/graded activities</td>
<td>When I first came home honestly for the first couple of weeks I just went round the property. I just didn’t feel I could venture too far and it was getting colder ... if it was a nice sunny day I just thought well this is the day I should really go a bit further so slowly I did, I just, you know and each day you had to try and go a wee bit further, so yeah just to build it up. (Participant 7)</td>
<td>Training</td>
<td>Guidelines Service provision</td>
<td>4.1 Instruction on how to perform a behaviour 6.1 Demonstration of the behaviour 8.7 Graded tasks 8.1 Behavioural practice 2.3 Self-monitoring 2.2 Feedback on the behaviour</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Have good pre-operative/baseline physical strength and aerobic capacity</td>
<td>So (before the operation) I lost about 12 or 14 kgs fairly rapidly. I did a lot of walking and a lot of biking. And so when I had the operation that movement was a lot easier to just slot back into than I guess it would’ve been. (Participant 20)</td>
<td>Training</td>
<td>Guidelines Service provision</td>
<td>12.6 Body changes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Build up/restore physical strength post-operatively</td>
<td>It was mainly the legs cause I hadn’t done any climbing for a while ’cause it was, walking round the block it was all flat down here, not many hills. (Participant 22) I think to try and get my chest and shoulders and everything all back in</td>
<td>Training</td>
<td>Communication/marketing Guidelines</td>
<td>12.6 Body changes 4.1 Instruction on how to perform a behaviour 6.1 Demonstration of the behaviour</td>
</tr>
<tr>
<td>Psychological Capability</td>
<td>Knowledge (An awareness of the existence of something)</td>
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<tr>
<td>Build up/ restore aerobic fitness post-operatively</td>
<td>I think it was getting the exercise and getting fit. 'Cause I wasn’t getting much before I had the operation cause like before at work if I did half of one side of the benches with the tools I’d have to stop and have a break and get my breath back but now I can do it and I don’t have to stop. (Participant 22)</td>
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<tr>
<td>Training Enablement</td>
<td>Communication/marketing</td>
<td>12.6 Body changes 4.1 Instruction on how to perform a behaviour 6.1 Demonstration of the behaviour</td>
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<tr>
<td>12.6 Body changes</td>
<td>4.1 Instruction on how to perform a behaviour 6.1 Demonstration of the behaviour</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Communication/marketing</td>
<td>5.1 Information about health consequences 5.3 Information about social and environmental consequences 5.7 Information about emotional consequences 9.1 Credible source</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Communication/marketing Guidelines</td>
<td>4.1 Instruction on how to perform a behaviour</td>
<td></td>
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</tbody>
</table>

some sort of physical shape... I’ve always had quite a bit of [strength] so yeah, I think the fact that I’d lost that sort of thing. (Participant 6)

I think by that time, you’re a bit more aware that you did need to do it and I mean, everybody drilled home that message, the surgeon, the other medical staff, the nursing staff, the physio, exercise, walk walk walk and I think that it’s an important message to get through even if you don’t necessarily want to hear it sometimes. (Participant 10)

Because you know, it’s in the old back of the mind oh am I doing this right, am I over doing it, am I under doing it or I’m not doing enough. (Participant 14)
| Know how to manage physical symptoms/problems | **Fatigue:** And then of course you just need to rest because at that stage you’re getting very tired, you get very tired real quick. (Participant 8)  
**Pain:** But then if I did too much I felt the pain. Not only in my chest, with my legs and that as well. (Participant 11)  
**Shortness of breath:** You know even when getting out walking still got you a wee bit short of breath and that was moving slowly. (Participant 9)  
**Medical complications:** I got an infection in it (leg wound) ...I couldn’t walk as far as I wanted to and I did what I could. I really felt as if that leg, yeah it held me up quite a bit. (Participant 9) |
| Know about a variety of exercises | Well they emphasised that I should do half an hour a day of walking but there was never any mention of any other physical exercise, like swimming ... while they all say walking’s number one, I think it’s not number one in everybody’s books. Maybe there’s other ways people would enjoy exercise. (Participant 3) |
| Behavioural Regulation (Anything aimed at managing or changing objectively observed or measured actions) | I knew my limitations if I did anything too much I’d feel it. Like for instance I didn’t take a big handful I’d just get a couple of bits (of firewood) and that just made me feel like I was wanted and doing something. (Participant 11) |

| Education | Communication/marketing Guidelines | 4.1 Instruction on how to perform a behaviour  
6.1 Demonstration of the behaviour |
<p>| Education | Communication/marketing Guidelines | 4.1 Instruction of how to perform a behaviour |</p>
<table>
<thead>
<tr>
<th>Have a plan for engaging in physical activity</th>
<th>It’ll work out quite nicely, I’ll do a small loop around the block first and just see how that goes and then, you know, start extending it out a bit. (Participant 17)</th>
<th>Enablement</th>
<th>Communication/ marketing Guidelines</th>
<th>1.4 Action planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-monitor physiological feedback from body to determine physical activity limits</td>
<td>Let your body guide you in what you can do. In other words go to the point where you are tired and you still feel good about doing it. Rather than if you push yourself and you just say well I’m not gonna do that again, I’m over this, I don’t wanna, well you’ve done too much. (Participant 18)</td>
<td>Training</td>
<td>Communication/ marketing Guidelines</td>
<td>4.1 Instruction on how to perform a behaviour 2.3 Self-monitoring of behaviour</td>
</tr>
<tr>
<td>Establish a routine/habit for physical activity</td>
<td>I was pretty good once I got into the habit of it... just at the same time really, just a routine. First thing in the morning get my breakfast and then go, just be out for a walk down to the corner or something and back. (Participant 5)</td>
<td>Training</td>
<td>Communication/ marketing Guidelines</td>
<td>8.3 Habit formation 6.1 Demonstration of the behaviour</td>
</tr>
</tbody>
</table>

Memory, attention and decision processes (The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives)

<table>
<thead>
<tr>
<th>Solve problems in order to facilitate activity engagement</th>
<th>Because the drive’s steep, what we did was I would walk down the drive to the road and walk up and down there but I found it really hard to get back up the drive. So we had a good arrangement where my wife came down and picked me up and took me back up the drive. (Participant 10)</th>
<th>Training</th>
<th>Communication/ marketing Guidelines</th>
<th>1.2 Problem solving 4.1 Instruction on how to perform a behaviour 6.1 Demonstration of the behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access resources in order to seek help or assistance</td>
<td>Help was always there because in a way I suppose it’s up to you ’cause they don’t ring you or anything after you’ve</td>
<td>Enablement</td>
<td>Communication/ marketing</td>
<td>3.1 Social support (unspecified)</td>
</tr>
<tr>
<td>to engage in physical activity</td>
<td>had the operation ... but you were certainly sent home with a lot of information and they always said don’t hesitate to call these numbers if you need to talk to anybody... I’m a great believer in you’ve really got to help yourself. (Participant 7)</td>
<td></td>
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<tr>
<td>Reflect on progress in physical activity engagement</td>
<td>I was able to look back and say oh yeah, yep no I did that ok so I could just keep increasing ... if I perhaps hadn’t have kept it (diary), it wouldn’t have been quite so interested looking back and making sure I was making progress. And a bit of a motivation that, you know, ok, I’m working through that, it’s getting better, that must mean good things. (Participant 16)</td>
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</tbody>
</table>

| Automatic Motivation | Reinforcement (Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus) |
| Experience positive psychological and physical benefits from physical activity engagement | Just take a note of what you’re feeling like at the time, then just force yourself out the door and then examine your feelings afterwards and how much your mind is clearer, you feel stronger, you just feel happier because you’ve done it. (Participant 4) |

| Emotion (A complex reaction pattern, involving experiential, behavioural and physiological elements, by which the individual attempts to deal with a personally significant matter or event) | Overcome feelings or emotions to engage in |
| | I was a bit scared to go out walking by myself because I’m by myself and I thought what if something happens to me. (Participant 2) |

| Environmental/s social planning | Enablement Guidelines 2.3 Self-monitoring of behaviour |
| | Enablement Guidelines 2.3 Self-monitoring of behaviour OR 5.4 Monitoring emotional consequences 15.4 Self-talk |
| | Persuasion Modelling Enablement Communication/marketing Environmental/s social planning 15.1 Verbal persuasion about capability |
physical activity
e.g. Fear, frustration, feeling vulnerable

*I mean you’ve got this concern about what you do when your chest has been chopped in half and stitched back together with a bit of old wire. You’re worried about that and what you can do.* (Participant 10)

Service provision

3.2 Social support (practical)
3.3 Social support (emotional)
8.7 Graded tasks

Reflective Motivation

Intentions (A conscious decision to perform a behaviour or a resolve to act in a certain way)

<table>
<thead>
<tr>
<th>Have the desire, motivation, determination and/or perseverance to engage in physical activity</th>
<th>Make a conscious decision to engage in physical activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>So I was really determined that you know, and it was always my goal to get going again...you know you’ve really got to push yourself to get going again. (Participant 6)</td>
<td>For me I’ve gotta do it, you know I’ve gotta do something, you sit round for so long and then you think well, come on you gotta get out and do something. (Participant 18)</td>
</tr>
<tr>
<td>I just had to do things even though you didn’t feel like it ... You really just had to force yourself to just go and do it, you know it was dead easy to say oh nah, I’m not feeling 100% so I won’t. Still get up and try and do it and afterwards you sort of felt as if, well that was good, felt a bit better about it. (Participant 9)</td>
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<tr>
<td>This idea that it’s going to be easy and instant forget about it you’ve just got to stick with it and persist ... I just find it’s a matter of persisting and the more that I do the easier it gets. (Participant 21)</td>
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Educaton Persuasion Incentivisation Modelling

Communication/marketing Guidelines Environmental/social planning

5.1 Information about health consequences
5.6 Information about emotional consequences
6.1 Demonstration of the behaviour
13.2 Framing/reframing
9.1 Credible source
9.2 Pros and cons
10.7 Self-incentive

Education Persuasion Incentivisation Modelling

Communication/marketing Environmental/social planning

7.1 Prompts and cues
6.1 Demonstration of behaviour
<table>
<thead>
<tr>
<th>Beliefs about Consequences (Acceptance of the truth, reality, or validity about outcomes of a behaviour in a given situation)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Believe that engaging in physical activity will have positive benefits</strong></td>
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<tr>
<td>Just, you know, the way to keep things good is to exercise. (Participant 9)</td>
</tr>
<tr>
<td>Well I think physical activity feels like you’re getting back to normal and I think it gives you confidence that I could do those things which it enables you to do, you know, realise you are going to be alright and get on with life. (Participant 19)</td>
</tr>
<tr>
<td><strong>Have realistic expectations about getting back into physical activity</strong></td>
</tr>
<tr>
<td>With I think realistic expectations. So I wasn’t expecting to get up and and be running around three days later. It was a realisation that it was going to be a gradual process. Things take a while to heal. (Participant 10)</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Beliefs about capabilities (Acceptance of the truth, reality or validity about an ability, talent, or facility that a person can put to constructive use)</th>
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<tbody>
<tr>
<td><strong>Build confidence to engage in physical activity</strong></td>
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<tr>
<td>I think I would feel a wee bit insecure if didn’t have somebody with me in the first few months to be fair I think. Yeah I think I probably needed that just someone walking with me for a start, mmm. But then as I said, as my confidence grew again, I’d just started going back on my own. (Participant 7)</td>
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<tr>
<td><strong>5.1 Information about health consequences</strong></td>
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<tr>
<td><strong>5.6 Information about emotional consequences</strong></td>
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<tr>
<td><strong>6.1 Demonstration of the behaviour</strong></td>
</tr>
<tr>
<td><strong>9.1 Credible source</strong></td>
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<tr>
<td><strong>Education</strong></td>
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<td><strong>Persuasion</strong></td>
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<tr>
<td><strong>Modelling</strong></td>
</tr>
<tr>
<td><strong>Communication/marketing</strong></td>
</tr>
<tr>
<td><strong>3.3 Social support (emotional)</strong></td>
</tr>
<tr>
<td><strong>15.1 Verbal persuasion about capability</strong></td>
</tr>
<tr>
<td><strong>8.7 Graded tasks</strong></td>
</tr>
<tr>
<td><strong>15.2 Mental rehearsal of successful performance</strong></td>
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<tr>
<td><strong>15.4 Self-talk</strong></td>
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<tr>
<td>Social Influences (Those interpersonal processes that can cause individuals to change their thoughts, feelings or behaviours)</td>
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<tr>
<td>Have encouragement and support from spouse, family or friends.</td>
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<td>Have goals or targets for activities or recovery</td>
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<tr>
<td>Have support, guidance and encouragement from health professionals</td>
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<tr>
<td>Have support, encouragement or guidance from peers</td>
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<tr>
<td>Have support, encouragement or guidance from peers</td>
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<tr>
<td>Physical Opportunity</td>
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<tr>
<td>Action</td>
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<td>----------------------------------------------------------------------</td>
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<tr>
<td>Have favourable weather conditions for walking outdoors</td>
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<tr>
<td>Have access to cardiac rehabilitation</td>
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<tr>
<td>Engage in necessary activities due to living situation or context</td>
</tr>
<tr>
<td>Have access to appropriate places/spaces to walk</td>
</tr>
</tbody>
</table>
BCW Step 5. Identify intervention functions

Decisions about whether or not to include the various intervention functions following the evaluation of each of the functions against the APEASE criteria are provided in Table 6.3. The intervention functions of coercion and restriction were excluded as they did not meet all of the APEASE criteria. The functions of education, persuasion, incentivisation, training, environmental restructuring, modelling and enablement were selected as feasible means to facilitate physical activity engagement. Particular consideration was taken in the decision to include environmental restructuring, as the findings from the first focus group indicated that limited resources (staff time and funding) would be a major barrier to expanding follow up support services. However, the importance of follow up support and its potential influence on physical activity engagement described by participants in both the current study and in the observational study (Chapter 4) could not be ignored. Expanding service provision could also address equity issues regarding access to follow up support. In addition, resource availability could increase in the future and/or may vary in different clinical settings. Also a future study may find that spending more resources on optimising recovery may save funding in the longer term by preventing hospital readmissions and/or re-do CABG surgery. Therefore, it was decided to include environmental restructuring as a potential intervention function. The seven selected intervention functions were subsequently mapped against the TDF domains and target behaviours (Table 6.2).

Step 6. Identify policy categories

Mapping of the seven selected intervention functions against the relevant policy categories (as described by the BCW) revealed that all seven policy categories were potentially eligible for utilisation. Therefore, all policy categories were examined using the APEASE criteria, to determine which ones would be utilised to support the delivery of the intervention. Four policy categories met the APEASE criteria and were selected to support the delivery of the programme. Details of the evaluation of each policy category against the APEASE criteria are provided in Table 6.4. The four selected policy categories were then mapped against the TDF domains, target behaviours and intervention functions (Table 6.2).
### Table 6.3 Selection of intervention functions to facilitate optimal engagement in physical activity following CABG surgery

<table>
<thead>
<tr>
<th>Candidate intervention functions</th>
<th>Does the intervention meet the APEASE criteria?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Yes – shown to be effective in previous studies (Chapter 2, section 2.11) and is commonly used in current practice (Chapter 5)</td>
</tr>
<tr>
<td>Persuasion</td>
<td>Yes – encouragement/support from health professionals shown to be effective in previous studies (Chapter 2, section 2.11)</td>
</tr>
<tr>
<td>Incentivisation</td>
<td>Yes – effectiveness not currently known; external rewards may undermine autonomy however self-rewards could be acceptable and has minimal cost to the provider</td>
</tr>
<tr>
<td>Coercion</td>
<td>No – creating an expectation of punishment or cost was deemed not acceptable (deemed not to align with person-centred care principles), affordable or equitable</td>
</tr>
<tr>
<td>Training</td>
<td>Yes – imparting skills through modelling or demonstrating behaviour commonly used in current practice and therefore acceptable</td>
</tr>
<tr>
<td>Restriction</td>
<td>No – using rules to increase the opportunity to engage in the target behaviour was deemed not acceptable (deemed to not align with the principles of autonomy) or practicable (difficult to monitor or enforce)</td>
</tr>
<tr>
<td>Environmental restructuring</td>
<td>Yes – one-on-one peer support shown to be effective in previous studies (Chapter 2, section 2.11)</td>
</tr>
<tr>
<td>Modelling</td>
<td>Yes – modelling coping with and overcoming challenges shown to be effective in previous studies (Chapter 2, section 2.11)</td>
</tr>
<tr>
<td>Enablement</td>
<td>Yes – reducing barriers for access to cardiac rehabilitation through telehealth is equitable</td>
</tr>
</tbody>
</table>

APEASE = affordability, practicability, effectiveness and cost effectiveness, acceptability, side-effects, and equity
Table 6.4 Selection of policy categories to support the delivery of the programme

<table>
<thead>
<tr>
<th>Policy category</th>
<th>Does the policy category meet the APEASE criteria?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication/marketing</td>
<td>Yes – provision of written information shown to be effective in previous studies (Chapter 2, section 2.11) and is widely used in current practice</td>
</tr>
<tr>
<td>Guidelines</td>
<td>Yes – changes to ‘clinical care pathways’ is required to better address the needs of patients (including those living rurally) and therefore equitable</td>
</tr>
<tr>
<td>Fiscal measures</td>
<td>No – implementing taxes not acceptable, affordable or practicable</td>
</tr>
<tr>
<td>Regulation</td>
<td>No – establishing rules not acceptable or equitable</td>
</tr>
<tr>
<td>Legislation</td>
<td>No – not practicable</td>
</tr>
<tr>
<td>Environment/social planning</td>
<td>Yes – providing one-on-one support from peers previously shown to be effective (Chapter 2, section 2.11) and support from health professionals highly desirable according to participants in the observational study (Chapter 4)</td>
</tr>
<tr>
<td>Service provision</td>
<td>Yes – inpatient service provision: all hospital services in the survey study (Chapter 5) currently commit time to preparing people to engage in activity and therefore acceptable and affordable; outpatient service provision outside of cardiac rehabilitation: only currently provided by three hospital sites (Chapter 5) but follow up support highly desired by patients, including those living rurally (Chapter 4). In addition follow up support has previously been shown to be effective (Chapter 2, section 2.11)</td>
</tr>
</tbody>
</table>

APEASE = affordability, practicability, effectiveness and cost effectiveness, acceptability, side-effects, and equity
Step 7. Identify BCTs and intervention components

From the list of BCTs relevant to each of the selected intervention functions provided in the BCW, a long list of affordable, practicable, safe and equitable BCTs was developed for potential inclusion in the programme (Table 6.2). Note: many of the BCTs potentially address more than one identified behaviour and therefore appear more than once in Table 6.2. A long list of intervention components (that is, practical examples of how the BCTs could address the relevant identified target behaviours) were identified (Table 6.5).

6.6.5 Phase 3: Determining participant preferences for programme components and modes of delivery

Following the identification of potential intervention components, a questionnaire was developed to determine former patient participant perceptions of the perceived effectiveness and acceptability of the proposed BCT’s or intervention components (Appendix 6.15). To simplify the questionnaire, some BCTs were condensed into one item. For example, all BCTs that referred to providing follow up support from health professionals (BCT 2.2, 3.1 and 3.3) were condensed into one questionnaire item “Receive follow up support from health professionals.” For some BCTs, two items were created for the questionnaire to provide greater differentiation in the responses. For example, “Provide instructions for performing appropriate/safe upper and lower limb strength exercises was separated into two items: “Know about arm strengthening exercises” and “Know about leg strengthening exercises”.

The questionnaire asked participants to state if they thought that each BCT was, or would have been, ‘extremely helpful’, ‘very helpful’, ‘somewhat helpful’, ‘a little bit helpful’ or ‘not at all helpful’. The initial decisions for whether to potentially include each BCT was pragmatically determined, on the basis of whether at least 50% of the respondents thought the BCT would be ‘extremely’ or ‘very helpful’, (therefore potentially included in the programme), versus 50% or more of the respondents stating the BCT would be ‘not at all’ to ‘somewhat helpful’ (therefore potentially exclude from the programme) (Table 6.6).
<table>
<thead>
<tr>
<th>Behaviour Change Techniques</th>
<th>Intervention components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Goal setting (behaviour)</td>
<td>Prompt the person to identify their own goals for activity engagement, for example walking frequency, distance and/or time; step counts; household tasks.</td>
</tr>
<tr>
<td>1.2 Problem solving</td>
<td>Prompt the person to identify potential physical (e.g pain, fatigue), psychological (e.g lack of motivation) or environmental (e.g unfavourable weather conditions, steep streets) barriers to activity in and prompt them to plan ways to manage or overcome these barriers.</td>
</tr>
<tr>
<td></td>
<td>Identify challenges or limitations with performing necessary activities and discuss ways to modify the performance of the activity, including accessing support or assistance where required.</td>
</tr>
<tr>
<td>1.3 Goal setting (outcome)</td>
<td>Prompt the person to identify their own goals for activities of importance that they want to engage in, for example return to work, hobbies/recreational activities, community involvement.</td>
</tr>
<tr>
<td>1.4 Action planning</td>
<td>Prompt the person to plan how they will perform or progress PA including at least one of the following contexts: where, with whom, frequency, duration and intensity.</td>
</tr>
<tr>
<td>1.5 Review behaviour goal(s)</td>
<td>Prompt the person to review their own goals for PA engagement and modify them if required.</td>
</tr>
<tr>
<td>1.7 Review outcome goals</td>
<td>Prompt the person to review their own goals for returning to activities of importance and modify the goals if required.</td>
</tr>
<tr>
<td>2.2 Feedback on the behaviour</td>
<td>Provide feedback to the person about their progress/levels of engagement in physical activity.</td>
</tr>
<tr>
<td>2.3 Self-monitoring</td>
<td>Prompt the person to monitor physical responses during PA, for example pain, fatigue or breathlessness to determine limits for PA engagement.</td>
</tr>
<tr>
<td></td>
<td>Ask the person to monitor and reflect on progress by recording daily activity in a diary and/or use pedometer to monitor and record daily steps.</td>
</tr>
<tr>
<td></td>
<td>Prompt person to record or reflect on how they feel after engaging in activity.</td>
</tr>
<tr>
<td>3.1 Social support (unspecified)</td>
<td>Provide information about other sources of information.</td>
</tr>
</tbody>
</table>
Provide a way for the person to contact health professionals for support if required.

Contact the person in person or via online videoconference, phone, email or text in order to encourage, guide and remind the person to engage in activity.

Send automated text messages to remind and encourage to engage in activity.

Prompt the person to access support from health professionals by attending cardiac rehabilitation.

Provide funding for visits to local physiotherapists or exercise specialists to access support and guidance from health professionals if they do not have access to cardiac rehabilitation.

Provide information about where to find further information about PA engagement.

Provide automated text messages to remind about PA.

Inform support person/s about the need to provide the person with encouragement and support for PA engagement.

Provide the opportunity to talk about PA with others who have previously undergone CABG surgery.

3.2 Social support (practical) Advise or arrange for someone to accompany the person during walks or activity to provide assistance if required.

Inform the support person to provide practical assistance when required, for example assistance with dressing or with household tasks until the person is able to perform them themselves.

3.3 Social support (emotional) Advise or arrange for someone to accompany the person during walks to provide reassurance, encouragement and/or emotional support until they feel confident to go on their own.

Health professional contact the person in person or via online videoconference, phone, email or text in order to reassure the person about the safety of engaging in activity.

Provide person with encouragement and reassurance about activity either in person, or via online video conferencing, phone or text messaging.

Inform support person/s about the importance of providing encouragement and reassurance about PA, for example accompany
on walks or watch out for them during activities in order to increase confidence and reduce fear and anxiety.

Provide the opportunity to talk about PA with others who have previously undergone CABG surgery.

### 4.1 Instruction on how to perform a behaviour

Provide a set programme to gradually progress PA e.g. walking programme and activities to introduce each week.

OR

Provide a general guide for progressing PA with options for individualising (e.g. taking into account physical capability and using examples from person’s own context/interests where possible).

Provide instructions about how to self-monitor responses during activity, for example RPE, breathlessness, discomfort.

Provide information about how to manage physical symptoms e.g. balance rest with activity if fatigued; modify activity and take medication if pain present; slow down if feel tired, breathless or pain.

Provide instructions about sternal precautions, including how to perform activities in a way that minimises sternal loading and when it is safe to engage in loaded upper limb activities.

Provide instructions for performing appropriate/safe upper and lower limb strength exercises.

Provide instructions for engaging in a variety of types of aerobic exercise following CABG surgery.

Provide information about exercises that can be done indoors when the weather is unfavourable.

### 5.1 Information about health consequences

Provide information about the short and long term benefits of PA for people who have had CABG surgery e.g. secondary prevention, improve quality of life, return to activities of importance earlier.

Provide information about the potential health consequences or risks associated with not engaging in PA.

### 5.3 Information about social and environmental consequences

Provide information about the social benefits of PA engagement following CABG surgery, for example faster return to meaningful or important activities.

### 5.4 Monitoring of emotional consequences

Prompt the person to reflect and/or record how they feel after engaging in activity.
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.6 Information about emotional consequences</td>
<td>Provide information about how PA helps to improve mood and mental well-being.</td>
</tr>
<tr>
<td>6.1 Demonstration of the behaviour</td>
<td>Provide a visual demonstration, e.g. via online video, for how to perform common daily activities and exercises. Provide stories or examples from former patients about: - how they engaged in PA in order to build up their fitness - how activity modification enabled activity participation - establishing a habit of engaging in PA - how they managed physical symptoms in order to allow activity engagement - the need for motivation, determination and perseverance to engage in activity - the need to make a conscious decision to engage in activity - the positive benefits of engaging in activity after heart surgery - varying experiences and outcomes of activity engagement following CABG surgery - how they built their confidence through progressive engagement in PA - about the importance of support from spouse, family and friends - how engaging in activity has enabled improved health and/or quality of life</td>
</tr>
<tr>
<td>6.2 Social comparison</td>
<td>Show the person, e.g. through stories, other peoples experiences with engaging in activity following CABG surgery. Provide the opportunity to talk about PA with others who have previously undergone CABG surgery.</td>
</tr>
<tr>
<td>6.3 Information about others approval</td>
<td>Provide stories from former patients about what they think about engaging in activity following CABG surgery, for example benefits and strategies to enable PA.</td>
</tr>
<tr>
<td>7.1 Prompts and cues</td>
<td>Put stickers/notes near chair or alarm/notifications on phone to remind the person to engage in activity.</td>
</tr>
<tr>
<td>8.1 Behavioural practice</td>
<td>Prompt people to take an active role in planning and practising increasing PA during their inpatient stay.</td>
</tr>
<tr>
<td>8.3 Habit formation</td>
<td>Prompt the person to identify a time of day that best suits them to regularly go for a walk/perform exercise.</td>
</tr>
<tr>
<td>8.7 Graded tasks</td>
<td>Prompt the person to engage in easy/less physically challenging tasks initially and then gradually increase difficulty/engage in more physically demanding tasks.</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>9.1 Credible source</strong></td>
<td>Present written and/or verbal information from a health professional e.g. physiotherapist, nurse or doctor to emphasise the importance of engaging in activity following CABG surgery. Provide written and/or verbal information from a health professional to describe the need to be realistic and that recovery of function will vary between individuals.</td>
</tr>
<tr>
<td><strong>9.2 Pros and cons</strong></td>
<td>Prompt person to list and compare reasons for wanting and not wanting to engage in activity.</td>
</tr>
<tr>
<td><strong>10.7 Self-incentive</strong></td>
<td>Prompt the person to provide themself with a reward (e.g. material object or social outing) for engaging in activity.</td>
</tr>
<tr>
<td><strong>12.6 Body changes</strong></td>
<td>If possible, prompt aerobic and strength training prior to surgery (elective procedures), including pre-operative exercise programmes. (Note: this was considered out of the scope of the current study since the programme was focused on how to support PA during the first 12 weeks post-hospital discharge). Pre-operatively and prior to discharge prompt practice of functional tasks required post-operatively, for example rising from chair without using arms, getting out of bed using log roll technique. Prompt aerobic exercise engagement and strength training post-operatively.</td>
</tr>
<tr>
<td><strong>13.2 Framing/reframing</strong></td>
<td>Identify alternative activities that the person can engage in apart from walking or other undesired forms of activity/exercise.</td>
</tr>
<tr>
<td><strong>15.1 Verbal persuasion</strong></td>
<td>Tell the person that they can safely and successfully increase their physical activity, despite their recent heart surgery. Inform support person/s about the need to encourage the person to engage in PA.</td>
</tr>
<tr>
<td><strong>15.2 Mental rehearsal of successful performance</strong></td>
<td>Prompt the person to imagine engaging in a particular activity prior to doing it.</td>
</tr>
<tr>
<td><strong>15.4 Self-talk</strong></td>
<td>Prompt the person to tell themselves that they have the ability to engage in PA and that a walk will help them feel better. Prompt the person to tell themselves to remain positive even when things feel difficult.</td>
</tr>
</tbody>
</table>

PA = physical activity; CABG = coronary artery bypass graft
The second focus group, comprising two former patient participants (one rural male and one urban female) and the health professional participants was held to reach a consensus agreement on which items to include or exclude based on the perceived practicability, effectiveness, affordability and acceptability of each of the items. Particular focus was held on discussing the items identified for potential exclusion to ensure that potentially important and/or helpful items were not being prematurely excluded. The final decisions regarding the inclusions and exclusions, along with relevant supporting quotes from the focus groups where available, are provided in Table 6.6. The consensus decisions by the group largely agreed with the initial decisions for exclusion based on the questionnaire responses. However, there were nine items where the focus group either disagreed with the initial categorisation or agreed with the decision but with some caveats. A summary of the discussions leading to these decisions follows:

Item: Know when it is safe to engage in physical activity

There was acknowledgement within the group that fear of doing damage to the sternum is a barrier to engaging in and progressing physical activity, even after the sternal precaution period has ended.

_ I think people get very fearful of their sternum, a little bit over the top fearful because they won’t want to lift anything so I just wonder if there’s too much of that and not enough of saying, because sometimes I see people in clinic at four to six weeks and they’re still not lifting anything and even in the book they’re supposed to be progressing a bit more and doing a little bit more, so I do think they get a little bit fearful. I don’t know if you guys have experienced that but they didn’t really want to lift anything at all until three months was up because then everything was healed and back to normal. So maybe there’s a little much emphasis on the not lifting and need a little bit more on when it’s safe to start._ (Health professional participant (HPP) 1)

The group decision was to include information about when they can progress their physical activity (especially upper limb activities), but recognising this needed to be balanced with ensuring that people know to adhere to the sternal precautions during the first 6-8 weeks.

_It’s just a nuisance though if someone does break their wires, cause they’re not an easy thing to repair and fix. Yeah so I think there is some merit in being cautious for the first 6 to 8 weeks._ (HPP2)
Item: Know how to listen to my body during physical activity

There was general agreement about the value of instructing people how to monitor their responses to physical activity to know when to slow down or stop, or when to do more.

*I agree, and often don’t think to discuss the side effects other than the major red flags listed at the beginning of the booklet.* (HPP3)

However, the health professionals were less comfortable than the former patient participants with using the term ‘listen to my body’ due to the vague nature of the term, and the fact that it could be interpreted differently by different people.

*“Listening to my body” is a bit controversial isn’t it. Because if I listened to my body I wouldn’t exercise ever. Because I don’t want to. So you’ve got to find a balance with that phrase it can mean so many different things for different people. Because some people are really high achievers and they just want to go 100 miles an hour straight away and then other people who go I don’t know I just feel like I’m going to fall apart I don’t want to do anything. So it’s not that useful a phrase.* (HPP1)

Therefore, while the group agreed to this item in principle, the preference was to teach people to use more objective and specific measures, such as the ‘Rate of Perceived Exertion’.

*I think what is useful is what we often talk about in hospital and at the cardiac rehab afterwards is measuring your rate of perceived exertion, how hard you think you’re working. And people are taught to do that in hospital and it’s in the booklet that they’re given when they leave hospital so I would interpret “how to listen to my body” as that rate of perceived exertion.* (HPP4)

Item: Know about exercises I can do to strengthen my arms

The group agreed that arm strengthening exercises are a worthwhile inclusion in the programme. However, this was countered by reluctance amongst the health professional participants for these types of exercises to be introduced too early due to the risk of causing sternal complications.

*It is wise to be cautious about the upper body for the first eight weeks really.* (HPP4)
Ah probably again about the arms, I have to say when we have bigger patients we do scare them we honestly do. So I think tailoring the exercises to each individual patient is probably good. Obviously sternal dehiscence, people are never ever the same again after that their whole quality of life is destroyed. So if we can not see one in a couple of years it would be good. But yeah it’s tricky it’s really tricky. (HPP2)

Another contributor to the hesitation about providing people with information about arm strengthening exercises too early was the inability to monitor that people did not engage in these exercises during the sternal precaution period.

But maybe building that into the book ... but the thing is who’s going to monitor that or if there is such a thing as monitoring it I don’t know if that’s even worthwhile. (HPP2)

Therefore, the consensus decision was to include the arm exercises, but not to introduce them until after the sternal precaution period had ended.

Item: Receive follow up support from health professionals

There was agreement amongst the group about the potential value of health professionals providing follow up support after discharge. One key reason described by the group for needing to provide ongoing support was the difficulty patients often have in retaining the large amount of information that they are provided with, prior to discharge.

When you go to go home they tell you so much it’s like you can’t take it all in.

(Participant 7)

There was a lack of consensus from the questionnaire responses regarding the optimal timing for providing follow up support. It was suggested, by the group, that around two weeks post-discharge, once people have had time to adjust to being home, may be a good time to initiate follow up support:

Patients find it quite hard to absorb all of the information they are given, they are given an overload of information ... So I think after being at home for a week or two would be a better time. (HPP4)
Yeah I reckon it would be a two week period before you start needing to look at your exercise programme as such because it does take you a couple of weeks just to get adjusted to getting back to being in your own home and taking on the fact that yeah your not what you were before you went away. (Participant 14)

However, the health professionals were concerned about the lack of resources available to provide such support.

Now that follow up support from health professionals, that’s a problem because of resource. It’s not resourced to do all that really. (HPP1)

As a potential solution to minimise the impact of expanding post-discharge services, there was suggestion amongst the group that follow up regarding physical activity could be provided during contacts with health professionals that already exist (e.g. district nurse visits (if needed), risk factor clinic follow up with cardiac nurse educator (though this would be Dunedin-based patients only) and follow up appointment with the surgical team).

The use of online videoconferencing was also identified, as a potential mode to provide follow up support for physical activity engagement for those living outside of the main cities.

It might be possible to follow up some people with video conference and we did that during the Covid lockdown. And even did some exercise assessments with video conferencing. So that could be something that we could develop further. (HPP5)

In summary, the overall consensus decision was that support would be valuable to include, but only if additional resourcing was available to enable it.

Item: Have a walking buddy until my confidence increases

Having a ‘walking buddy’ was agreed by the group to be a good idea, especially initially when confidence levels are low:

The other thing is the confidence thing too cause you’re a wee bit afraid, so yes it is nice to have someone with you initially. (Participant 7)
Yes, and people often feel more secure if there’s somebody with them just in case something goes wrong or they get to a point where they simply can’t go on there’s somebody else to go and get help or get the car. (HPP3)

However the health professional participants stated that the hospital service would be unable to provide or find a walking buddy for those who live alone and/or have no support person available.

Item: Talk with others who have had CABG surgery

The group recognised the potential value of patients talking with peers about their recovery experiences. However some of the health professionals in the group were reluctant to implement peer support as part of the programme or service due to experiences in the past of well-meaning volunteers giving unhelpful advice or support.

*It was good for some people but it depended on who the willing volunteer was and sometimes people who are not health professionals put a slant on it that may not be helpful to that individual ... So it’s a little bit tricky it needs policing in some way ... I think we had some discussion about it and it was helpful for some people but it was a bit scary for others.* (HPP4)

*I think that’s actually really reasonable I haven’t really thought about this before because we’ve always had a lot of volunteers talk to our patients at other hospitals, but now that you mention it it could actually be detrimental just depending on whose doing the talking and who they’re speaking with, you know someone who has had a really protracted post-op course or you know was quite a frail person before hand it may not be appropriate for someone whose got a lot of zip be telling them they should be doing better, so.* (HPP2)

Therefore, the consensus decision was not to include a structured peer support service as part of the programme.

Feedback regarding the programme components to be included and excluded was subsequently provided as part of Questionnaire 2 (Appendix 39) to allow participants to
provide feedback on these decisions. No major disagreement for the final decisions was received from any of the former patient participants.

Step 8. Identify mode of delivery

Questionnaire 1 (sent to former patient participants in phase 3; Appendix 38) also included questions regarding preferences for the mode of the delivery of programme resources and follow up support. Written/booklet format was the most preferred option for the programme resources, followed by a website, with a phone App being the least preferred option. The name of the booklet currently provided (and that the participants would have received when they left hospital) is called “Road to Recovery”. Most participants expressed a liking for this name and no participants suggested an alternative name for the resource. The image on the front cover of the current booklet has a cartoon heart character. Most participants said that they liked the image, and that a cartoon heart character was the preferred image for the front cover, followed by photo/s of real people, with a heart logo and a cartoon person being the least preferred options. The focus group consensus was to retain the name “Road to Recovery” and to use a new cartoon heart character for the images. The group agreed that using such images would work better than photographs, as it is easier to represent all people with a cartoon than to select a person of a particular gender, race, age and/or size that others might not relate to. It was therefore decided to contract the services of a graphic designer/illustrator, to assist with the redesign of the heart character and to include more illustrations throughout the book to increase the visual appeal.
<table>
<thead>
<tr>
<th>Intervention components (BCT code/s addressed)</th>
<th>Provisional decisions to include* (I) or exclude** (E)</th>
<th>Focus group consensus decisions</th>
</tr>
</thead>
</table>
| Know about the short-term benefits of PA (5.1, 5.3, 5.6)                                                    | I: n=20  
E: n=0                                           | Include                          |
| Know about the long-term benefits of PA (5.1, 5.3, 5.6)                                                     | I: n=19  
E: n=1                                           | Include                          |
| Know about the risks or consequences of not engaging in PA (5.1)                                           | I: n=18  
E: n=2                                           | Include                          |
| Know how to engage in PA (4.1)                                                                               | I: n=18  
E: n=2                                           | Include                          |
| Know how to manage physical barriers to PA (4.1)                                                            | I: n=19  
E: n=1                                           | Include                          |
| Know about exercises to do indoors (4.1, 12.6)                                                              | I: n=18  
E: n=2                                           | Include                          |
| Know about other types of exercise apart from walking (4.1, 12.6, 13.2)                                     | I: n=19  
E: n=1                                           | Include                          |
| Know when it is safe to engage in activity (4.1)                                                            | I: n=18  
E: n=2                                           | Include (as long as follow sternal precaution restrictions for 6-8 weeks) |
| Know how to modify activities in order to do them safely or comfortably (4.1)                               | I: n=18  
E: n=2                                           | Include                          |
<table>
<thead>
<tr>
<th>Topic</th>
<th>Include, but use different language to “listen to my body”, e.g. use RPE</th>
<th>I: n=19</th>
<th>E: n=1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Know how to “listen to my body” during PA (4.1, 2.3)</td>
<td>Include</td>
<td>I: n=17</td>
<td>E: n=3</td>
</tr>
<tr>
<td>Know to be realistic and that everyone recovers at a different rate (9.1)</td>
<td>Include</td>
<td>I: n=1</td>
<td></td>
</tr>
<tr>
<td>Know about arm strengthening exercises (4.1, 12.6)</td>
<td>Include after week 8 post-op</td>
<td>I: n=15</td>
<td>E: n=5</td>
</tr>
<tr>
<td>Know about leg strengthening exercises (4.1, 12.6)</td>
<td>Include (no time restrictions)</td>
<td>I: n=15</td>
<td>E: n=5</td>
</tr>
<tr>
<td>Have a set schedule to follow for walking (4.1, 12.6)</td>
<td>Include</td>
<td>I: n=13</td>
<td>E: n=7</td>
</tr>
<tr>
<td>Have general guidelines so I can progress at my own pace (4.1, 12.6)</td>
<td>Include alongside set schedule to allow for individualisation</td>
<td>I: n=14</td>
<td>E: n=6</td>
</tr>
<tr>
<td>Know where to find more information (3.1)</td>
<td>Include</td>
<td>I: n=18</td>
<td>E: n=2</td>
</tr>
<tr>
<td>Receive follow up support from HP’s (2.2, 3.1, 3.3, 15.1)</td>
<td>Ideally include (but not possible with current resources)</td>
<td>I: n=12</td>
<td>E: n=8</td>
</tr>
<tr>
<td>Be given contact details of HP’s to access support (3.1)</td>
<td>Include</td>
<td>I: n=12</td>
<td>E: n=8</td>
</tr>
<tr>
<td>Attend in person cardiac rehabilitation programme (3.1)</td>
<td>Include (if available locally)</td>
<td>I: n=11</td>
<td>E: n=9</td>
</tr>
<tr>
<td>Have HPs advise whanāu/support persons that I need their encouragement and support (3.1, 3.2, 3.3, 15.1)</td>
<td>Include</td>
<td>I: n=17</td>
<td>E: n=3</td>
</tr>
<tr>
<td>Read or watch other people’s stories about getting back into activity (6.1, 6.2, 6.3)</td>
<td>Include</td>
<td>I: n=11</td>
<td>E: n=9</td>
</tr>
<tr>
<td>Activity</td>
<td>Include</td>
<td>Exclude</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>---------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Receive automated text messages to encourage or remind me to engage in PA (3.1)</td>
<td>I: n=4</td>
<td>E: n=16</td>
<td></td>
</tr>
<tr>
<td>Have a “walking buddy” until my confidence increases (3.2)</td>
<td>I: n=15</td>
<td>E: n=5</td>
<td></td>
</tr>
<tr>
<td>Talk with others who have had CABG surgery (3.1, 3.3, 6.2)</td>
<td>I: n=16</td>
<td>E: n=4</td>
<td></td>
</tr>
<tr>
<td>Triggers or cues to remind to engage in PA (7.1)</td>
<td>I: n=4</td>
<td>E: n=16</td>
<td></td>
</tr>
<tr>
<td>Write a pros and cons list for engaging in PA (9.2)</td>
<td>I: n=2</td>
<td>E: n=18</td>
<td></td>
</tr>
<tr>
<td>Mentally rehearse an activity before attempting it (15.2)</td>
<td>I: n=5</td>
<td>E: n=15</td>
<td></td>
</tr>
<tr>
<td>Tell myself that I have the ability to engage in PA (15.4)</td>
<td>I: n=11</td>
<td>E: n=9</td>
<td></td>
</tr>
<tr>
<td>Tell myself to stay positive (15.4)</td>
<td>I: n=16</td>
<td>E: n=4</td>
<td></td>
</tr>
<tr>
<td>Set my own goals for engaging in physical activity (1.1, 1.3)</td>
<td>I: n=18</td>
<td>E: n=2</td>
<td></td>
</tr>
<tr>
<td>Review my own goals (1.5, 1.7)</td>
<td>I: n=13</td>
<td>E: n=7</td>
<td></td>
</tr>
<tr>
<td>Create a plan for with whom, when and where to engage in PA (1.4, 8.1)</td>
<td>I: n=15</td>
<td>E: n=5</td>
<td></td>
</tr>
<tr>
<td>Self-monitor PA using an activity diary (2.3)</td>
<td>I: n=13</td>
<td>E: n=7</td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Include/Exclude</td>
<td>I: n</td>
<td>E: n</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-----------------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Self-monitor PA using an activity tracker e.g. FitBit if I have access to one (2.3)</td>
<td>Include</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Reflect on positive benefits following PA engagement (2.3, 5.4)</td>
<td>Include</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Reflect on how I feel to know if done too much/ not enough PA (2.3)</td>
<td>Include</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Identify barriers to PA and plan ways to overcome them (1.2)</td>
<td>Include (but don’t address until approximately two weeks post-discharge)</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>Develop a habit of engaging in PA (8.3)</td>
<td>Include</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>Provide myself with a reward for engaging in PA (10.7)</td>
<td>Exclude</td>
<td>3</td>
<td>17</td>
</tr>
</tbody>
</table>

PA = physical activity; HP = health professional; CR = cardiac rehabilitation. *‘Include’ refers to a decision based on 50% or more of the questionnaire respondents stating the item would be ‘extremely’ or ‘very helpful’; **‘Exclude’ refers to a decision based on less than 50% of respondents stating the item would be ‘somewhat’, ‘a little bit’ or ‘not at all helpful’.
Questionnaire 1 (Appendix 38) included two items asking participants for their preferences regarding videos providing information about engaging in physical activity and showing examples of exercises that were safe to do at various stages of recovery after CABG surgery. Ten participants thought that access to such videos would be ‘extremely’ or ‘very helpful’. One former patient participant in the focus group said they would prefer to watch a video online than read about something.

*But the thing with the booklet is if you’re a reader of booklets that’s good but I’m a listener to people, interact with people learn from that. If I look at something in a booklet (whistles and indicates over his head), it doesn’t register... Yeah talking to people and listening to them I feel like I can pick it up straight away.* (Participant 14)

Focus group members also stated that such videos would address equity issues like literacy levels. The focus group consensus was therefore that a website containing information and videos portraying messages from health professionals, exercise demonstrations and former patients sharing their stories would be of value. It was decided that the development of such online resources would be targeted in the future if/when funding is able to be secured.

In regard to the mode of delivery for follow up support, ‘in person’ was the most preferred option, followed by phone, online videoconference call, text and then email (in that order). The focus group also agreed that in person visits would be preferable, though this could create a burden for patients to travel to appointments or be costly to provide if the physiotherapist was to travel to the patient. One of the outpatient cardiac rehabilitation physiotherapists described the success of using online telehealth (via phone and videoconference calls) to deliver cardiac rehabilitation during the Covid-19 lockdown and was enthusiastic about the potential for using telehealth to provide follow up support to people following CABG surgery. There was concern that videoconference calls may not be possible for some people living rurally, however the group also acknowledged that in such situations, phone calls could be made instead.

Questionnaire 1 (Appendix 38) also included an item regarding preferences for accessing follow up support including group online information and exercise sessions. While seven people thought that group online information sessions and 10 participants thought that group online exercise sessions would be ‘extremely’ or ‘very helpful’, most of these people (n=5 and n=6 respectively) lived in a major city where these services were already available in
person. During the focus group session it was decided that such sessions would be difficult to deliver during the early post-discharge period because people would be at different stages of recovery. In addition, one of the former patient participants said that they would only attend such programmes after hours, while the health professional participants said that an after hours’ service would be difficult to provide with the current resources. It was therefore decided not to include group online sessions in the programme, since these were deemed by the group to be neither practicable nor affordable.

The final potential mode of delivery for follow up support was to receive funding to see a local physiotherapist in private practice for advice regarding physical activity, if they were unable to access cardiac rehabilitation. Nine respondents said that this would be ‘extremely’ or ‘very helpful’, with four of these being from either rural or small town settings where access to cardiac rehabilitation was difficult due to travelling time and/or distance. One of the former participants in the focus group described how they went to their local private practice physiotherapist for advice about arm strengthening exercises, which they found incredibly valuable. However, while the health professionals within the focus group thought this would potentially be a very good solution, there was concern about affordability if such services were to be contracted out to the primary care setting compared to the DHB delivering these services remotely via telehealth. Therefore, it was decided not to include this mode of delivery for follow up support in the current programme.

6.6.6 Phase 4: Development of programme outline and resources

Based on the feedback received in phase 3 (questionnaire 1 and focus group 2), the research team developed a prototype programme outline and written resources. All of the practical applications that were approved by the study participants for inclusion in the programme are addressed either during the interactions with health professionals (either pre-operatively, or during the inpatient stay or post-discharge follow-up sessions), and/or by the information provided in the written resources. An overview of the programme outline is provided in Figure 6.6. A more detailed description of the programme, including how some of the follow up support could be provided within the existing framework of follow up appointments with health professionals, is provided in Appendix 40. The resources included two booklets: 1) “The Road to Recovery”, which contains information about physical activity
Figure 6.6 Overview of the programme to prepare and support people to engage in physical activity following coronary artery bypass graft surgery
engagement following CABG surgery and opportunities for individualised goal setting, and activity planning; and 2) “Stories from the Road to Recovery”, which contained excerpts from the former patient participant interviews relating to target behaviours for which demonstration of the behaviour through the provision of stories had been identified as a potential BCT. As part of this process, an illustrator was contracted, to create images for both the front cover and throughout the ‘Road to Recovery’ booklet, including an infographic depicting a winding road, which represents a timeline for the approximate times when various activities can be commenced. A third written resource was also developed outlining various arm strengthening exercises to be introduced after the follow up appointment with the cardiac surgery team (Appendix 41).

6.6.7 Phase 5: Results for feedback from questionnaire two and focus group 3

A copy of the prototype booklets and questionnaire two was sent to 21 former patient participants, and 19 responded. Note that the programme outline detailing the services delivered by health professionals in the inpatient and outpatient setting (Appendix 40) and the arm strengthening exercise resource (Appendix 41) were not sent to the former patient participants as it was decided that the appropriateness of these would best be determined by the health professionals in the focus group.

The questionnaire responses were overwhelmingly positive about both the content and presentation of the “Road to Recovery” booklet. For example, all 19 respondents said they found the content either extremely or very easy to understand, and either ‘extremely’ or ‘very helpful’. Several participants included additional optional comments about the booklet

    It's all in the booklets well done. (Participant 22)

    My feeling is that the booklet 'road to recovery' is easy to read and understand. Appears to cover the most appropriate aspects of recovery. (Participant 20)

    Could have done with having the booklets at the time so feel they will be very useful. Overall a well done production 8-9/10. (Participant 5)
I liked the booklet Road to Recovery and think this is well done. Would have been good earlier when I was recovering. (Participant 3)

Similarly, 19/19 respondents said that the “Road to Recovery” booklet was ‘extremely’ or ‘very visually appealing’, although four people suggested increasing the font size. Feedback from both former patient and health professional participants’ regarding the cartoon heart character and images in particular were extremely positive.

The front page [is] very impressive, loved it. (Participant 22)

Love the cover and illustrations. (Participant 7)

Here’s my comment – it was “Love this”. I like it because it’s so visual. And I like your little heart and I like the little road cause that goes with the journey that people go on so I thought it was great, yeah really loved it. Good job. (HPP1)

Only one participant was not supportive of the images as they thought that the cartoon imagery portraying the road to recovery was easier than it was in reality:

For me the cartoon symbolised emphasised that the road to recovery is a happy, simple affair...The cartoon is too simplified. (Participant 4)

Some participants provided suggestions regarding either additional content to include or seeking clarification of content included in the booklet. One participant asked for clarification of the “Keep your move in the tube” diagram, which they found confusing to interpret. The draft booklet had included the sternal precautions information that is currently advised at the Southern DHB. This includes limiting lifting to 2-3 kg for 8 weeks, as well as a diagram from the KYMITT protocol showing how to perform various activities by keeping one’s arms “in the tube”. A discussion about combining KYMITT with conventional sternal precaution advice was initiated by the primary researcher, in third focus group, since this issue was related to a key finding from the survey study (Chapter 5) and the focus group presented an opportunity to discuss these concepts further. Concerns in the group were raised about some of the images in the KYMITT figure, particularly where it portrays a person lifting a box above their head using both arms. The medical representative was wary about letting people “lift to pain” and the feeling amongst the group was that if you allow too much leniency then some people will end up engaging in activities that will put them at risk of sternal
complications. There was also concern from the group that the principle of keeping your arms in the tube may be a difficult concept for some people to grasp (as evidenced by the comment above made by one former patient). The overall decision of the group was therefore to keep with the conventional sternal precautions as the “golden rule”. However, since getting out of bed and rising from a chair were common activities, it was agreed to retain the images and descriptions showing how to perform these activities during the first eight weeks or until the sternum is fully healed.

Table 6.7 shows additional suggestions from the participants’ regarding additional content to include in the programme. These comments and suggestions were discussed during focus group 3. Table 6.7 also includes the consensus decisions regarding these suggestions.

Additional suggestions and decisions from the focus group for changes to the ‘Road to Recovery’ booklet were:
- Say “You might like to have somebody with you when you go for a walk…” so that people do not think they cannot go for a walk if they are alone.
- Include a comment that says it is ok to not feel up to going for a walk and that it is ok to have the occasional rest day. Participant 14 described that if you do feel like a walk when you are feeling terrible and it is not enjoyable then that could reduce your desire to want to go for a walk next time.
- Include a comment about shortness of breath and what to do if shortness of breath with activity worsens or if you have shortness of breath at rest.
- Include a ‘frequently asked questions’ section that includes information about sex, and more information about getting back into bike riding, golf and swimming.
- Swap the positions of ‘walking up hills’ and ‘swimming’ on the infographic so that walking up hills comes before swimming.

Feedback from the former patient participants regarding the “Stories from the Road to Recovery” booklet was also overwhelmingly positive. Most participants thought these stories were either ‘extremely’ (n=4) or ‘very’ (n=12) helpful. The remaining participants thought these stories were only ‘somewhat’ (n=1) or ‘a little bit’ (n=2) helpful. However, the two participants who thought the stories would be only ‘a little bit helpful’ both included a comment acknowledging that while it may not have been helpful for them, others might benefit from the stories. For example, Participant 3 said “This type of information is not my
thing but would be helpful to some after all we are all different.” Eighteen participants thought that the number and length of stories were ‘about right’, with only one participant responding that they thought there were ‘too many’ stories and that they were ‘too long’. Feedback from one health professional (who was unable to attend the final focus group) highlighted the predominance of male and Caucasian voices in the stories, which could potentially mean the stories were less engaging for females and people of other ethnicities.

Sixteen participants provided feedback regarding their preferences for the images and information about the people sharing their story in the “Stories from the Road to Recovery” booklet. Of these, seven participants preferred a cartoon image of a person/people, seven preferred a photo of several real people, and two preferred a photo of one real person on the front cover. The focus group consensus was to include cartoon images of people on the front, preferably those that reflect a range of genders, ages and ethnicities. Fourteen participants agreed that it would be good to include more information, for example age and occupation, as well as a photograph of the person alongside the stories. However, two of these respondents commented that some information about the person would be good, but not a photograph. The focus group decision for these factors was to: 1) include a cartoon pictures of people on the front, preferably ones that reflects a range of genders, age and ethnicities; and 2) to include brief demographic information about the people sharing their stories, but not photographs. The main reason expressed by the group for not wanting to use photographs of real people for the front cover or throughout the booklet was that in a small country like NZ there is a chance that people may be recognised by other users of the booklets. In addition, when the person in the photograph eventually passes away, seeing their photograph in the booklet could cause distress for whānau or friends if they were to come across the booklet in the future. Also, the participants in the study were all of NZ European decent, and therefore there is potential for people of other ethnicities to not relate to the people in the photographs.
Table 6.7 Suggested changes from questionnaire two and subsequent consensus decisions by the focus group

<table>
<thead>
<tr>
<th>Suggestions from former patient participants (number of participants who made the suggestion)</th>
<th>Consensus decisions from focus group (with explanation where required)</th>
</tr>
</thead>
<tbody>
<tr>
<td>More information about managing pain/impact of pain (n=3)</td>
<td>No change required (the information was deemed adequate and those who need more information can discuss with health professional at follow up).</td>
</tr>
<tr>
<td>Include information about the potential for sternal wires to cause problems (n=1)</td>
<td>No change required. This is a rare complication that would be addressed by health professionals if required. There was concern that by telling people this is a potential problem that some patients could “look” for it as a problem and may add additional unnecessary anxiety.</td>
</tr>
<tr>
<td>Include a box when an activity goal should be achievable by (n=1)</td>
<td>Do not include this as it is hard to predict individuals’ recovery trajectories. If the target time frame is too soon/easy the goal is meaningless in regard to encouraging PA, and if it is too hard it may create frustration or disappointment.</td>
</tr>
<tr>
<td>Include a way to recognize when you have achieved your goals (n=1)</td>
<td>Include a tick box with space to write the date when a particular activity goal has been met.</td>
</tr>
<tr>
<td>State that having a walking buddy also makes exercise more enjoyable and social (n=1)</td>
<td>Add this information to the reasons for having a “walking buddy”.</td>
</tr>
<tr>
<td>State that a companion may be useful in all types of exercise/activity, not just during walking (n=1)</td>
<td>Expand the idea of a “walking buddy” to include having someone with them during any activity where support or company is required/desirable. Add this suggestion to the booklet.</td>
</tr>
<tr>
<td>Take a mobile phone with you when go walking on own (n=1)</td>
<td>Add this suggestion to the booklet.</td>
</tr>
<tr>
<td>If no hills around, find some steps to go up and down (n=1)</td>
<td>Add this suggestion to the booklet.</td>
</tr>
<tr>
<td>Emphasize where it says it can feel scary and that fatigue and pain are common problems (n=1)</td>
<td>No change required. In particular the former patient participants in the group thought that the information included was sufficient and that people have varying experiences so it may not be appropriate to emphasize any particular problems over others.</td>
</tr>
</tbody>
</table>
In regard to the selected BCTs and intervention components, the vast majority of participants agreed with the final decisions about the inclusions and exclusions. Similarly, overall the focus group were satisfied with the programme outline and had no suggestions for changes to be made. They agreed that the proposed outline for the timing of follow up support was appropriate and appreciated the caveat that such support could only be provided if additional funding was available. The inclusion of providing arm strengthening exercises was very well received by the former patient participants in the focus group. However, the health professionals were not completely sure who the best health professional would be to introduce these arm exercises, or how the instructions and equipment would be delivered to the patient. It was suggested by the group that when the patient has their follow up appointment with the surgical team, they could see either a cardiac rehabilitation nurse or physiotherapist for their week 8 follow up during the same visit. That way the equipment could be provided, and the arm exercises taught in person.

6.6.8 Phase 6: Refinement to the programme outline and resources

Following the feedback and decisions from phase 6, refinements were made to the written resources as required. The final versions of the ‘Road to Recovery’ and ‘Stories from the Road to Recovery’ booklet are found in Appendices 42 and 43 respectively. No changes were required for the programme outline (Appendix 40) or the arm strengthening exercises resource (Appendix 41).

6.7 Discussion

This chapter described the systematic development of a programme that aims to facilitate engagement in physical activity during the first 12 weeks following CABG surgery. The programme was developed using the BCW, which provided a comprehensive approach for identifying theory-based intervention components. All the steps as outlined by the BCW, including using the COM-B model and TDF, were applied to perform a behavioural analysis from the qualitative data. This was followed by the application of the taxonomy of behaviour change (BCTv1) to select relevant strategies and design the intervention components. The study identified 31 potential BCTs deemed to be relevant to the programme. Consultation with stakeholders reduced the final number of BCTs to be included in the programme to 26. This number is realistic in light of previous studies, which have utilised the BCW for their
intervention design. For example, Ojo et al. (2019) identified 31 BCTs to target breaking up sedentary time in the workplace. Similarly, Walsh et al. (2019) utilised 22 BCTs in the development of an eHealth intervention for the self-management of cardiovascular disease.

Current cardiac rehabilitation guidelines provide few clinical guidelines to inform practice for preparing and supporting people who have had CABG surgery to engage in physical activity following hospital discharge. Additionally, to date intervention studies targeting engagement in physical activity during the early recovery period in this population are relatively few in number, with approximately half of these studies reporting inconclusive findings. Not only has this study enabled the development of a programme to target physical activity engagement, it has also provided insights for clinicians regarding what to incorporate into their clinical practice when working with people following CABG surgery. While the programme has yet to be tested and refined in a feasibility study or evaluated for effectiveness in a RCT, consulting with stakeholders in the development process has ensured that the programme is perceived to be both relevant and potentially effective to patients and clinicians.

One of the key principles underpinning the development of the current programme was self-management. Several self-management strategies as described by Lorig (2003) were directly reflected in the selected BCTs, namely: problem solving, action planning and social support through partnership with health professionals. The BCT taxonomy does not include any BCTs specifically relating to resource utilisation or decision making. However, resource utilisation was addressed as part of the provision of social support by ensuring that people know how to contact health professionals or where to find more information. Decision making was woven through the programme with people being encouraged to set their own goals, self-monitor their physical activity engagement and take an active role in their activity planning.

The behavioural analysis in step four of the BCW revealed that, while all elements of the COM-B framework were found to be relevant, psychological capability and reflective motivation were the elements that had the most TDF domains and sources of behaviour associated with them. This highlights the importance of psychological contributions to engagement in physical activity following CABG surgery, which was also a key finding from the observational study described in Chapter 4.
One of the biggest psychological facilitators for physical activity engagement identified in both Chapter 4 and the current study was the need for self-motivation. The BCTs identified to potentially facilitate motivation included providing information about the health (5.1) and emotional (5.6) benefits of physical activity. However, knowledge of these benefits alone may not facilitate motivation. According to the SDT, recognising and valuing the benefits of a behaviour in relation to ones’ life context and personal goals is required to facilitate identified motivation for that behaviour. To therefore facilitate identified motivation, a section where people could record their recovery goals was included in the ‘Road to Recovery’ booklet to enable people to recognise and reflect on the benefit of physical activity for helping them to reach their recovery goals. Then, later in the booklet when it talks about struggling with lack of motivation, it encourages the person to reflect on their recovery goals and to think about how physical activity may help them to achieve their goals. The ‘motivation’ section in the booklet also includes advice to choose activities that the person finds enjoyable as, according to the SDT, this would enhance intrinsic motivation for physical activity. Allowing people such choices also encourages autonomy, which Deci and Ryan describe as a key innate psychological need. Selecting alternative activities that are more enjoyable was the intervention component for BCT 13.2 framing/reframing, whereby a negative view of physical activity could be reframed by choosing an alternative, more enjoyable activity. Providing a self-incentive or reward (BCT 10.7) was also proposed as a way to increase motivation for physical activity. However, this was largely rejected by the participants, which is not surprising given that incentives or rewards are external sources of motivation, which according to the SDT, are the least effective forms of motivation.

In summary, the final programme includes ways to increase intrinsic motivation (by choosing activities that are enjoyable) and introjected motivation (by informing people about the short and long term benefits of physical activity, as well as facilitating the person to reflect on how physical activity can help them to achieve their recovery goals). The final elements of the programme that were incorporated to facilitate motivation were: 1) examples of people needing self-motivation from the ‘Stories from the Road to Recovery’ booklet (Appendix 43) and 2) encouraging people to have an ‘activity buddy’ with whom to join them during physical activity which, as well as providing confidence, may increase the inherent enjoyment of the activity. These final elements also address another key innate psychological
need-relatedness, which is defined by Deci and Ryan as having a sense of shared experience and meaningful relationships.\textsuperscript{191}

While social opportunity had fewer TDF domains and sources or behaviour compared to psychological capability and reflective motivation, its importance to participants should not be underestimated. In both the observational study (Chapter 4) and the current study, support from spouses, whānau and health professionals was described by many participants as a vital part of their recovery. Support from health professionals was seen in Chapter 4 to be a potential way for participants to overcome psychological barriers such as fear and uncertainty. In a previous study by Bikmoradi et al. (2017), telephone counselling (including facilitating problem solving and answering questions), provided to CABG recipients six times during the first month following hospital discharge resulted in significantly improved physical, social and emotional quality of life (all \(p<0.001\)).\textsuperscript{256} Based on the findings of the systematic review previously undertaken by our research team,\textsuperscript{45} it appears that no study has previously investigated the effectiveness of providing individualised follow up support from health professionals, on facilitating physical activity engagement during the first three months CABG surgery. However, the provision of support from health professionals has been shown to result in improved physical activity engagement in other populations, including those with heart failure\textsuperscript{257} and post-cardiac rehabilitation.\textsuperscript{258} The provision of follow up support therefore has potential for improving physical activity engagement in the post-CABG surgery population as well.

A lack of equity for access to follow up support following CABG surgery is a problem that was identified in the observational study (Chapter 4), the survey of current practice (Chapter 5) and the current study. Equitable access to health care is a global\textsuperscript{259} and national priority.\textsuperscript{260} The programme designed in the current study addressed equity of access for those living rurally or who do not have means to access support from health professionals in person by incorporating options for telehealth in the delivery of follow up support. Telehealth has been advocated as a mode for delivery of cardiac rehabilitation services.\textsuperscript{261,262} In addition, the latest health reforms announced by the NZ Ministry of Health in April 2021 include a greater focus on using technology to deliver more care digitally in order to reduce health inequities for those living in rural communities.\textsuperscript{263} Therefore incorporating telehealth into the programme design is relevant to the future of health-care delivery in NZ.
By providing follow up support, the programme not only allows for a more seamless transition from hospital to home, but potentially into outpatient cardiac rehabilitation as well. Indeed, establishing systems that enable cardiac rehabilitation to be continuously performed from hospital, to home, to outpatient rehabilitation, and finally to the community has also been called for in Japan. While the primary focus of the current intervention is facilitating people to return to physical activity, the relationships established between patients and health professionals during follow up support could be extended into an outpatient (in person or telehealth) cardiac rehabilitation programme. As a result, providing follow up support may also contribute to increased uptake of cardiac rehabilitation.

A key element of the way that the pre-discharge information and follow up support provided by health professionals in the current programme is presented, is that it is person-centred and delivered on an individual basis. Kummel et al. (2008) investigated the effectiveness of providing group counselling and education sessions led by nurses before and following CABG surgery. The study had mixed findings, with significant increases in exercise frequency as a result of the group education sessions being seen in men (p<0.01), but not women. Likewise a study by Golaghaie et al. (2019), investigating the effectiveness of pre-operative peer-led group education sessions also did not demonstrate a significant improvement in physical activity engagement at one and two months post-CABG surgery.

In the current study, the health professionals described that to address time pressures, they sometimes deliver the information prior to discharge in groups, rather than one on one. The findings from both Kummel et al. (2008) and Golaghaie et al. (2019) suggest that group education sessions may not be helpful to all patients, particularly women. In addition, group settings do not easily allow individualised information or discussions. Therefore, the intention of delivering one on one individualised preparation and follow up support appears to be both evidence-based as well as aligning with principles of person-centred care.

A key consideration in the design of the programme was that it needed to be feasible to implement in clinical practice. The major constraint described by the health professional participants was limited time and resources. Therefore, when making the decisions about the degree of individualisation in the current programme, a balance was needed between the need to provide one-on-one individualised preparation and support with the ability of staff to deliver such services within their current resources. For this reason, the pre-discharge preparation remained relatively structured in regard to the information provided but included
tailored elements such as enabling people to identify their personal recovery and activity related goals, and individualised activity planning which were considered by the health professional participants achievable to be addressed in the time available. However, the lack of time and staffing resources available would be a barrier to being able to provide the individualised follow up support proposed in the programme outline. Indeed, the follow up support would not be able to be delivered in the current clinical setting. Since no previous studies have investigated the effectiveness of individualised follow up support by health professionals on physical activity engagement post-CABG surgery, a future study that compares the inpatient preparation plus follow up support to inpatient preparation alone may provide evidence for the benefit of follow up support. Such evidence may provide weight to the argument for increasing funding in this area.

Providing support via text messaging would be less burdensome on staff time and therefore may be more feasible to implement in the clinical setting than one-on-one in-person or telehealth sessions. Text messaging has been shown to significantly improve physical activity levels in people attending a cardiovascular disease prevention programme, older sedentary adults and following cardiac rehabilitation. In the current study, text messaging was the least preferred means of receiving follow up support. In addition, the lack of individualisation and involvement of the patient with text messaging interventions did not align as well with autonomous, person-centred care compared to support provided in person, or via videoconference or telephone. Therefore, text messaging support was not included in our programme design. However, if one-on-one, individualised support is not feasible to implement in clinical practice, text messaging may be preferable to no follow up support at all. However, we did not determine whether the participants would prefer text messaging support over no follow up support. Further exploration of the acceptability and effectiveness of providing support via text messaging in this population may therefore warrant future investigation.

Another form of support that was perceived by participants to be beneficial, was talking with peers. Peer support has previously been shown to significantly increase physical activity levels during the first month following CABG surgery. As described in section 2.11 of Chapter 2, in the RCT by Parent and Fontin (2000), one-on-one peer support to provide reassurance, coach towards activity, listen, affirm and give feedback to patients that was provided at day one, day four and four weeks post-CABG surgery resulted in significantly
higher levels of self-reported physical activity at five days (p<0.01) and four weeks (p<0.05) post-surgery. While the findings of Parent and Fontin provide evidence for the effectiveness of individualised peer support, in the current study, feedback from the health professionals indicated that implementing quality peer support may be difficult to manage in the clinical setting and therefore the decision was made to not include such support in the programme.

The follow up support provided by health professionals in the current programme is designed to offer reassurance, encouragement, feedback and guidance in a person-centred way. Therefore, even though support from health professionals does not necessarily provide the same degree of relatedness as vicarious support from peers, the support provided in the programme will still contain the same ‘active ingredients’ that appeared to successfully increase physical activity in the study by Parent and Fontin (2000). However when reflecting on the decision to not provide in person follow up support from peers, the concern of health professionals about not being able to monitor the quality and/or safety of the peer interactions can be seen as a paternalistic and controlling perspective. As such the decision to not include peer support may not be in the true spirit of person-centred care, where health professionals are to view patients and significant others as equal partners as well as empower patients and their whānau to have an active role in the management of their health and well-being. This aspect of the programme design has highlighted that while person-centred care is valued as being important, health professionals can unintentionally find themselves defaulting to a paternalistic and controlling model of care.

In the programme designed in the current study, peer influence or role modelling is limited to social comparison through patient stories. As previously described in section 2.11, while the sharing of experiences by peers in a group setting in the study by Golaghaie et al. (2019) did not result in significant improvements in physical activity engagement, another study has shown that patient stories can result in increased physical activity engagement following CABG surgery. In the study by Mahler et al. (1999), video tapes containing vicarious experiences of physical activity engagement, which portrayed patients sharing coping experiences where they needed effort to successfully cope with a variety of difficulties, resulted in significantly more moderate to vigorous physical activity at three months post-CABG compared to tapes depicting mastery experiences, where patients’ were depicted to be calm and confident and made steady progress without complications. These findings suggest that establishing realistic expectations and modelling how to cope with inevitable challenges may help people who have had CABG surgery to problem solve to enable successful
engagement in physical activity. In the current study, the mapping of BCT’s against sources of behaviour led to the identification of patient story topics, which covered coping with various challenges and set backs, as well as the need to be realistic and to persevere. The findings from Mahler et al. (1999) suggest that such stories may be helpful to facilitate physical activity engagement following CABG surgery.

The vicarious experiences shared through the stories of former patients also contributes to building self-efficacy. Other sources of self-efficacy were also addressed in the programme. Reflection on both mastery experiences and positive emotional and psychological benefits of physical activity are facilitated through the activity diaries and during follow-up discussions with health professionals. Verbal persuasion is facilitated by informing whānau and friends of the importance of providing emotional support and encouragement for physical activity. In addition to these four sources of self-efficacy as described by Bandura et al., the literature also suggests that various BCTs may contribute to increased self-efficacy for physical activity. For example, a systematic review published by Williams and French in 2011 found that in healthy adults, ‘action planning’, ‘reinforcing effort towards behaviour’ and ‘provide instruction’ were associated with significant increases in both self-efficacy and physical activity behaviour. In 2013, Olander et al. reported the findings of a systematic review and meta-analysis that investigated which BCTs increase self-efficacy and physical activity behaviour of obese adults. Their findings showed that ‘action planning’, ‘time management’, ‘prompt self-monitoring of behavioural outcome’ and ‘plan social support’ were all significantly associated with increased self-efficacy for physical activity, with the latter two also significantly associated with increased physical activity behaviour. Several of these BCTs were selected for inclusion in the current programme. However, the review by Williams and French also identified that some BCTs were associated with a significant reduction in self-efficacy and physical activity behaviour: ‘relapse prevention’ and ‘setting graded tasks’. ‘Setting graded tasks’ was utilised in the current programme by providing a suggested guideline for return to activities. While progressive return to physical activity following CABG surgery (where a graded return to activity is necessary) is a very different context to healthy adults engaging in physical activity, the findings from Williams and French (2011) highlight the importance of not assuming that all techniques and strategies will lead to improvements in self-efficacy and/or physical activity engagement. Therefore, while participants in the current study perceived the programme developed in this chapter to include components that would be beneficial, the effectiveness of the programme on
outcomes such as self-efficacy and physical activity behaviour needs to be investigated in a future study.

The focus group discussions in the current study also revealed the ongoing need for research on sternal precautions following cardiac surgery. The survey of current practice (Chapter 5) revealed that most NZ hospitals represented in the survey advise both traditional sternal precautions and less restrictive precautions such as KYMITT when providing instructions regarding upper limb activities. A detailed discussion about the potential conflict in using these two approaches together is found in Chapter 5, section 5.5.2. In the current study, there was discussion during the final focus group regarding how these two approaches were being delivered together, and whether conservative or less restrictive sternal precautions should be included in the programme. While the discussion provided little insight or clarity into why the two approaches were currently included together, the group was clear that, if given a choice, there was a strong preference for conservative sternal precautions. The main reason for choosing the more conservative approach was the strong desire to avoid sternal dehiscence given the poor outcomes that frequently arise after such an event. While no studies have shown an increased risk of sternal dehiscence when using less restrictive sternal precautions, the current evidence appears to be insufficient to convince some clinicians (including the health professionals in the current study) of their safety. Similarly, the consensus of the group was to be conservative regarding the introduction of upper limb resistance exercises, with the decision being to wait until at least eight weeks before beginning such exercises. This conservative approach is also likely due to the lack of evidence for the safety of introducing low load upper limb resistance exercises during the first two to three months following cardiac surgery. Therefore, it appears that further evidence regarding the safety and efficacy of both less restrictive sternal precautions and early upper limb resistance exercises following cardiac surgery is required for clinicians to have more confidence to implement such protocols in the clinical setting.

Another interesting finding in the current study related to fear associated with sternal precautions. Previous criticisms of sternal precautions have included that restrictive precautions create fear which can result in inactivity. Indeed fear of doing damage has been described as a barrier to physical activity in several previous studies, as well as two studies in the current thesis (Chapters 4 and 6). However, in the current study, one health professional commented that fear of sternal dehiscence was actually encouraged, particularly
for higher risk individuals, as such fear may facilitate compliance with the sternal precautions. This implies that fear may be seen as beneficial by some health professionals. Even if fear is considered beneficial, the argument by researchers such as Adams et al.\textsuperscript{111} is that fear becomes unhelpful if it results in excessive and unnecessary restriction in physical activity. These findings highlight the urgent need for further research to establish consistent guidelines for evidence based sternal precautions that balance the need to protect the healing sternum with the need to empower people to engage in physical activity with increased confidence.

In regard to the overall decision in the current study to use conservative sternal precautions, while it can be argued that there is no evidence for the need for such restrictive precautions, it can equally be argued that there is currently no evidence that less restrictive sternal precautions create less fear or result in increased physical activity levels following cardiac surgery. In addition, based on the findings of the current study, conservative sternal precautions may be easier for some people to understand. Therefore, the decision to include conservative sternal precautions may not necessarily limit overall physical activity engagement or create more fear compared to using less restrictive sternal precautions. However, as further research is undertaken the programme should be adapted if required to reflect the most up to date evidence in this area.

The absence of information about when it is safe to start sexual activity in the booklet was raised by the health professional participants during the final focus group. Sexual activity is classified as a type of physical activity in the Compendium of Physical Activity,\textsuperscript{270} and the absence of information regarding return to sex was an oversight and limitation for both the current study and the observational study in Chapter 4. It has previously been shown that both sexual desire and sexual response are still significantly limited at three months after CABG surgery.\textsuperscript{271} It has also been shown, that providing information about sexual intercourse reduces fear and increases sexual activity and satisfaction after CABG surgery.\textsuperscript{272} The decision was made therefore to include information regarding resumption of sexual activity in the booklet. However, there appears to be an absence of studies in the literature on which to base guidance around how to safely resume sexual intercourse following cardiac surgery. Therefore the advice included in the booklet (Appendix 42) was largely based on the expertise and knowledge of the health professionals in the focus group, as well as that provided by the New Zealand Heart Foundation.\textsuperscript{273} Results of two studies have shown that
exercise training results in improved sexual quality of life following cardiac revascularisation. Johnston et al. (1978) found that patients who had myocardial infarction and cardiac revascularisation but were physically trained, had less reduction in the frequency of sex compared to untrained patients. More recently, Rakhshan et al. (2019) found that people who had previously undergone CABG surgery, who attended outpatient cardiac rehabilitation had greater improvements in sexual quality of life compared to those who did not attend. Therefore the advice that engagement in regular exercise may prepare the body for the resumption of sexual activity and may also improve sexual satisfaction was included as part of the advice.

The final point requiring discussion is the mode of delivery of information. While receiving information in written/booklet form was the most preferred option selected by the study participants, it needs to be acknowledged that literacy skills is a potential barrier to accessing information in written form. Acar et al. (2017) explored adherence to exercise (defined as moderate intensity exercise for 30 minutes at least twice per week) in 202 participants who were at least six-months post-revascularisation. These authors’ findings showed that low education level (primary level education or less) was one of only two independent predictors of lack of exercise adherence (OR 3.26, 95% CI 1.31-8.11, p<0.01). Those with poor literacy skills are more likely to be found within the low education level group. Therefore, written information may not be able to be accessed by those who need it the most. This potential barrier may be overcome by ensuring written information is easy to read and through the development of a website containing videos of health professionals sharing information and former patients sharing their stories verbally. Another way to overcome health literacy as a barrier is to provide follow up support. In the study by Acar et al. (2017) the other independent predictor of exercise adherence was lack of follow up support (OR 2.95, 95% CI 1.01–8.61, p=0.01). Providing follow up support to those with a low education level may therefore be another way to address barriers to accessing information through written media.

6.7.1 Strengths of the study

The main strength of the study was the design in which the BCW approach was used to provide a robust and reasoned approach to develop a sound theoretical framework to the programme. Another key strength was the consultation with stakeholders throughout the
programme design process. Having the input of stakeholders in the decision-making process provides confidence that the programme is relevant and perceived to be potentially effective, acceptable and practicable to the end users. Indeed, given that the majority of the identified intervention components were identified as being potentially extremely or very helpful by most participants increases the confidence that the modelling process was successful in identifying potentially effective BCTs. Finally, the input of representatives from medicine, nursing and physiotherapy provided interprofessional collaboration during the design process. Interprofessional collaboration benefitted the design of the programme by drawing on the knowledge and insights of people from various professions, as well as ensuring that the programme is considered acceptable and feasible to implement by clinicians from a range of disciplines.

6.7.2 Limitations of the study

There are a several limitations with the current study. Firstly, the design of the programme did not include testing its feasibility as part of the refining process. Therefore, there are several areas which we do not yet have certainty about in regard to how the programme could be implemented. For example, in regard to providing follow up support it is not yet clear who the best person would be to deliver this support, or if it could be effectively delivered by a number of health professionals to reduce the amount of additional work being added to any one individuals workload. It is intended that in the future the programme will be tested and refined in the clinical setting first through a proof of concept study followed by a feasibility study.

Secondly, although most of the intervention components were identified as being potentially ‘extremely’ or ‘very helpful’ by the majority of participants, evidence for its effectiveness is required through conducting a future RCT. In addition, because we only included participants from the Southern DHB region, the programme may not be entirely relevant or able to be implemented in other areas of NZ or internationally. Therefore, any future RCT would benefit from being a multi-site trial.

Regarding the participants included in the current study, because their surgery had taken place up to two years prior to inclusion in the study, there is potential for recall bias in both their interviews and ability to accurately respond to the questionnaires. In addition, none of
the participants identified as being Māori or Pacific. Therefore, the programme may not reflect the needs Māori or Pacific peoples. Future studies that focus on the experiences and needs of Māori and Pacific peoples during their recovery following CABG surgery is therefore required.

Another limitation was that the time period for facilitating physical activity focused on the first 12 weeks following hospital discharge. While this time period was selected based on the expected time for sternal healing and previous findings showing the majority of improvements in physical activity and physical function take place during this time, some people may take longer to get back into activity so further follow up may be required. The potential need for longer follow up would be included as part of proof of concept and/or feasibility study. Also, since one of the programme aims was to initiate lifestyle changes regarding physical activity engagement, future studies would need to explore of the effectiveness of the intervention on long-term physical activity engagement.

Finally, when designing the programme the sources of behaviour focused on what needed to change for the patient. While the health service context was considered during the design of the programme, health professional behaviour (i.e. what needs to change for the health professional for them to facilitate people to engage in physical activity) was not specifically included in the behavioural analysis during step four of the BCW process. Future proof of concept and feasibility studies would therefore require a qualitative component focusing on the perceived challenges of limitations faced by health professionals when implementing the intervention.

6.8 Conclusion

Through the process of consulting with stakeholders and by utilising the BCW method for designing interventions, this chapter achieved its overall aim, which was to develop a programme to facilitate physical activity engagement during the first three months following CABG surgery. While the programme has yet to be evaluated (the next phase of the aMRC framework), the programme was deemed acceptable and potentially beneficial to people who have previously undergone CABG surgery. Further studies will be required to determine the feasibility and effectiveness of the programme.
CHAPTER 7 : GENERAL SUMMARY AND CONCLUSIONS

7.1 Background

It is generally known that engaging in physical activity during the initial weeks and months following CABG surgery provides many physical\textsuperscript{16-18} and psychosocial benefits.\textsuperscript{19, 20}

Immediately after CABG surgery both physical function and physical activity engagement decline,\textsuperscript{23, 24} before there is a gradual improvement over time.\textsuperscript{29, 103} Previous research has indicated that the majority of recovery of function and physical activity occurs during the first three months following CABG surgery.\textsuperscript{27, 29} In the initial months, physical activity engagement contributes to the restoration of physical function, health-related quality of life and return to participation in vocational, social and recreational activities of daily living. The importance of physical activity in the secondary prevention of cardiovascular disease and promotion of individualised targeted approaches to support physical activity engagement is recognised in cardiac rehabilitation guidelines from around the world.\textsuperscript{5, 33, 34, 36} Besides generic guidance, several of the guidelines provide some guidance for facilitating physical activity in specific groups, for example post myocardial infarction, PCI, CABG or heart valve surgery.\textsuperscript{5, 33, 37} However, none of the guidelines to date have provided information for health professionals about how to prepare and support people who have undergone cardiac surgery to engage in physical activity during the immediate weeks following hospital discharge. This left a gap in relation to how to prepare and support people who have had CABG surgery to engage in physical activity during the first three months following hospital discharge.

Further, examination of the literature (Chapter 3) revealed a paucity of high quality evidence for the barriers and facilitators for physical activity during the first three months following CABG surgery. There was therefore a need for research to increase our understanding of the factors that impact on physical activity during the short term recovery following CABG surgery, as well as investigation of how health professionals can optimally prepare and support people to engage in physical activity during the immediate weeks following hospital discharge.

Based on this premise the main aim of this thesis was to develop a psychosocial programme that aimed to prepare and support people to engage in physical activity during the first three months following CABG surgery. To address the aim, the aMRC framework\textsuperscript{48} for the
development of health interventions as described by Bleijenberg et al. (2018) was utilised as
the underlying framework on which to design a series of investigations that informed the
development of the programme (Figure 1.2). The incorporation of this framework allowed the
thesis to follow a sound and thorough process for the development of the intervention.

Each study of this thesis has been reported and its findings discussed in detail in the previous
chapters. This chapter provides a summary of the key findings of all the studies undertaken in
this thesis and discussion on how each study contributed to the programme development
through the aMRC framework. Within this summary, the contributions of the thesis to the
body of knowledge relating to cardiac rehabilitation and the implications of the thesis
findings for clinical practice are also highlighted. Furthermore, the chapter reflects on the
strengths and limitations of the thesis along with research opportunities arising from the new
knowledge gained in this thesis.

7.2 Summary of contributions to the aMRC framework elements by the previous
chapters in this thesis

The aMRC framework for the development of complex health interventions provides a
comprehensive approach to intervention design. The framework was developed with the
intention of reducing research waste by optimising the effectiveness of interventions by
ensuring they address the causal mechanisms of the problem, as well as the needs of the
recipients and those who will be delivering the intervention. The aMRC framework describes
six iterative elements for the development phase for interventions. The following sections
includes a summary of how the findings from the studies described in Chapters 3, 4, 5 and 6
contributed to the various aMRC framework elements.

7.2.1 Element 1: Problem identification

In Chapters 1 and 2, the introduction to the thesis and the narrative literature review, gaps in
the literature regarding the lack of guidelines or evidence for how to prepare people to engage
in physical activity, and how to support people to engage in physical activity during the
transition period between hospital discharge and commencing cardiac rehabilitation were
identified. These chapters also described the potential problem associated with lack of follow
up support for those unable to access supervised outpatient cardiac rehabilitation. In the observational study (Chapter 4) this problem became evident, with most participants living too far away to attend a cardiac rehabilitation programme. The problem was compounded by minimal support or guidance for physical activity being provided during contact with health professionals following hospital discharge. The survey of current practice (Chapter 5) highlighted the problem again by revealing a general lack of follow up support for physical activity engagement provided to people outside of the supervised cardiac rehabilitation setting. The findings from the first focus group with health professionals in Chapter 6 provided further insight into the context of current practice and revealed that the main barrier to providing follow up support is a lack of resources (time and staff) available. Most participants in the observational study (Chapter 4) had expressed fear, uncertainty and feeling cautious about undertaking physical activity during the 12-week period following hospital discharge. In addition, many participants were not sure where to access further information or support about progressing their engagement in physical activity when they needed help. It was inferred that the lack of follow up support available from health professionals may contribute to suboptimal physical activity engagement and delayed return to activities of daily living for some people. Importantly, the lack of follow up support available also highlights the need to optimally prepare people to engage in physical activity prior to their discharge from hospital to enable them to engage in physical activity with greater confidence.

7.2.2 Element 2. Systematically identify the evidence

To optimally prepare and support people to engage in physical activity, an understanding of the factors that influence physical activity during the early recovery period following CABG surgery is required. In Chapter 3 the findings from a systematic review of the literature that explored the factors that impact on physical activity engagement following CABG surgery were discussed. The outcomes provided insight into a range of physical, psychological and environmental factors that impacted on physical activity during the first three months after hospital discharge following CABG surgery. However while a variety of factors were identified, few were explored in depth and the majority of findings in the review were based on low or fair quality evidence. Further, the majority of findings were around barriers to physical activity and there was a paucity in findings relating to facilitators. There was also insufficient evidence to enable a description of the relationships between many of these
factors. Therefore, a need for further research that examined the factors that impact physical activity engagement during the first three months following CABG surgery was identified.

As discussed in the literature review (Chapter 2, section 2.11) a systematic review\(^4\) conducted by our team in parallel with this thesis identified seven intervention studies that specifically aimed to facilitate physical activity engagement during the first three months following hospital discharge after CABG surgery, with only five showing significant differences in physical activity levels. Of the seven interventions identified in this review, only one was informed by a specific behaviour theory\(^{15}\) or a conceptual model.\(^{28, 154}\) Examination of the intervention design of the seven identified studies found minimal use of BCTs (as described by Abraham and Michie, 2008\(^{145}\)):

- provide information about health behaviour link (n=6);
- provide opportunity for social comparison (n=4);
- provide general encouragement (n=3);
- provide instruction (n=2);
- provide feedback on performance (n=1);
- and plan social support (n=1).

No consistent pattern regarding the effectiveness of various BCTs was able to be identified. In general, the most effective interventions were those that provided 1) structured pre-discharge education, with face to face, verbal explanations appearing to add to the effectiveness, 2) interventions that addressed coping with barriers to physical activity and 3) individualised, person-centred peer support post-operatively. While the latter two of these overall findings suggest the potential for two self-management strategies (problem solving and partnership – in particular with peers) to be effective, examination of the studies included in the review revealed that none utilised self-management support principles to underpin their intervention designs. It was therefore concluded that there is a need for interventions which: 1) utilise theoretical frameworks to inform their design; 2) include a range of BCTs that meet the needs of individuals following CABG surgery; 3) facilitate the development of self-management skills; and 4) are designed with a framework which allows for individualisation of information and support.

### 7.2.3 Element 3. Determining the needs

The findings from the observational study (Chapter 4) built upon the findings from the systematic review (Chapter 3) by providing a greater understanding of the needs of people following CABG surgery. In this prospective observational study, the physical activity engagement experiences of 12 people who underwent CABG surgery at the local hospital,
were explored at weeks 1, 3, 6 and 12 following hospital discharge. The study findings expanded on what was already known by describing how the impact of the various factors changed over time. Importantly, the study findings included the establishment of a conceptual model (Figure 4.2) and narrative description of the relationships between many of the barriers and enablers of physical activity. In summary, physical activity engagement was perceived to be difficult, especially at first, as people navigated their recovery in unfamiliar territory. While physical activity engagement became easier over time as confidence and physical capability increased, participants expressed ongoing fear and uncertainty, which resulted in them taking a cautious approach to physical activity engagement throughout the study period.

While follow up support was generally lacking, participants did appreciate support and guidance from health professionals when it was available. Other key facilitating factors were the need for personal motivation, increasing self-efficacy or confidence over time, support from whānau and talking with others who had had a similar surgery. These findings provided insight into how people could be better prepared and supported, to engage in physical activity. Potential strategies identified included: managing potential physical barriers to physical activity; use of activity modification to enable rather than avoid certain activities; and provision of follow up support to reduce uncertainty and increase confidence.

The findings from the first focus group in Chapter 6 provided insight into the perceived needs of preparing and supporting people from the perspective of health professionals. Health professionals perceived that preparing people to engage in physical activity prior to discharge and providing follow up support was important. The health professionals also identified a potential need to change practice by providing a more individualised approach when preparing people prior to discharge, as well as providing alternative options for follow up support other than traditional supervised cardiac rehabilitation.

7.2.4 Element 4. Examine current practice and context

The survey study (Chapter 5) examined the current practice for preparing and supporting people to engage in physical activity following CABG surgery. Previous surveys in this area had focused on physical activity in the inpatient setting prior to discharge, or implementation of sternal precautions following median sternotomy procedures. The findings of this study provided a benchmark for the information given to people about
physical activity, how it was delivered, how self-management and behaviour change principles were utilised, and the provision of follow up support from health professionals. In general, there was considerable variation by hospital services across NZ in relation to the way that people were prepared and supported to engage in physical activity. Potential gaps in practice that were identified included: managing potential barriers to physical activity, implementation of resistance exercise and exploring motivation for physical activity engagement.

Another novel finding that built upon those from previous surveys was the combination of conventional sternal precautions with the less restrictive KYMITT guidelines given in advice to patients. This was reported by just over half of the respondents. The survey findings also identified potential underutilisation of various self-management and behaviour change principles. Examples of self-management or behaviour change techniques not frequently utilised included: prompting the person to create a plan for physical activity engagement; planning social support; and providing follow up support for physical activity engagement from health professionals.

Importantly, the survey study in Chapter 5 identified areas for potential improvement in practice to better meet the needs of people who have had CABG surgery. These included: preparing people to face common barriers to physical activity engagement; greater utilisation of self-management principles (in particular problem solving, action planning and shared decision making); a considered approach to the inclusion of behaviour change techniques; and provision of follow up support following hospital discharge. As previously stated in section 7.2.3, the first focus group in the final study (Chapter 6) provided insight into the context of clinical practice and the perceived capacity of health professionals for implementing changes to service delivery. The key finding was that lack of resources (primarily time pressures and not enough staff available) was an important perceived barrier to changing current practice. These findings justified the need to ensure that the programme developed could be implemented in the real-world clinical context.
7.2.5 Element 5. Identifying or developing theory

Principles of self-management and person/whānau centred care as core principles to underpin the programme development were identified in the thesis. Other relevant theories drawn upon were the SDT as described by Deci and Ryan\textsuperscript{191} and Bandura’s self-efficacy theory.\textsuperscript{190} These theories were selected following the identification in the observational study (Chapter 4) of the roles of motivation and self-efficacy respectively as important facilitating factors for physical activity engagement. Another key reason for selecting SDT was its apparent alignment with the principle of self-management support where individuals and their whānau/partner with health professionals (thus upholding the SDT value of relatedness), as well as person/whānau centred care (which aligns with the SDT value of prioritising autonomy of the person).

7.2.6 Element 6. Modelling process and outcomes

The process by which the programme was ultimately developed was described in Chapter 6. The programme development was undertaken through a series of consultations (interviews, focus groups and/or questionnaires) with stakeholders (that is both people who had previously undergone CABG surgery and the health professionals who are responsible for patient care during the first few months following CABG surgery). Modelling of the programme design was undertaken using the BCW for designing interventions.\textsuperscript{139} The use of this method enabled a rigorous and reasoned approach to the selection of interventions to include in the programme. To ensure that the programme was perceived to be potentially helpful, relevant and applicable to the clinical context, many decisions regarding the programme design were made in consultation with stakeholders (that is people who have previously had CABG surgery (former patients) and the health professionals who were responsible for patient care during the first few months following CABG surgery). Interviews of people who have previously had CABG surgery were undertaken first. These interviews were analysed inductively and subsequently mapped against the TDF, which aligned with the capability, opportunity and motivation elements of the COM-B model. Selection of potential programme strategies were then undertaken following the systematic mapping of the identified TDF elements against potentially relevant behaviour change techniques. Techniques that overlapped with self-management principles and strategies to facilitate
motivation and self-efficacy were prioritised when identifying potential strategies to be included in the programme. The ultimate selection of strategies to include was based on feedback from former patient participants, with final selections being decided by a focus group comprising both health professionals and former patient participants. Finally, a programme outline and supporting written programme materials were developed. Former patient participants were asked to provide feedback on the perceived relevance and helpfulness of various programme components and written materials, as well as any suggested changes. Final amendments to the programme and written materials were confirmed in a subsequent focus group held with the same health professionals and former patients.

In summary, this thesis achieved its main aim, to develop a psychosocial programme that aimed to prepare and support people to engage in physical activity following CABG surgery. In doing so we were able to generate suggestions for future clinical practice as well as create a programme to the point where a future study could be conducted to test the programme’s feasibility and effectiveness. An additional outcome of this thesis was the production of two booklets, the first being a guide to progressing physical activity engagement and the second being a compilation of former patient experiences modeling various strategies used to engage in physical activity following CABG surgery (Appendices 6.19 and 6.20). The relevance of the booklets to patients will be included as part of the study on the programme’s effectiveness. It is intended that the booklets will subsequently be available for use within the Southern DHB and potentially beyond.

7.3 Strengths of the thesis

The main strength of the thesis was that the overall programme development was informed by recognised frameworks for intervention development – the aMRC and BCW frameworks. This meant there was an objective lens was in place throughout the programme development process. A key strength in the implementation of the aMRC framework was that each of the studies addressed more than one of the framework elements. By doing so it provided a degree of triangulation, as some of the individual study findings confirmed and/or built upon the findings of other studies in this thesis. This increased the level of confidence in confirming the thesis findings, for example in regard to the experiences of people recovering from
CABG surgery (from findings in Chapters 3, 4 and 6) and service delivery (findings from Chapters 5 and 6). Utilising Michie et al.’s BCW for the modelling and programme design process also provided an objective approach which reduced the potential for researcher bias. For example, the behavioural analysis and identification of potential strategies to include in the intervention, was based on the findings from participant interviews, rather than the doctoral candidate (and her supervisors) utilising their own biases and preferences in the selection process.

Another factor that reduced the potential influence of the researcher’s preferences was the involvement of stakeholders in the programme development process. Involving stakeholders also ensured that the programme was relevant and useful to patients, as well as being able to be implemented within clinical practice either within existing resources, or potentially with a slight expansion.

Other key strengths of the thesis included the following:

- The broad search strategy and robust screening process utilised in the systematic review (Chapter 3) ensured that a thorough investigation and in-depth description of the literature was achieved.
- The mixed method approach in the observational study (Chapter 4) allowed for the triangulation of findings to support and confirm several of the key factors influencing physical activity identified from the analysis of the participant interviews.
- The observation of people’s experiences at multiple time points during the first 12 weeks following CABG surgery in Chapter 4 led to rich descriptions of physical activity at each time point and enabled identification of how the influence of the various facilitators and barriers to physical activity changed over time.
- The achievement of a high response rate to the questionnaire exploring current practice (Chapter 5), despite the number of hospitals providing cardiac surgery in NZ being small in number. This provided confidence that the survey findings reflect the current practice of public and private hospitals across NZ that perform cardiac surgery.

A further strength was that the thesis provided not just solutions but also an improvement in the understanding required to address the identified knowledge gaps in the literature and clinical practice. The knowledge gaps that have been addressed by this thesis include:
- The nature and extent of barriers and facilitators to physical activity engagement during the first three months following CABG surgery.
- Current practice regarding the way hospital services in NZ prepare and support people to engage in physical activity following CABG surgery.
- Guidance for clinicians in regard to how to prepare and support people who have had CABG surgery to self-manage their engagement in physical activity during the first three months following hospital discharge.

Importantly also, a programme has been developed that addressed equity issues that were identified from barriers to accessing supervised cardiac rehabilitation programmes, for example for those living rurally or who do not have access to transport.

7.4 Limitations of the thesis

The findings of this thesis need to be considered in the context of the methodological limitations. In Chapters 4 and 6 there was potential selection bias in the methodology. As with all studies involving humans, participants are provided with the opportunity to reflect on whether they want to participate or not and to provide informed consent should they choose to participate. In the current thesis, it is unknown why some people who were either provided a study invitation (Chapter 4) or saw an advertisement for the study (Chapter 6) decided not to participate. It is possible that those who do not enjoy physical activity, or felt that they did not engage in physical activity at a sufficient level, decided not to participate. Indeed, in both Chapters 3 and 6 the majority of participants described either having had a previous high level of physical activity engagement, or highly valued the benefit that physical activity provided them following surgery. Therefore, the programme may unwittingly have been designed based on the reflections of those who were already engaging in and/or valued physical activity and thus may not have represented the perspectives or choices of those who did not.

While the thesis has made original contributions to this health issue, an important omission from this thesis is the perspectives of Māori and Pacific peoples voices as they were not represented in the study findings. The adoption of purposive sampling techniques (rather than the convenience sampling strategies utilised in Chapters 4 and 6) may have increased study
participation rates for Māori and Pacific peoples. However, participation of Māori and Pacific participants is not sufficient for conducting research for Māori or Pacific health advancement. Research for Māori health advancement requires meaningful engagement and relationships with individuals, whānau and communities, as well as including Māori in the development of the research question, study design and how the results will be translated. Similarly, health research with Pacific peoples requires cultivating relationships through meaningful engagement and the inclusion of participation of Pacific peoples at all levels of decision making and implementation of the research. The thesis did not utilise these important principles sufficiently in either the planning or when undertaking the research and as a result the outcomes of this thesis may not adequately address the needs of Māori or Pacific peoples.

Other limitations that affect the generalisability of the thesis findings were that only participants in one region of NZ and those undergoing isolated CABG surgery were invited to participate. Therefore, the findings and outcomes of this thesis may not be generalisable to those having other types of cardiac surgery or to those who live in other parts of NZ or in the global community.

Finally, it was beyond the scope of this thesis to evaluate the programme using a feasibility study or undertake an RCT to test the implementation of the programme in a clinical setting. Therefore, while the programme provides guidance to clinicians on ways to prepare and support people to engage in physical activity following CABG surgery, the effectiveness of the programme to increase physical activity participation or improve outcomes post-CABG surgery has not yet been established.

7.5 Future directions

While this thesis has provided some pertinent answers to gaps in the literature, it has also generated some recommendations for future research. Of primary importance for future research is the establishment of relationships to allow meaningful engagement with Māori and Pacific peoples, and the inclusion of Māori and Pacific peoples throughout the research process to explore their experiences of engaging in physical activity following CABG surgery as well as their preferences for being supported by health professionals to engage in physical activity following discharge from hospital.
Another area for future research is the establishment of a feasibility study to determine the feasibility of both implementing the programme in the clinical setting and for conducting a RCT. This would be followed by a RCT to test the effectiveness of the programme. However, prior to investigating the programme’s effectiveness, identification of groups that would most benefit from the programme may be required. For example, people already highly motivated to engage in physical activity may not receive any additional benefit from the programme, whereas those who do not have a history of physical activity engagement and/or are not motivated to engage in physical activity may gain more benefit from receiving follow up support. Therefore, a quantitative observational study that identifies predictors of physical activity engagement following CABG surgery may be required to identify which groups may benefit most from the programme.

To determine whether the findings from this thesis are relevant to those who have undergone other types of cardiac surgery, an exploration of physical activity engagement experiences for those who have undergone other types of invasive cardiac surgery procedures, for example cardiac valve or CABG plus valve procedures, is also required.

This thesis has also raised particular questions around the implementation of sternal precautions in contemporary clinical practice. In particular, further investigation into how and why clinicians report using both conventional precautions and “KYMITT” in practice, is required. In addition, the safety of performing upper limb resistance exercises is yet to be fully established. While the programme developed in this thesis utilised recommendations for upper limb exercise based on current cardiac rehabilitation guidelines and evidence in the literature, further research is required to establish the optimal timing, load and types of upper limb exercises that can be safely introduced following median sternotomy procedures.

7.6 Conclusions from the thesis

Physical activity engagement during the first three months following CABG surgery has many physical and psychosocial benefits. However, the findings of the thesis have shown that physical activity levels decrease markedly immediately following CABG surgery due to a range of potential physical and psychological barriers experienced during this time. In
addition, the majority of people who have had CABG surgery will likely not access follow up support through outpatient cardiac rehabilitation services. For those who do attend cardiac rehabilitation, there will likely be a gap of weeks or months from the time of hospital discharge to commencing cardiac rehabilitation. It is therefore important for health professionals to provide optimal preparation and support to facilitate people to overcome barriers and activate ways to facilitate people to self-manage their physical activity engagement during the initial weeks and months following hospital discharge. However, current published cardiac rehabilitation guidelines do not address how health professionals can optimally prepare and support people to engage in physical activity following hospital discharge. Through a series of investigations, this thesis explored and identified the factors (including personal-, environmental- and service-related factors) that impact on physical activity during the first three months post-CABG. In doing so, this thesis ultimately achieved its overall aim, which was to develop a psychosocial programme that aimed to prepare and support people to engage in physical activity following their hospital discharge following CABG surgery.

The programme and supporting written materials produced as an outcome from this thesis, together have the potential to facilitate people to self-manage their engagement in physical activity during the first three months following CABG surgery. Although the programme has not been tested in the ‘real world’ setting, the programme was well received by stakeholders, showing its potential for facilitating physical activity engagement. Further, through developing the programme, suggestions for preparing and supporting people to engage in physical activity following CABG were identified. These suggestions have helped to address the gaps in current clinical guidelines by providing guidance for health professionals when designing their services.
REFERENCES


261. Australian Cardiovascular Health and Rehabilitation Association, Heart Foundation Australia. ACRA and Heart Foundation position statement on telehealth and cardiac


268. Williams SL, French DP. What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour - and are they the same? Health Educ Res. 2011;26(2):308-22.


APPENDIX 1: DATABASE SEARCH STRATEGIES (CHAPTER 3)

**Database: PubMed**

#1 coronary artery bypass[MeSH Major Topic] OR CABG
#2 physical activity OR exercise OR activities of daily living OR recovery of function
#3 #1 AND #2
Filters: English

(Result: 2402 articles)

**Database: CINAHL**

S1 MH coronary artery bypass OR CABG
S2 physical activity OR exercise OR activities of daily living OR recovery of function
S3 S1 AND S2
Filters: English

(Results: 363 (760 if not MJ))

**Database: Scopus**

TITLE-ABS-KEY (("coronary artery bypass" OR cabg ) AND ("physical activity" OR exercise OR "activities of daily living" OR "recovery of function") ) AND LIMIT TO (LANGUAGE, “English”)

(Results: 5,307)

**Database: Web of Science**

TOPIC: (“coronary artery bypass” OR CABG) AND (“physical activity” OR exercise OR “activities of daily living” OR “recovery of function”)
Limits: English

(Results: 1,297)
Dear Dr Skinner,

I am again writing to you concerning your proposal entitled "Perceptions of engaging in physical activity in adults following coronary artery bypass graft surgery", Ethics Committee reference number H17/024.

Thank you for your response of 6th April 2017 addressing the issues raised by the Committee.

On the basis of this response, I am pleased to confirm that the proposal now has full ethical approval to proceed.

The standard conditions of approval for all human research projects reviewed and approved by the Committee are the following:

Conduct the research project strictly in accordance with the research proposal submitted and granted ethics approval, including any amendments required to be made to the proposal by the Human Research Ethics Committee.

Inform the Human Research Ethics Committee immediately of anything which may warrant review of ethics approval of the research project, including: serious or unexpected adverse effects on participants; unforeseen events that might affect continued ethical acceptability of the project; and a written report about these matters must be submitted to the Academic Committees Office by no later than the next working day after recognition of an adverse occurrence/event. Please note that in cases of adverse events an incident report should also be made to the Health and Safety Office:

http://www.otago.ac.nz/healthandsafety/index.html

Advise the Committee in writing as soon as practicable if the research project is discontinued.

Make no change to the project as approved in its entirety by the Committee, including any wording in any document approved as part of the project, without prior written approval of the Committee for any change. If you are applying for an amendment to your approved research, please email your request to the Academic Committees Office:
gary.witte@otago.ac.nz

jo.farrondediaz@otago.ac.nz

Approval is for up to three years from the date of this letter. If this project has not been completed within three years from the date of this letter, re-approval or an extension of approval must be requested. If the nature, consent, location, procedures or personnel of your approved application change, please advise me in writing.

The Human Ethics Committee (Health) asks for a Final Report to be provided upon completion of the study. The Final Report template can be found on the Human Ethics Web Page [http://www.otago.ac.nz/council/committees/committees/HumanEthicsCommittees.html](http://www.otago.ac.nz/council/committees/committees/HumanEthicsCommittees.html)

Yours sincerely,

[Signature]

Mr Gary Witte
Manager, Academic Committees
Tel: 479 8256
Email: gary.witte@otago.ac.nz

c.c. Professor I A Hale  Dean  School of Physiotherapy
Ngāi Tahu Research Consultation Committee
Te Komiti Rakahau ki Kāi Tahu

Wednesday, 08 March 2017.
Dr Margot Skinner,
School of Physiotherapy,
DUNEDIN.

Tēnā Koe Dr Margot Skinner,

Attitudes and barriers to physical activity and levels of physical activity measured in patients attending a supported weight management clinic that utilises a very low calorie diet

The Ngāi Tahu Research Consultation Committee (the committee) met on Tuesday, 07 March 2017 to discuss your research proposition.

By way of introduction, this response from The Committee is provided as part of the Memorandum of Understanding between Te Rūnanga o Ngāi Tahu and the University. In the statement of principles of the memorandum it states "Ngāi Tahu acknowledges that the consultation process outline in this policy provides no power of veto by Ngāi Tahu to research undertaken at the University of Otago". As such, this response is not "approval" or "mandate" for the research, rather it is a mandated response from a Ngāi Tahu appointed committee. This process is part of a number of requirements for researchers to undertake and does not cover other issues relating to ethics, including methodology they are separate requirements with other committees, for example the Human Ethics Committee, etc.

Within the context of the Policy for Research Consultation with Māori, the Committee base consultation on that defined by Justice McGechan:

"Consultation does not mean negotiation or agreement. It means: setting out a proposal not fully decided upon; adequately informing a party about relevant information upon which the proposal is based; listening to what the others have to say with an open mind (in that there is room to be persuaded against the proposal); undertaking that task in a genuine and not cosmetic manner. Reaching a decision that may or may not alter the original proposal."

The Committee notes this is Southern District Health Board research.

The Committee considers the research to be of importance to Māori health.

As this study involves human participants, the Committee strongly encourage that ethnicity data be collected as part of the research project as a right to express their self-identity. That is the questions on self-identified ethnicity and descent, these questions are contained in the latest census.

The Committee suggests dissemination of the research findings to relevant Māori health organisations regarding this study, including Taeaora Tinana, Māori Physiotherapists within the
Ngāi Tahu Research Consultation Committee

Te Komiti Rakahau ki Kāi Tahu

New Zealand Society of Physiotherapists.

We wish you every success in your research and the committee also requests a copy of the research findings.

This letter of suggestion, recommendation and advice is current for an 18 month period from Tuesday, 07 March 2017 to 7 September 2018.

Nāhaku noa, nā

[Signature]

Mark Brunton
Kaiwhakahaere Rangahau Māori
Research Manager Māori
Research Division
Te Whare Wānanga o Ōtāgo
Ph: +64 3 479 8738
Email: mark.brunton@otago.ac.nz
Web: www.otago.ac.nz

The Ngāi Tahu Research Consultation Committee has membership from:

Te Rūnanga o Ōtāko Incorporated
Kāti Huirapa Rūnaka ki Puketeraki
Te Rūnanga o Moeraki
11/04/2017

Mr Richard Bunton
Cardiology, DPH

Dear Richard

SUBJECT: Perceptions, barriers and facilitators to engaging in physical activity in adults following coronary artery bypass graft surgery

I am writing on behalf of Health Research South to confirm that the project mentioned above has been granted approval to proceed.

According to our records:

This project is due to commence on: 10/04/2017

It is due to be completed by: 31/03/2018

If you have any questions with regards to this process, please contact me quoting the project ID number shown above.

Yours sincerely,

Ruth Sharpe
CLINICAL RESEARCH ADVISOR

C.C. JANINE COCHRANE, SOUTHERN DHB
DR MARGOT SKINNER, SCHOOL OF PHYSIOTHERAPY, UoO

Health Research South, PO Box 56, Dunedin 9054
hrs@otago.ac.nz; www.otago.ac.nz/hrs
Ruth Sharpe, Clinical Research Advisor, Ph: 03 470 9032; Ruth.Sharpe@otago.ac.nz
LETTER OF INVITATION

Study title: Perceptions of engaging in physical activity in adults following coronary artery bypass graft surgery

Dear

You have been placed on the list for cardiac surgery. We are inviting you to consider taking part in a study that investigates physical activity following the cardiac surgery. Physical activity can prevent heart disease and reduce the risk of experiencing future heart problems following the surgery. This research project aims to investigate the perceptions and experiences of physical activity engagement during the first months in adults who have had heart for blockages in the arteries (coronary artery bypass graft or CABG). Researchers at the School of Physiotherapy are undertaking the study.

We invite you to read the Participant Information Sheet attached. Should you be interested in participating there would be one 40 minute appointment prior to your surgery, and four 20 minute phone interviews after your surgery.

If you are interested in being involved in the study, please complete the attached form. You are welcome to put the form in the box at the nurses’ station, or contact Dr Margot Skinner, the principal investigator, directly on 03 4797466 or email margot.skinner@otago.ac.nz. If you wish to participate Dr Skinner will organise an appointment time and date and answer any questions you may have. A further opportunity to ask questions will be provided prior to signing the written consent form with Emily Gray, the person undertaking the research. Emily, is a Physiotherapist, who will be supervised by Dr Skinner and Mr Bunton.

If you complete the form to participate and later decide to withdraw from this study this can be done at any time without any negative consequences by advising the researchers.

Thank you for your time.

Mr Richard Bunton
Consultant/Co-investigator

Dr Margot Skinner
Principal Investigator

May 2017
APPENDIX 6: OBSERVATIONAL STUDY EXPRESSION OF INTEREST FORM (CHAPTER 4)

Study title: Perceptions of engaging in physical activity in adults following coronary artery bypass graft surgery

☐ I am interested in participating in the study and would like to find out more from the researchers

☐ I am not interested in participating in the study

Name: ______________________________________________________

Signature: _________________________________________________
PARTICIPANT INFORMATION SHEET

Study title: Perceptions of engaging in physical activity in adults following coronary artery bypass graft surgery

<table>
<thead>
<tr>
<th>Principal Investigator:</th>
<th>Name</th>
<th>Dr Margot Skinner</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Department</td>
<td>School of Physiotherapy</td>
</tr>
<tr>
<td></td>
<td>Position</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>Co-Investigator:</td>
<td>Name:</td>
<td>Mr Richard Bunton</td>
</tr>
<tr>
<td></td>
<td>Department:</td>
<td>Southern District Health Board</td>
</tr>
<tr>
<td></td>
<td>Position:</td>
<td>Cardiothoracic Surgeon</td>
</tr>
<tr>
<td></td>
<td>Contact phone number:</td>
<td>03 4797466</td>
</tr>
</tbody>
</table>

Introduction

Thank you for showing an interest in this project. Please read this information sheet carefully. Take time to consider and, if you wish, talk with relatives or friends, before deciding whether or not to participate.

If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the aim of this research project?

Physical activity can prevent heart disease and reduce risk of experiencing future heart problems following heart surgery. This research project aims three to investigate the perceptions and experiences of physical activity engagement during the first months in adults who have had heart for blockages in the arteries (coronary artery bypass graft or CABG). Findings from this study will contribute to the understanding of participants’ experiences of physical activity following surgery and may lead to future improvements in the delivery of health care for people following heart surgery.
Who is funding this project?
This study is being funded by the School of Physiotherapy and is being undertaken as part of the research requirement for Emily Gray, a post graduate student enrolled on a Master of Physiotherapy degree.

Who are we seeking to participate in the project?
Potential participants have been identified from the surgery list for people awaiting CABG surgery. We are seeking adults aged over 18 years of age who live in the Southern District Health Board catchment area and are undergoing CABG surgery.

If you participate, what will you be asked to do?
If you agree to take part in this study you will be asked to fill out some questionnaires and have your height weight and waist circumference measured prior to surgery.
Following your operation you will be asked to wear a small activity monitor (pictured on right) clipped to the waist band of your trousers/skirt for approximately 24 hours prior to discharge from hospital.
After you are discharged from hospital you will be asked to wear the activity monitor for five days at four different time points: weeks one, three, six and twelve following discharge. At the end of each of these weeks you will be asked to fill out some questionnaires and participate in a short interview with the researcher who will contact you either over the phone or online (like Skype) depending on your preference. The interviews are expected to take approximately 15-20 minutes and will be undertaken at a time that is convenient to you. This process is outlined in the flow chart below:

**Timeline for Involvement in Study**

<table>
<thead>
<tr>
<th>Pre-surgery</th>
<th>During the last day of your hospital stay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill out questionnaires</td>
<td>Meet with researcher and be shown how to wear activity monitor</td>
</tr>
<tr>
<td>Height, weight and waist circumference measured</td>
<td>Wear activity monitor for final day in hospital</td>
</tr>
<tr>
<td>(Estimated time 40 minutes)</td>
<td>(Estimated time 20 minutes)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>First week following discharge from hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear activity monitor for five days</td>
</tr>
<tr>
<td>Fill out questionnaires (10 minutes – do not have to be completed in one sitting)</td>
</tr>
<tr>
<td>Undergo a phone or online interview (approximately 15 minutes) with the researcher at the end of the week</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weeks three, six and twelve following discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear the activity monitor for five days</td>
</tr>
<tr>
<td>Fill out questionnaires (20 minutes)</td>
</tr>
<tr>
<td>Undergo a phone or online interview (approximately 15 minutes) with the researcher at the end of the week</td>
</tr>
</tbody>
</table>

Maximum time requirement for study participation: 3.5 hours
All of the questionnaires and activity monitors will be couriered to you and you will be provided with return postage courier packs for you to return your completed questionnaires and activity monitor to the researchers.

Your participation in this study is voluntary and no aspect of your care will be affected by either a decline or agreement to participate. You are also free to withdraw from participation in the study at any time with no disadvantage to yourself.

**Is there any risk of discomfort or harm from participation?**
There is not expected to be any discomfort or harm from wearing the activity monitor apart from the inconvenience of remembering to wear it. People often feel tired and fatigued for some time following CABG surgery. You may experience tiredness from mental concentration when completing the questionnaires, however you will be able to complete these at your leisure at a time that is convenient to you. The interviews will be of short duration (approximately 15 - 20 minutes) and you will be free to end these at any time if you feel tired or fatigued or you do not like the line of questioning.

**What specimens, data or information will be collected, and how will they be used?**
We will ask for information on your age, sex, ethnicity and current employment status prior to your surgery. This information will be used to describe our study sample as a whole, and will not be linked to your individual experiences. In order to obtain current information about your health profile, you will also be asked about other health conditions that you have. Your height, weight and waist measurement will also be measured by the researcher prior to your surgery.

The interviews will be recorded and typed up either by the student researcher or a professional transcriber. Themes regarding participants’ experiences in engaging in physical activity identified from the information will be reported in the outcomes of the study.

The data obtained from wearing the accelerometer will be used to describe the amount of physical activity that people are able to engage in at various time points following surgery. Only the researchers named will have access to the raw data. The data collected will be securely stored in such a way that only those researchers will be able to gain access to it. Data obtained as a result of the research will be retained for at least 10 years in secure storage in the office of the principal investigator, Dr Skinner. Any personal information held on the participants such as contact details and audio recordings, after they have been transcribed, will be destroyed at the completion of the research even though the data derived from the research will, in most cases, be kept for much longer or possibly indefinitely.

**What about anonymity and confidentiality?**
Any personal information collected will be held confidentially and your anonymity will be maintained by allocating each participant a unique code and by the secure storage of all questionnaires and interview recordings. Any comments made in the interviews will be kept
confidential within the research group and will be quoted anonymously if used in the final report. You are welcome to review the interview audio and transcripts if you wish to and you can do so by indicating on the consent form or by asking any of the researchers.

**If you agree to participate, can you withdraw later?**
You may withdraw from participation in the project at any time and without any disadvantage to yourself.

**Any questions?**

If you have any questions now or in the future, or if you wish to participate in this study please contact:

**Dr Margot Skinner**  
Principal Investigator  
Senior Lecturer  
School of Physiotherapy  
University of Otago

Phone: 03 4797466  
email: margot.skinner@otago.ac.nz

This study has been approved by the University of Otago Human Ethics Committee (Health).  
If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (phone +64 3 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.
APPENDIX 8: OBSERVATIONAL STUDY PARTICIPANT CONSENT FORM (CHAPTER 4)

Perceptions of engaging in physical activity in adults following coronary artery bypass graft surgery

Principal Investigator: Dr Margot Skinner (margot.skinner@otago.ac.nz; 03 4797466)

CONSENT FORM

Following signature and return to the research team this form will be stored in a secure place for ten years.

Name of participant:…………………………………………..

1. I have read the Information Sheet concerning this study and understand the aims of this research project.

2. I have had sufficient time to talk with other people of my choice about participating in the study.

3. I confirm that I meet the criteria for participation which are explained in the Information Sheet.

4. All my questions about the project have been answered to my satisfaction, and I understand that I am free to request further information at any stage.

5. I know that my participation in the project is entirely voluntary, and that I am free to withdraw from the project at any time without disadvantage.

6. I know that as a participant I will be required to complete questionnaires and undergo body measurements such as height and weight prior to surgery. Following surgery I will be required to wear an activity monitor for seven days, complete some questionnaires and undertake an interview either over the phone or online at 1, 3, 6 and 12 weeks following discharge from hospital.
7. I know that the interview will explore my perceptions of engaging in physical activity following surgery and that if the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s), and/or may withdraw from the project without disadvantage of any kind.

8. I understand the nature and size of the risks of discomfort or harm which are explained in the Information Sheet.

9. I know that when the project is completed all personal identifying information will be removed from the paper records and electronic files which represent the data from the project, and that these will be placed in secure storage and kept for at least ten years.

10. I know that a professional transcriber may type up the recorded interviews but that my details (apart from my first name when it is used in the interview) will not be made available to this person.

11. I understand that the results of the project may be published and be available in the University of Otago Library, but I agree that any personal identifying information will remain confidential between myself and the researchers during the study, and will not appear in any spoken or written report of the study.

12. I know that there is no remuneration offered for this study, and that no commercial use will be made of the data.

13. I wish to be given a copy of the interview transcripts to review.

14. I wish to be provided with a written summary of the study findings at the completion of the study.

Signature of participant: ___________________________ Date: ___________________________

Name of person taking consent: ___________________________ Date: ___________________________
APPENDIX 9: OBSERVATIONAL STUDY DEMOGRAPHIC DATA COLLECTION FORM (CHAPTER 4)

Name: _________________________

Date of Birth (Date/Month/Year): ___________________  Sex: Male/Female

Ethnicity:  
- NZ European □  
- Māori □  
- Samoan □  
- Cook Island Māori □  
- Tongan □  
- Niuean □  
- Chinese □  
- Indian □  
- Other □ Please State: _______________________________

Employment Status:  
- Work full time □  
- Work part time □  
- Unemployed □  
- Retired □  
- Other □ Please State: ________________________

Smoking History:

Are you currently a:  
- Smoker □  
- Previous smoker (> 10 cigarettes in your lifetime) □  
- Never smoked (< 10 cigarettes in your lifetime) □

If you are a current or previous smoker, how many cigarettes (on average) do/did you smoke every day: ________________

For how many years have/did you smoke for? ________________
Please list any health conditions that you have:

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

Do you have any conditions that make it difficult for you to walk or exercise due to (for example) pain or balance problems?

Yes □          No □

If yes please give details: ______________________________________________________

___________________________________________________________________________

___________________________________________________________________________
Participant Number_________________________ Date________________

Please circle the number for the answer that best applies to you.

1. In general, would you say your health is:

<table>
<thead>
<tr>
<th>Health Level</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>1</td>
</tr>
<tr>
<td>Very good</td>
<td>2</td>
</tr>
<tr>
<td>Good</td>
<td>3</td>
</tr>
<tr>
<td>Fair</td>
<td>4</td>
</tr>
<tr>
<td>Poor</td>
<td>5</td>
</tr>
</tbody>
</table>

2. **Compared to one year ago,** how would you rate your health in general **now**?

<table>
<thead>
<tr>
<th>Health Level</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Much better now than one year ago</td>
<td>1</td>
</tr>
<tr>
<td>Somewhat better now than one year ago</td>
<td>2</td>
</tr>
<tr>
<td>About the same</td>
<td>3</td>
</tr>
<tr>
<td>Somewhat worse now than one year ago</td>
<td>4</td>
</tr>
<tr>
<td>Much worse now than one year ago</td>
<td>5</td>
</tr>
</tbody>
</table>
The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

**(Circle One Number on Each Line)**

<table>
<thead>
<tr>
<th></th>
<th>Yes, Limited a Lot</th>
<th>Yes, Limited a Little</th>
<th>No, Not Limited at All</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. <strong>Vigorous activities</strong>, such as running, lifting heavy objects, participating in strenuous sports</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>4. <strong>Moderate activities</strong>, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>5. Lifting or carrying groceries</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>6. Climbing <strong>several</strong> flights of stairs</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>7. Climbing <strong>one</strong> flight of stairs</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>8. Bending, kneeling, or stooping</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>9. Walking <strong>more than a mile</strong></td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>10. Walking <strong>several blocks</strong></td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>11. Walking <strong>one block</strong></td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
<tr>
<td>12. Bathing or dressing yourself</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
</tr>
</tbody>
</table>
During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health? (Circle One Number on Each Line)

13. Cut down the amount of time you spent on work or other activities
14. Accomplished less than you would like
15. Were limited in the kind of work or other activities
16. Had difficulty performing the work or other activities (for example, it took extra effort)

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

(Circle One Number on Each Line)

17. Cut down the amount of time you spent on work or other activities
18. Accomplished less than you would like
19. Didn't do work or other activities as carefully as usual
20. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups? (Circle One)

Not at all 1
Slightly 2
Moderately 3
Quite a bit 4
Extremely 5

21. How much bodily pain have you had during the past 4 weeks?
(Circle One Number)

None 1
Very mild 2
Mild 3
Moderate 4
Severe 5
Very severe 6

22. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

(Circle One Number)

Not at all 1
A little bit 2
Moderately 3
Quite a bit 4
Extremely 5
These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the **past 4 weeks** . . .

*(Circle One Number on Each Line)*

<table>
<thead>
<tr>
<th></th>
<th>All of the Time</th>
<th>Most of the Time</th>
<th>A Good Bit of the Time</th>
<th>Some of the Time</th>
<th>A Little of the Time</th>
<th>None of the Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>23. Did you feel full of pep?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>24. Have you been a very nervous person?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>25. Have you felt so down in the dumps that nothing could cheer you up?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>26. Have you felt calm and peaceful?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>27. Did you have a lot of energy?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>28. Have you felt downhearted and blue?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>29. Did you feel worn out?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>30. Have you been a happy person?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>31. Did you feel tired?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
32. During the **past 4 weeks**, how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)?

**(Circle One Number)**

- All of the time 1
- Most of the time 2
- Some of the time 3
- A little of the time 4
- None of the time 5

How **TRUE or FALSE** is **each** of the following statements for you.

**(Circle One Number on Each Line)**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Definitely True</th>
<th>Mostly True</th>
<th>Don't Know</th>
<th>Mostly False</th>
<th>Definitely False</th>
</tr>
</thead>
<tbody>
<tr>
<td>33. I seem to get sick a little easier than other people</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>34. I am as healthy as anybody I know</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>35. I expect my health to get worse</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>36. My health is excellent</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

APPENDIX 11: CARDIAC SELF-EFFICACY SCALE QUESTIONNAIRE
(CHAPTER 4)

CARDIAC SELF-EFFICACY QUESTIONNAIRE

For each of the questions below please indicate with a tick how you currently feel about controlling or managing your heart condition by placing a tick in the appropriate circle.

<table>
<thead>
<tr>
<th>How confident are you that you know or can:</th>
<th>Not at all confident</th>
<th>Somewhat confident</th>
<th>Moderately confident</th>
<th>Very confident</th>
<th>Completely confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control your chest pain by changing your activity levels</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Control your breathlessness by changing your activity levels</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Control your chest pain by taking your medications</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Control your breathlessness by taking your medications</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>When you should call or visit your doctor about your heart disease</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>How to make your doctor understand your concerns about your heart</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>How to take your cardiac medications</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>How much physical activity is good for you</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Maintain your usual social activities</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Maintain your usual activities at home with your family</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Maintain your usual activities at work</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Maintain your sexual relationship with your spouse</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Get regular aerobic exercise (work up a sweat and increase your heart rate)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

## APPENDIX 12: CODES, CATEGORIES AND SUPPORTING QUOTES FOR EACH THEME (CHAPTER 4)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Codes</th>
<th>Supporting examples from data extracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theme 1: Navigating a difficult and unfamiliar road to recovery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Needing to cope with physical symptoms during the initial weeks</td>
<td>Pain/discomfort limiting activity</td>
<td>Pain is probably the biggest thing for movement that stops you from moving. (Participant 12, week 1)</td>
</tr>
<tr>
<td></td>
<td>Fatigue/lack of energy/tiredness limiting activity</td>
<td>They (light household tasks) can be a bit tiring, a bit crazy, but yeah, I do feel a wee bit tired. I’m just not used to not being able to do it, you know what I mean. I just, yeah this tired bit really gets me sometimes. (Participant 8, week 3)</td>
</tr>
<tr>
<td></td>
<td>Medical complications limiting activity and/or decreasing confidence</td>
<td>This infection in my leg gets a bit sore. While I’m walking it’s alright just when you stop it seems to start to sting and that. You’re always worrying that if I go too far I’m going to end up too sore. (Participant 4, week 1)</td>
</tr>
<tr>
<td></td>
<td>Activity modification due to physical symptoms</td>
<td>My heart was racing so I was admitted to hospital [overnight] ...So that was a wee hiccup in the road. I was a wee bit frightened and a wee bit afraid thinking is it going to happen again ... thinking oh it (physical activity) might bring it on again, but I’ve got past that now. (Participant 8, week 3)</td>
</tr>
<tr>
<td>Being in unfamiliar territory resulted in</td>
<td>Uncertain about what to expect</td>
<td>I couldn’t figure out which was just pain and acceptable and which was doing damage. (Participant 1, week 1)</td>
</tr>
<tr>
<td>Psychological Challenges to Overcome</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Uncertain about how to do something</td>
<td>I sat down and looked at the walking schedule and thought “Oh man, I just don’t know how the heck I’m going to do that.” (Participant 11, week 1)</td>
<td></td>
</tr>
<tr>
<td>Home seen as a safe haven/familiar</td>
<td>And maybe not wanting to go to stray too far I suppose? I don’t know why. It’s not the fact of thinking I’m going to collapse or anything like that, but I guess it’s that safety of your surroundings. (Participant 11, week 1)</td>
<td></td>
</tr>
<tr>
<td>Fear/worry/apprehension</td>
<td>The first couple of days it was really quite white frosty and I was a bit worried about walking outside and slipping and maybe falling. (Participant 2, week 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I’m paranoid about splitting my sternum so I can’t do very much with my arms at all. (Participant 4, week 3)</td>
<td></td>
</tr>
<tr>
<td>Feeling cautious</td>
<td>I am definitely not up to normal speed. I think it is just caution, more than anything. (Participant 11, week 3)</td>
<td></td>
</tr>
<tr>
<td>Lack of confidence</td>
<td>I think, it’s been that confidence around home and out onto the deck and back in again. (Participant 11, week 1)</td>
<td></td>
</tr>
<tr>
<td>Only attempting things within perceived capability</td>
<td>Anything that I thought that would be difficult I haven’t been trying. (Participant 3, week 3)</td>
<td></td>
</tr>
<tr>
<td>Importance of motivation to overcome physical and</td>
<td>Needing self-motivation/make a conscious decision to do something</td>
<td></td>
</tr>
<tr>
<td>Needing self-motivation/make a conscious decision to do something</td>
<td>I have got to do it. My motivation is to get well, and it is mind over matter, I have got to get up and do it. It’s a lot easier just to say, oh bugger it, I will just sit here for another five minutes. (Participant 8, week 1)</td>
<td></td>
</tr>
<tr>
<td>Psychological challenges</td>
<td>Yeah, I do need to motivate myself to get up and go for a walk. Not because it’s sore or anything like that, it’s just, I don’t know, I need to get motivated. (Participant 7, week 3)</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| Importance of support to overcome physical and psychological challenges | Needing assistance with tasks  
*Helping me get in and out of bed if I need help. Cause I can get out of bed by myself but it’s a lot easier with somebody helping.* (Participant 3, week 1) |
|                          | Needing/appreciating emotional support and encouragement  
*I’m quite happy because all my neighbours up and down the road here all know that I have had this and they are all supporting towards me, so I am pretty lucky really.* (Participant 9, week 1) |
|                          | Needing someone with them in case something goes wrong  
*[My wife] comes round and keeps an eye on me in case I fall over, that’s about all.* (Participant 10, week 6) |
| Family restricting activity | Family restricting activity (even if participant felt capable of doing something)  
*I don’t do much because I am not allowed to do much, he (husband) won’t let me.* (Participant 8, week 3) |

**Theme 2: Becoming more confident and able … but remaining cautious**

| Reducing impact of physical symptoms over time | Lessening impact of pain/ pain only with more strenuous activities  
*And of course now there is less pain so I can do most things like getting in and out of bed.* (Participant 1, week 3) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Still if I do a wee bit too much, it hurts a bit but … just stretching different parts of my body and stuff … Or bending, putting too much weight on my arms and stuff like that. Yeah, pushing and pulling and lifting bits and pieces. Still gives a wee bit of trouble … Like I can do the lifting but my chest lets me know when I’ve done it.</em> (Participant 7, week 12)</td>
</tr>
<tr>
<td>Topic</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Lessening impact of fatigue/ fatigue only after increased levels of activity</td>
<td>Just a little bit tired. But not as much as when I was when I first came home so. But certainly improving every week. (Participant 9, week 6)</td>
</tr>
<tr>
<td></td>
<td>But I certainly have that desire and energy to do that a bit more. (Participant 11, week 6)</td>
</tr>
<tr>
<td>Increasing strength and fitness over time</td>
<td>Improving strength and/or fitness</td>
</tr>
<tr>
<td></td>
<td>Physical deconditioning/ perceived not back to baseline strength and/or fitness</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Increasing confidence/self-efficacy over time</td>
<td>Increasing confidence about ability to engage in activity</td>
</tr>
<tr>
<td></td>
<td>Sources of self-efficacy (mastery experiences/ physiological feedback/ verbal persuasion/ vicarious experiences)</td>
</tr>
<tr>
<td></td>
<td>Physiological feedback after single or multiple bouts of activity:</td>
</tr>
<tr>
<td>Remaining cautious about engaging in more challenging/strenuous activities</td>
<td>Fear about engaging in more challenging/strenuous activities</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Yeah I felt fine. I feel actually better. When I come back in I feel like that was an achievement, I feel good. (Participant 2, week 1)</td>
<td>Just puffed out the first few days but the more I do the better it gets, pretty much. (Participant 7, week 1)</td>
</tr>
<tr>
<td>Verbal persuasion: My husband...(says) get up, walk around. I’ll walk with you. (Participant 8, week 1)</td>
<td>Oh my wife’s reminding me all the time what I’ve got to do. (Participant 5, week 3)</td>
</tr>
<tr>
<td>Vicarious experiences: And they come and visit and talk about what their experiences are like some of them um they had either family or whatever and they’ve had the same problem and they’ve overcome it and they’ve just got back to their normal lives again and so it’s been really good the fact that they’ve been able to come and do that. (Participant 10, week 12)</td>
<td></td>
</tr>
<tr>
<td>I don’t think I’m quite up to being able to do exercise yet. I’m a bit worried about my chest I don’t want it splitting open or anything. See they did say not to lift anything over 4 kg but I don’t know for how long that restriction is in for. (Participant 5, week 6)</td>
<td>I’m scared that somewhere down the line if I do something too hard well what’s it going to effect is it going to affect my chest affect my heart or the arteries that they put in, is it strong enough to take this and that? (Participant 12, week 6)</td>
</tr>
<tr>
<td>Uncertainty about returning to more</td>
<td>They [arms] just feel a wee bit yeah. Like they’re not as they were. So, I don’t know what to do? What can I do to strengthen your chest muscles?</td>
</tr>
<tr>
<td>Source of motivation: belief that physical activity is beneficial</td>
<td>Motivated to engage in exercise</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Could I, at that twelve-week mark, could I go back to the gym and just, do light stuff? Or, do you think it’s too early? (Participant 8, week 6)</td>
<td>‘Cause my arms can lift up above me now I’m fine with that. As long as I’m careful and cautious. And I can pick up chairs and things like that not an issue cause again you’ve got them close to your body you’re not lifting them away from your body. (Participant 12, week 12)</td>
</tr>
</tbody>
</table>
APPENDIX 13: SURVEY STUDY ETHICS APPROVAL (CHAPTER 5)

Dear Dr Skinner,

I am writing to confirm for you the status of your proposal entitled “Preparing and Supporting People Who Have Undergone CABG Surgery to Engage in Physical Activity Following Discharge From Hospital: A Survey of Current Practice in Australasia”, which was originally received on November 18, 2019. The Human Ethics Committee’s reference number for this proposal is D19/349.

Thank you for your email of 19 December 2019 addressing the Locality Authorisation matters the Committee raised. The revised application resulting in an amendment to restricting work to NZ institutions is approved. We note the consultation with Health Research South and look forward to receiving Locality Authorisations from participating institutions in due course. Please note the correct ethical reference number for this work is D19/349 and update paperwork accordingly.

The above application was Category B and had therefore been considered within the Department or School. The outcome was subsequently reviewed by the University of Otago Human Ethics Committee. The outcome of that consideration was that the proposal was approved.

Approval is for up to three years from the date of HOD approval. If this project has not been completed within three years of this date, re-approval must be requested. If the nature, consent, location, procedures or personnel of your approved application change, please advise me in writing.

Yours sincerely,

[Signature]

Mr Gary Witte
Manager, Academic Committees
Tel: 479 8256
Email: gary.witte@otago.ac.nz
Ngāi Tahu Research Consultation Committee
Te Komiti Rakahau ki Kai Tahu

Thursday, 10 October 2019

Dr Margot Skinner
School of Physiotherapy
325 Great King Street
Central
Dunedin 9016

Tēnā koe Dr Margot Skinner,

Preparing and Supporting People Who Have Undergone CABG Surgery to Engage in Physical Activity Following Discharge From Hospital: A Survey of Physiotherapists

The Ngāi Tahu Research Consultation Committee (the Committee) met on Tuesday, 08 October 2019 to discuss your research proposition.

By way of introduction, this response from the Committee is provided as part of the Memorandum of Understanding between Te Rūnanga o Ngāi Tahu and the University. In the statement of principles of the memorandum it states “Ngāi Tahu acknowledges that the consultation process outlined in this policy provides no power of veto by Ngāi Tahu to research undertaken at the University of Otago”. As such, this response is not “approval” or “mandate” for the research, rather it is a mandated response from a Ngāi Tahu appointed committee. This process is part of a number of requirements for researchers to undertake and does not cover other issues relating to ethics, including methodology; they are separate requirements with other committees, for example the Human Ethics Committee, etc.

Within the context of the Policy for Research Consultation with Māori, the Committee base consultation on that defined by Justice McCechnan:
"Consultation does not mean negotiation or agreement. It means: setting out a proposal not fully decided upon; adequately informing a party about relevant information upon which the proposal is based; listening to what the others have to say with an open mind (in that there is room to be persuaded against the proposal); undertaking that task in a genuine and not cosmetic manner. Reaching a decision that may or may not alter the original proposal."

The Committee considers the research to be of importance to Māori health.

The Committee suggests researchers consider the Southern District Health Board’s Tikaka Best Practice document, in particular patient engagement.

The Committee suggests including a Māori researcher in the team.

The Committee suggests dissemination of the research findings to relevant Māori health organisations regarding this study, including Taeaora Tinana, Māori Physiotherapists within the New Zealand Society of Physiotherapists.

NGĀI TAHU RESEARCH CONSULTATION COMMITTEE
TE KOMITI RAKAHAU KI KAI TAHU

The Committee requests a copy of the research findings.

This letter of suggestion, recommendation and advice is current for an 18-month period from Tuesday, 08 October 2019 to 25 March 2021.

The recommendations and suggestions above are provided on your proposal submitted through the consultation website process. These recommendations and suggestions do not necessarily relate to ethical issues with the research, including methodology. Other committees may also provide feedback in these areas.

Nāhaku noa, nā

[Signature]

Claire Porina
Manager, Māori Research Consultation
Office of Māori Development
Te Whare Wānanga o Otīkou
Ph: +64 3 4798081
Email: claire.porina@otago.ac.nz
Web: www.otago.ac.nz
APPENDIX 15: INVITATION LETTER FOR PILOT PARTICIPANTS (CHAPTER 5)

Prepared and Supporting People Who Have Undergone CABG Surgery to Engage in Physical Activity Following Discharge From Hospital: A Pilot Survey of Current Practice in New Zealand

To____________________,

We are a group of researchers who are undertaking a study to determine how inpatient hospital services prepare and support people who have undergone CABG surgery to engage in physical activity following their discharge from hospital.

As a health professional who currently works or has recently worked on the cardiothoracic surgical ward at your hospital we are inviting you to participate in the piloting of a questionnaire, which will be used in a survey of health professionals at hospitals across New Zealand that provide adult cardiac surgery services. Enclosed in this pack is an information sheet about the pilot study, a consent form, a paper copy of the questionnaire and a return post envelope. Please read the participant information sheet carefully before deciding to participate in this study. If you agree to participate in this study you will be required to complete a questionnaire, which will take approximately 25 minutes to complete. You will also be asked some additional questions about the usability and relevance of the questionnaire. Your responses will help us to make any necessary changes to the survey prior to distribution for the wider distribution to health professionals across New Zealand.

If you are unable to complete the survey for any reason, please feel free to pass this information to another physiotherapist at your hospital who is currently or recently involved in the inpatient care of patients following CABG surgery for them to consider whether they wish to participate. Please do not pass the survey to your most senior physiotherapist, as they will likely be the person from your hospital who will be invited to participate in the main study.

If you require any further information, please contact Dr Margot Skinner at margot.skinner@otago.ac.nz or Emily Gray at emily.gray@postgrad.otago.ac.nz

Kind regards
Dr Margot Skinner
Primary Investigator
Preparation and Support People Who Have Undergone CABG Surgery to Engage in Physical Activity Following Discharge From Hospital: A Pilot Survey for Current Practice in New Zealand

INFORMATION SHEET FOR PARTICIPANTS

Thank you for considering participating in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the Aim of the Project?

After discharge from hospital following coronary artery bypass graft (CABG) surgery, engagement in physical activity is important in both the short term to optimise the person’s functional recovery and return to daily activities and in the long term, to improve their quality of life and reduce mortality risk. However engagement in physical activity during the first three months following CABG surgery has many potential barriers. Physical symptoms such as fatigue and pain as well as psychological factors such as fear and uncertainty result in people feeling cautious about engaging in physical activity during this initial timeframe.

There are no published studies or guidelines regarding the optimal way to prepare or support people who have undergone CABG surgery to engage in physical activity following their discharge from hospital. In addition, the current practice regarding how hospital services in New Zealand prepare patients who have undergone CABG surgery to engage in physical activity following their discharge from hospital is unknown.

The aim of the primary research will be to conduct a survey of health professionals who work at public and private hospitals across New Zealand in order to determine the current practice in hospitals across New Zealand to prepare and support adults for engaging in PA following discharge from hospital after CABG surgery.

The aim of the current pilot survey is to determine the usability and relevance of a purpose-designed questionnaire to gather data from health professionals to answer the above aim.

This project is being undertaken by Emily Gray as part of the requirements for her PhD studies. The project is supervised by University of Otago academic staff members at the School of Physiotherapy, Dr Margot Skinner and Professor Leigh Hale.
What Type of Participants are being sought?

We are seeking physiotherapists who have worked on the acute cardiothoracic surgical ward at either Dunedin Public Hospital or Mercy Hospital (Dunedin) in the past year. You have been suggested as meeting this criteria by being a participant in the Dunedin Cardiorespiratory Physiotherapy Interest Group.

What will Participants be asked to do?

Should you agree to take part in this project, you will be asked to complete the paper questionnaire that is included in the package that was sent to you. It is anticipated that the questionnaire will take approximately 25 minutes to complete. At the end of the survey there are some additional questions about the usability and relevance of the survey, for example:

- How easy the questionnaire was to understand and complete
- How long the questionnaire took to complete
- If you think the questionnaire has captured all of the relevant information

It is anticipated that the questions about the usability and relevance will take an additional 10 minutes (approximately) to complete.

Following completion of the survey, you will be required to place the completed questionnaire in the return postage courier bag that has been provided and return to us via post.

What Data or Information will be collected and what use will be made of it?

The questionnaire asks firstly for information relating to your health professional qualifications and clinical experience in relation to managing people who have undergone CABG surgery. No information that will personally identify you, for example your name or contact details, will be collected. An identification number will be included on the survey so that the research group can track responses, however this number will not be linked to your personal details in any subsequent data analysis.

Following the collection of this professional information, the questionnaire will ask about the ways that health professionals in your hospital service prepare and support people who have undergone CABG surgery to engage in physical activity following their discharge from hospital. Finally, the questionnaire will ask about the specific information and advice health professionals in your hospital service provide to people who have undergone CABG surgery for engaging in physical activity during the first three months following discharge from hospital that.

Your responses to the questions relating to the usability and relevance of the questionnaire will be transposed onto an electronic spreadsheet. Responses from all pilot participants will be collated and changes will be made to the wording and structure of the questionnaire as required. While the findings from the piloting of the questionnaire may be included in the Thesis of the student researcher, the pilot findings will not be included in any subsequent publications. Your anonymity and that of your workplace will be preserved in all circumstances.
Your responses to the main part of the questionnaire will not be transposed or used in the analysis of the main study or be included in any subsequent publications.

The data collected will be securely stored in such a way that only the members of the research group will be able to gain access to it. Data obtained as a result of the research will be retained for at least 10 years. Electronic data will be stored on Dr Skinner’s password protected computer and the paper surveys and handouts will be stored in a locked filing cabinet in Dr Skinner’s office.

Can Participants change their mind and withdraw from the project?

You may withdraw from participation in the project at any time until you have posted the completed survey back without any disadvantage to yourself.

Any questions?
If you have any questions now or in the future, please contact either:

Dr Margot Skinner Phone: +64 03 4797466
margot.skinner@otago.ac.nz
Principal Investigator
Senior Lecturer
School of Physiotherapy
University of Otago

Emily Gray Phone: +64 03 4795422
emily.gray@postgrad.otago.ac.nz
PhD Candidate
School of Physiotherapy
University of Otago

This study has been approved by the School of Physiotherapy, University of Otago Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (phone +64 3 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.
Preparing and Supporting People Who Have Undergone CABG Surgery to Engage in Physical Activity Following Discharge From Hospital: Pilot Survey for Current Practice in New Zealand

CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:

1. My participation in the project is entirely voluntary;

2. I am free to withdraw from the project at any time without any disadvantage;

3. No data that can personally identify me (for example name or contact details) will be collected

4. The data that I provide in my survey responses, including any free text comments, will not be reported in the main study

5. There should not be any risks or discomfort from participating in this project;

6. There will be no renumeration for participating in this study;

7. The results of the pilot study will not be published but will be included in a PhD thesis which will be available in the University of Otago Library (Dunedin, New Zealand).

I agree to take part in this project.

................................................................. .........................................................
(Signature of participant) (Date)

.................................................................
(Printed name)
Additional Questions for Pilot Testing of Questionnaire

1. Please comment below on the clarity of the instructions and questions in this questionnaire. Please feel free to write on the questionnaire itself to indicate any aspects of the survey that were unclear.

2. How long (in minutes) did it take you to answer this questionnaire? ______________

3. Do you think that this questionnaire captured all of the relevant information related to the preparation of people who have undergone CABG surgery to engage in physical activity following their discharge from hospital? Yes/No (circle one)

(Note that participants in the main study will be requested to provide patient information handouts that will be used to supplement and add to their questionnaire responses)

Please comment:

4. Please write any other comments you would like to make about any aspects of the questionnaire.
Preparation and Support of People Who Have Undergone CABG Surgery to Engage in Physical Activity Following Discharge From Hospital: A Survey of Current Practice in New Zealand

Survey Instructions and Definitions

If you work in more than one hospital setting, please answer the questions in relation to the hospital setting that the research team referred to, in the letter sent inviting you to participate in this survey. Although the survey is being completed by you as an individual health professional, we are asking you to comment on the services or standard package of care typically provided by the health professional team as a whole, in your hospital. You can ask/consult other health professionals in your team if you are unsure of the answers to any of the questions if you so wish.

In this survey ‘prepare’ refers to any methods used in the acute inpatient setting to prepare people who have undergone CABG surgery to engage in physical activity following their discharge from hospital. Examples include education, advice, collaborative goal setting, action planning and provision of written or online resources.

In this survey ‘physical activity’ is defined as ‘Any bodily movement produced by skeletal muscles that results in energy expenditure beyond resting’ and includes any/all of the following: active movements, activities of daily living and structured exercise.

Written or Online Information for Patients

We are also interested in receiving copies of any resources (written and/or online) that you provide to people who have had CABG surgery about their engagement in physical activity following discharge from hospital. Provision of these resources will allow us to collate and compare information that is provided from a range of hospital settings. The sources of the information provided will be non-identifiable in any of the outputs arising from this research - no information that you provide will be identified as, or linked to your place of work, in any subsequent analysis or written or oral reports about our research findings.

If you are willing to provide us with copies of the resources used by your hospital service, please indicate how you would you prefer to send the resources:

- Email – please email to emily.gray@postgrad.otago.ac.nz
- Post along with completed survey in return postage courier bag provided
- I do not wish to provide our resources
For the questions in Sections 1-7 please place a tick (v) in the relevant box/boxes and make brief notes when asked to specify

Section 1: Professional Information

1) What is your health profession?
   ☐ Physiotherapist ☐ Nurse ☐ Doctor ☐ Other, please specify _______

2) In what country did you receive your entry level (first) Health Professional qualification?
   ☐ New Zealand ☐ Australia ☐ Other, please specify _____________

3) In what year did you graduate from your entry level Health Professional qualification? ___

4) Please indicate below the highest level of tertiary education that you have completed
   ☐ Diploma
   ☐ Bachelor degree/Graduate Entry Masters
   ☐ Postgraduate Certificate/Diploma
   ☐ Postgraduate Masters by coursework
   ☐ Postgraduate Masters
   ☐ PhD/Doctorate
   ☐ Other (please specify) ____________________________________________

5) Which year group below best represents the number of years you have you been working with adult patients post-CABG surgery, who are in an acute cardiothoracic surgery ward.
   ☐ 0-2
   ☐ 3-5
   ☐ 6-10
   ☐ 11-15
   ☐ 16-20
   ☐ >20
Section 2: Clinical Setting

Reminder: All questions in this and subsequent sections of the survey are to be answered in relation to the current practice and context that is utilised by health professionals in the hospital services in the setting to which this survey has been sent.

6) Which one of the following best describes your place of work?
   - Public Hospital
   - Private Hospital

7) Please tick the box that best represents the average number of adults per week in your hospital who undergo coronary artery bypass graft (CABG) surgery (excluding CABG plus valve/other procedures).
   - 0-5
   - 6-10
   - 11-15
   - 16-20
   - >20

8) What is the average length of hospital stay post operation, for people undergoing uncomplicated CABG surgery?

______________________ Days
Section 3: Preparing people who have undergone CABG surgery to engage in physical activity following discharge from hospital

The following questions are about how health professionals in your hospital service prepare people who have undergone CABG surgery to engage in physical activity during the first 12 weeks following their discharge from hospital, as part of the standard care pathway. When the survey refers to ‘preparing people’ it is asking about preparation PRIOR TO a person’s discharge from hospital.

9) How frequently do health professionals in your hospital service prepare people who have undergone CABG surgery to engage in physical activity following their discharge from hospital?

<table>
<thead>
<tr>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
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</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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</table>

10) If you answered “Never” to question 9, please select from the list below why your service does not prepare people who have undergone CABG surgery, to engage in physical activity following their discharge from hospital (tick all that apply).

☐ Lack of staff time and resources
☐ No perceived need to prepare patients
☐ Other (please comment): ________________________________
______________________________

If you answered “Never” to question 9, please go to Section 4 on page 11

11) If you answered in the range of “Mostly” to “Rarely” for question 9, please select the key factor/s that determine why your hospital service does not always prepare people who have had CABG surgery to engage in physical activity following their discharge from hospital. (Tick all that apply)

☐ Time available for staff
☐ Individual requirements of patients (e.g. some need preparation and others do not)
☐ Patients are sometimes discharged after hours/during weekend before information can be provided
☐ Other ________________________________
12) In your hospital service, indicate who is primarily responsible for preparing people who have undergone CABG surgery to engage in physical activity following their discharge from hospital?

☐ Physiotherapist  
☐ Nurse  
☐ Doctor  
☐ Other (Please specify) ____________________________________

13) Please indicate below how often the following modes for the delivery of information are used by health professionals in your hospital service to prepare people who have undergone CABG surgery to engage in physical activity following their discharge from hospital. (Tick all that apply)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written information/handouts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A face to face conversation</td>
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<tr>
<td>Pre-recorded video</td>
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<tr>
<td>Online information</td>
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<tr>
<td>(Please specify)</td>
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<tr>
<td>Apps</td>
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<td>(Please specify)</td>
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<tr>
<td>Other</td>
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<td>(Please specify)</td>
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</tbody>
</table>
14) Please indicate below at which stage/s the various forms of information about engagement in physical activity following discharge from hospital are typically provided by health professionals in your hospital service, to people undergoing CABG surgery. (POD = post-operative day)

<table>
<thead>
<tr>
<th>Written Handouts</th>
<th>Face to Face Conversation</th>
<th>Online Information</th>
<th>Pre-recorded Video</th>
<th>Other (specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-operatively</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POD 1</td>
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<tr>
<td>POD 2-3</td>
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<tr>
<td>POD 4-5</td>
<td></td>
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<tr>
<td>The day of discharge</td>
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<tr>
<td>Not applicable</td>
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<tr>
<td>Other (please specify)</td>
<td>__________</td>
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</tbody>
</table>

15) If you indicated that health professionals in your hospital service use a ‘face to face conversation’ to provide information about engaging in physical activity, how often do they request that a support person for the patient (for example spouse, family member or friend) be present during the conversation?

Always  Mostly  Sometimes  Rarely  Never
									

16) In your hospital service, prior to the person’s discharge, how much time is typically spent by health professionals having a face to face conversation with people who have undergone CABG surgery in order to specifically prepare them to engage in physical activity following discharge from hospital? (Tick one)

☐ Less than 5 minutes
☐ 6-10 minutes
☐ 11-20 minutes
☐ 21-30 minutes
☐ 31-40 minutes
☐ 41-60 minutes
☐ >60 minutes
☐ Other (please specify) ___________________________
17) When preparing people who have had CABG surgery to engage in physical activity following their discharge from hospital, how often does your service provide people with the following information?

If you are sending us a copy of the written/online information about engaging in physical activity that is provided to patients following CABG surgery, you are only required to give details or examples where requested if it is not included in the information provided to patients.

<table>
<thead>
<tr>
<th>Information</th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
<th>Please give details or examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Information about benefits to health from engaging in physical activity</td>
<td></td>
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<tr>
<td>b) Information about the consequences of both engaging in and not engaging in physical activity</td>
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<tr>
<td>c) Information about what others (for example health professionals or other people who have had CABG surgery) think about people engaging in physical activity after CABG surgery</td>
<td></td>
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<tr>
<td>d) Information about common barriers to engagement in physical activity</td>
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<tr>
<td>e) Short term benefits of physical activity following CABG surgery</td>
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<tr>
<td>f) Long term benefits of physical activity following CABG surgery</td>
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<tr>
<td>g) Warning signs and symptoms during physical activity that signal the need to slow down or stop the activity</td>
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</tbody>
</table>
18) Please indicate below how often health professionals in your hospital service use the following methods to prepare persons who have had CABG surgery, to engage in physical activity following discharge from hospital.

<table>
<thead>
<tr>
<th>Method</th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Explore the person’s knowledge and beliefs about physical activity</td>
<td></td>
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<tr>
<td>b) Explore the person’s values about why physical activity engagement is important to them</td>
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<tr>
<td>c) Provide instructions about how to engage in physical activity</td>
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<tr>
<td>d) Demonstrate the activities or exercises you want the person to engage in</td>
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<tr>
<td>e) Get the person to agree on a written, signed behaviour contract for engagement in physical activity</td>
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<tr>
<td>f) Get the person to practise engagement in physical activity in preparation for discharge</td>
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<tr>
<td>g) Provide opportunities for social comparison such as stories or videos of experiences of other persons engaging in physical activity (apart from at a cardiac rehabilitation programme)</td>
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<tr>
<td>h) Indicate to the person how they may be an example or role model for others in regard to engagement in physical activity</td>
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<tr>
<td>i) Teach the person strategies and techniques to reduce their stress and anxiety</td>
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<tr>
<td>j) Motivational interviewing to facilitate engagement in physical activity</td>
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<tr>
<td>k) Shared/collaborative decision making about physical activity engagement with the person</td>
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<tr>
<td>l) Ensure that the person knows where to access resources and support regarding physical activity engagement following discharge</td>
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<tr>
<td>m) Address the person’s cultural needs when preparing them to engage in physical activity</td>
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</tbody>
</table>

Please give some examples of how the cultural needs of persons who have had CABG surgery are addressed in your hospital service:
19) Please indicate below how often health professionals in your **hospital service** prompt people who have undergone CABG surgery to use the following strategies to facilitate self-management of their engagement in physical activity following discharge from hospital.

If you are sending us a copy of the written/online information about engaging in physical activity that is provided to patients following CABG surgery, you are only required to give details or examples where requested if it is not included in the information provided to patients.

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
<th>Please give details or examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Problem solving relating to engagement on physical activity</td>
<td></td>
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<tr>
<td>b) Self-reflection (for example identifying what works/helps them to engage in physical activity)</td>
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<tr>
<td>c) Self-discovery/self-awareness (for example awareness of the person’s own previous experience with physical activity; knowledge, beliefs, hopes and fears relating to physical activity following discharge)</td>
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<tr>
<td>d) Identify barriers to engagement in physical activity and plan ways to overcome them</td>
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<tr>
<td>e) Self-monitor physical activity engagement (for example, an activity diary)</td>
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<tr>
<td>Question 19 continued:</td>
<td>Always</td>
<td>Mostly</td>
<td>Sometimes</td>
<td>Rarely</td>
<td>Never</td>
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<tr>
<td>f) Create their own goals for engagement in physical activity</td>
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<tr>
<td>g) Build confidence/self-efficacy through recognising successes in physical activity</td>
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<tr>
<td>h) Build confidence/self-efficacy through self-reflection on how they feel (physically and/or emotionally) during or after physical activity</td>
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<tr>
<td>i) State (verbally or written) their intention to engage in physical activity</td>
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<tr>
<td>j) Create their own plan for how, when where and/or with whom they will engage in physical activity</td>
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<tr>
<td>k) Independently review and/or reconsider their own goals or intentions in regards to engagement in physical activity</td>
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<tr>
<td>l) Use prompts or cues to remind themselves to engage in physical activity</td>
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<tr>
<td>m) Use self-instruction and self-encouragement (silent or aloud) to support engagement in physical activity</td>
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<tr>
<td>n) Identify situations that may cause potential relapses or failures relating to physical activity and develop a plan to avoid and/or manage these situations</td>
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<tr>
<td>o) Use time management planning to fit physical activity into their everyday routine</td>
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</tbody>
</table>
Section 4: Considerations relating to the sternum when engaging in physical activity following CABG surgery

20) Prior to the person’s discharge from hospital, how often do health professionals in your hospital service typically provide the following advice regarding considerations relating to the sternum when engaging in physical activity during the first 12 weeks following CABG surgery?

Sternal support when coughing or sneezing

<table>
<thead>
<tr>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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If always - mostly: Please indicate the length of time you advise the patient to continue to provide sternal support on coughing or sneezing

- □ <4 weeks
- □ 4-6 weeks
- □ 7-8 weeks
- □ 9-12 weeks
- □ Until no longer painful to perform
- □ Other (please specify): __________________________

Avoid unilateral arm movements

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If always – mostly: Please specify which unilateral arm movements you advise the person to avoid:

______________________________

Please indicate the length of time you advise for this limit to apply for

- □ <4 weeks
- □ 4-6 weeks
- □ 7-8 weeks
- □ 9-12 weeks
- □ Until no longer painful to perform
- □ Other (please specify): __________________________
Restrictions on activities that require lifting, pushing or pulling (no matter how the movement is performed)

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If always - mostly: Please indicate the weight limit that you advise at the time of discharge

☐ <2 kg  ☐ 2-5 kg
☐ 6-10 kg ☐ 11-15 kg
☐ Pain limiting ☐ Other (please specify) ______________

Please indicate the length of time you advise this limit to apply for

☐ <4 weeks  ☐ 4-6 weeks
☐ 7-8 weeks  ☐ 9-12 weeks
☐ Until no longer painful to perform
☐ Other (please specify): ______________________

‘MOVE IN THE TUBE’ (Restrictions only on activities that require lifting, pushing or pulling with the arms are abducted away from or extended behind the body)

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</table>

If always - mostly: Please indicate the weight limit that you advise if moving “outside of the tube” at the time of discharge

☐ <2 kg  ☐ 2-5 kg
☐ 6-10 kg ☐ 11-15 kg
☐ Pain limiting ☐ Other (please specify): __________

Please indicate the length of time you advise for this limit to apply for

☐ <4 weeks  ☐ 4-6 weeks
☐ 7-8 weeks  ☐ 9-12 weeks
☐ Until no longer painful to perform
☐ Other (please specify): _______________________
No restrictions on lifting, pushing or pulling at any time as long as the activity is not painful

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No restrictions on lifting, pushing or pulling at any time, even if the activity is painful

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Advice or instructions about how to reintroduce upper limb activities or exercise after sternal restrictions are lifted

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Please give details: ____________________________________________

_________________________________________________________________

_________________________________________________________________

21) Please indicate below who primarily sets the guidelines for sternal considerations that are advised to people following CABG surgery in your hospital service? (Tick one)

- [ ] Interprofessional Team
- [ ] Nurse
- [ ] Physiotherapist
- [ ] Surgeon
- [ ] Other (please specify) _______________________
- [ ] Unsure

22) If you would like to make any other comments about the advice that your hospital service provides regarding STERNAL CONSIDERATIONS when engaging in physical activity during the first 12 weeks following CABG surgery please include them here:
Section 5: Advice regarding engagement in EXERCISE following CABG surgery

This section explores the advice provided by health professionals in your hospital service to persons who have undergone CABG surgery regarding engagement in exercise during the first 12 weeks following discharge from hospital.

For the purpose of this survey exercise is defined as ‘planned, structured, repetitive and purposeful movement with the goal of maintaining or improving physical fitness’.

If you are sending us a copy of the written/online information about engaging in exercise that is provided to patients following CABG surgery at your hospital you DO NOT need to write a detailed response when the survey asks for more information or examples.

23) How often do health professionals in your hospital service prepare people who have undergone CABG surgery prior to their discharge from hospital, to engage in EXERCISE following their discharge?

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</table>

If you answered ‘never’, please go to section 6 on page 19

If you answered ‘always to rarely’, please go to Question 24 on the next page
24) Please indicate below how often health professionals in your hospital service include the following information when preparing people to engage in **exercise** during the first 12 weeks following CABG surgery.
If you are sending us a copy of the written/online information about engaging in exercise that is provided to patients following CABG surgery you DO NOT need to provide details or examples.

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<th></th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
<th>Please give details or examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Information about engaging in AEROBIC EXERCISE</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>b) Information regarding TYPES OF AEROBIC EXERCISE to engage in</td>
<td></td>
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<tr>
<td>c) Information regarding the INTENSITY OF AEROBIC EXERCISE</td>
<td></td>
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<tr>
<td>d) Information regarding how people can MONITOR THE INTENSITY</td>
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<tr>
<td></td>
<td>Always</td>
<td>Mostly</td>
<td>Sometimes</td>
<td>Rarely</td>
<td>Never</td>
<td>Please give details or examples</td>
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<tr>
<td>e) Information about the AMOUNT OF AEROBIC EXERCISE that people should aim to engage in</td>
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<tr>
<td>f) Information regarding knowing how to PROGRESS THEIR ENGAGEMENT IN AEROBIC EXERCISE</td>
<td></td>
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<tr>
<td>g) Information about engaging in LOWER LIMB RANGE OF MOVEMENT EXERCISES (no resistance)</td>
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<tr>
<td>h) Information about engaging in UPPER LIMB ACTIVE RANGE OF MOVEMENT EXERCISES (no resistance)</td>
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<tr>
<td>i) Information about engaging in CERVICAL OR THORACIC SPINE RANGE OF MOVEMENT EXERCISES (no resistance)</td>
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<tr>
<td></td>
<td>Always</td>
<td>Mostly</td>
<td>Sometimes</td>
<td>Rarely</td>
<td>Never</td>
<td>Please give details or examples</td>
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<tr>
<td>j) Information about engaging in LOWER LIMB RESISTANCE EXERCISE</td>
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<tr>
<td>k) Information about engaging in UPPER LIMB RESISTANCE EXERCISE for the HAND, WRIST AND ELBOW</td>
<td></td>
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<tr>
<td>l) Information about engaging in UPPER LIMB RESISTANCE EXERCISE for the SHOULDER</td>
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<tr>
<td>m) Information about ABDOMINAL OR SPINAL RESISTANCE/STRENGTHENING EXERCISES</td>
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<tr>
<td>n) Information regarding KNOWING HOW TO PROGRESS ENGAGEMENT IN RESISTANCE EXERCISE</td>
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</table>
25) Please indicate below who primarily sets the guidelines regarding engagement in exercise during the first 12 weeks following CABG surgery that is provided to people in your hospital service? (Tick one)

☐ Interprofessional Team
☐ Nurse
☐ Physiotherapist
☐ Surgeon
☐ Other (please specify) ____________________
☐ Unsure

26) If you would like to make any other comments about the advice that your hospital service provides regarding engaging in EXERCISE during the first 12 weeks following CABG surgery please include them here:
Section 6: Preparation for engagement in ACTIVITIES OF DAILY LIVING following CABG surgery

This section explores the advice provided to persons who have undergone CABG surgery regarding engagement in activities of daily living during the first 12 weeks following discharge from hospital.

‘ACTIVITIES OF DAILY LIVING’ refers to any daily tasks requiring movement including personal cares, as well as activities in and around the home and community (but excluding exercise).

27) Prior to the person’s discharge from hospital, how often do health professionals in your hospital service prepare the person who has undergone CABG surgery to engage in ACTIVITIES OF DAILY LIVING following their discharge from hospital?

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<thead>
<tr>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
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</thead>
</table>

If you answered ‘never’, please go to section 7 on page 22

If you answered ‘always to rarely’, please go to Question 28 on the next page
28) Please indicate below how often your hospital service includes the following information when preparing people to engage in ACTIVITIES OF DAILY LIVING during the first 12 weeks following CABG surgery.

If you are sending us a copy of the written/online information about engaging in activities of daily living that is provided to patients following CABG surgery you DO NOT need to provide details or examples.

<table>
<thead>
<tr>
<th>Information Provided</th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
<th>Please give details or examples</th>
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<tbody>
<tr>
<td>a) Progressive engagement in activities of daily living</td>
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<tr>
<td>b) Standardised advice regarding engagement in activities of daily living</td>
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<tr>
<td>c) Individualised advice regarding engagement in activities of daily living</td>
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<tr>
<td>d) Specific examples of activities of daily living to engage in at various time points</td>
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<tr>
<td>e) Using self-monitoring of symptoms such as pain or fatigue to determine engagement in activities of daily living</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>f) Information about expected timeframes for return to work</td>
<td>Always</td>
<td>Mostly</td>
<td>Sometimes</td>
<td>Rarely</td>
<td>Never</td>
<td>Please give details or examples</td>
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<tr>
<td>g) Need for increased rest during the first few weeks</td>
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<tr>
<td>h) Balancing the needs for rest and activity</td>
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<td></td>
<td>Information about time spent being sedentary</td>
</tr>
</tbody>
</table>

29) Please indicate below who primarily sets the guidelines regarding engagement in **activities of daily living** that are provided to people following CABG surgery in your hospital service? (Tick one)

- [ ] Interprofessional Team
- [ ] Nurse
- [ ] Physiotherapist
- [ ] Surgeon
- [ ] Unsure
- [ ] Other (please specify) _________________

30) If you would like to make any other comments about the advice that your hospital service provides regarding engaging in **ACTIVITIES OF DAILY LIVING** during the first 12 weeks following CABG surgery please include them here:
Section 7: Supporting patients who have undergone CABG surgery to engage in physical activity following discharge from hospital

The following questions are about the support your hospital service provides to persons who have undergone CABG surgery, to engage in physical activity during the first 12 weeks following their discharge from hospital.

When the survey refers to ‘supporting people’, it is asking about the support provided to a person FOLLOWING their discharge from hospital.

31) Does your hospital service provide a supervised outpatient cardiac rehabilitation programme?

Yes □ No □

32) If you answered “no” to question 31, are people who undergo CABG surgery at your hospital referred to attend a supervised outpatient cardiac rehabilitation provided by another hospital service?

Yes □ No □

Please give details: _______________________________________________________
_______________________________________________________________________

33) How often are persons who have undergone CABG surgery at your hospital given a referral to attend a supervised outpatient cardiac rehabilitation programme?

Always □ Mostly □ Sometimes □ Rarely □ Never □ Unsure □

34) Apart from support provided through outpatient cardiac rehabilitation programmes, how often are persons who have undergone CABG surgery typically provided with follow up support by health professionals specifically in regard to engaging in physical activity during the first 12 weeks following discharge from hospital?

Always □ Mostly □ Sometimes □ Rarely □ Never □ Unsure □
35) If you answered “**Sometimes - Never**” to question 34, please select from the list below why your service does not always support persons who have undergone CABG surgery, to engage in physical activity following their discharge from hospital (tick all that apply).

- □ Lack of time for staff
- □ Such a service is not funded
- □ No community or outpatient services provided by our hospital
- □ Patients are referred to community or outpatient services provided by another hospital
- □ No perceived need to provide support to any patients following discharge
- □ Only people having difficulty with physical activity are provided with support following discharge
- □ Other (please comment): ________________________________

36) If you indicated in the range of “**always to sometimes**” to question 34, please indicate below **which health professionals typically provide support**; in **which week/s** following discharge from hospital the professionals provide this support; and **how** they provide this support (tick all that apply).

- □ **General practitioner**
  - Week/s: __________________________ or □ Unsure
  - □ Face to face  □ Phone call  □ Online video call
  - □ Email  □ Text  □ Other (please specify):

- □ **Physiotherapist**
  - Week/s: __________________________ or □ Unsure
  - □ Face to face  □ Phone call  □ Online video call
  - □ Email  □ Text  □ Other (please specify):

- □ **Cardiac nurse educator**
  - Week/s: __________________________ or □ Unsure
  - □ Face to face  □ Phone call  □ Online video call
  - □ Email  □ Text  □ Other (please specify):

- □ **District nurse**
  - Week/s: __________________________ or □ Unsure
  - □ Face to face  □ Phone call  □ Online video call
  - □ Email  □ Text  □ Other (please specify):

- □ **Cardiac Surgeon**
  - Week/s: __________________________ or □ Unsure
  - □ Face to face  □ Phone call  □ Online video call
  - □ Email  □ Text  □ Other (please specify)
Apart from supervised cardiac rehabilitation programmes, please indicate below how often the following strategies are used as part of your hospital service’s standard pathway of care in order to support persons who have had CABG surgery to engage in physical activity following their discharge from hospital.

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<tr>
<th></th>
<th>Always</th>
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<th>Rarely</th>
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<th>Please give details or examples</th>
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</thead>
<tbody>
<tr>
<td>a) Build confidence/self-efficacy through providing feedback</td>
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<tr>
<td>b) Provide praise, encouragement and/or material rewards for engagement in physical activity that is not contingent on specific achievements or standards of performance</td>
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<tr>
<td>c) Provide praise, encouragement and/or material rewards for attaining certain achievements or standards of performance relating to physical activity</td>
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<tr>
<td></td>
<td>Always</td>
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<td>Please give details or examples</td>
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<tr>
<td>d) Provide feedback on physical activity performance following their discharge</td>
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<tr>
<td>e) Use follow up prompts (e.g. phone calls or texts) following discharge to remind persons to engage in physical activity</td>
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<tr>
<td>f) Provide social support to engage in physical activity, for example peers in a “buddy” system</td>
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</table>

Thank you for completing this survey!  
We really appreciate the time you have given to participate.

Please put your signed consent form, completed survey and any written patient handouts into the return post courier bag provided.
APPENDIX 20: STUDY INVITATION FOR MAIN STUDY PARTICIPANTS
(CHAPTER 5)

Preparing and Supporting People Who Have Undergone CABG Surgery to Engage in Physical Activity Following Discharge From Hospital:
A Survey of Current Practice in New Zealand

To the senior physiotherapist or cardiac nurse specialist on the cardiac surgery ward

We are a group of researchers who are undertaking a study to determine the current practice in hospitals across New Zealand to prepare and support adults for engaging in physical activity following discharge from hospital after CABG surgery.

We are inviting the most experienced health professional (physiotherapist or nurse) who is primarily responsible for preparing inpatients who have undergone CABG surgery to engage in physical activity following their discharge from hospital to participate in this study. If there are similarly experienced health professionals in your setting who could complete this questionnaire, the decision about who will complete this questionnaire is at the discretion of your health service delivery team.

Enclosed in this pack is an information sheet about the study, a consent form, a paper copy of the questionnaire and a return post envelope. Please read the participant information sheet carefully before deciding to participate in this study. If you agree to participate in the study you will be required to complete a questionnaire, which will take approximately 30 minutes to complete. You will also be requested to provide a copy of the any written information handouts or links to any online resources about engaging in physical activity that you provide to patients who have had CABG surgery (optional).

If, for any reason, you are unable to participate in this study, please feel free to pass this information on to an appropriately experienced health professional for their consideration.

Locality authorisation/permission has been granted by your hospital for us to send this questionnaire. At the completion of the study, a report of the findings of this nationwide survey will be provided to your hospital.

If you require any further information, please contact
Dr Margot Skinner or Emily Gray
margot.skinner@otago.ac.nz emily.gray@postgrad.otago.ac.nz
Phone +64 3 4797466

Kind regards
Dr Margot Skinner
This project has been reviewed and approved by the School of Physiotherapy Ethics Committee, University of Otago. Ethics reference number: D19/349
Preparing and Supporting People Who Have Undergone CABG Surgery to Engage in Physical Activity Following Discharge From Hospital: A Survey of Current Practice in New Zealand

INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the Aim of the Project?

After discharge from hospital following coronary artery bypass graft (CABG) surgery, engagement in physical activity is important in both the short term to optimise the patient’s functional recovery and return to daily activities and in the long term, to improve their quality of life and reduce mortality risk. However engagement in physical activity during the first three months following CABG surgery has many potential barriers. Physical symptoms such as fatigue and pain, as well as psychological factors such as fear and uncertainty, result in people feeling cautious about engaging in physical activity during this initial timeframe. From our review of the relevant literature it appears there are no published studies or guidelines regarding the optimal way to prepare patients to engage in physical activity following CABG surgery. In addition, the current range of practice regarding how hospital services in New Zealand prepare and support patients who have undergone CABG surgery to engage in physical activity following their discharge from hospital is unknown.

The aim of this research is to conduct a survey of health professionals who work at public and private hospitals across New Zealand in order to determine the current practice in hospitals across New Zealand to prepare and support adults for engaging in physical activity following discharge from hospital after CABG surgery.

This project is being undertaken by Emily Gray as part of the requirements for her PhD studies. The project is supervised by University of Otago academic staff members at the School of Physiotherapy, Dr Margot Skinner and Professor Leigh Hale.
What Type of Participants are being sought?

The most experienced health professional at each hospital who is primarily responsible for preparing inpatients who have undergone CABG surgery to engage in physical activity following their discharge from hospital will be invited to participate in the study. The individual will be requested to complete the survey on behalf of their hospital services in regards to the preparation and support that is provided to adults for engaging in physical activity following discharge from hospital after CABG surgery. If there are similarly experienced health professionals in your setting who could complete this questionnaire, the decision about who will complete this questionnaire is at the discretion of your health service delivery team.

If there are no inpatient cardiac surgery services provided by your hospital, then you are not eligible to participate in this study.

What will Participants be asked to do?

Should you agree to take part in this project, you will be asked to sign a consent form and complete the paper questionnaire that is included in the package that was sent to you. The questionnaire will take approximately 30 minutes to complete. You will also be asked to provide a copy of any patient information sheets or links to online resources about engaging in physical activity that your hospital service provides to people following CABG surgery prior to their discharge from hospital. These handouts can be provided in paper form or electronically via email. Provision of these resources is optional.

Following completion of the survey, you will be required to place the survey and any relevant patient information sheets (if applicable) in the return postage courier bag that has been provided and return to us via post.

What Data or Information will be collected and what use will be made of it?

The questionnaire asks firstly for information relating to your professional qualifications, clinical experience and details regarding your hospital setting. No information that can personally identify you, for example your name or contact details, will be collected. Following the collection of this professional information, the questionnaire will ask about the ways that the health professionals in your hospital service prepare and support people who have undergone CABG surgery to engage in physical activity following their discharge from hospital. Finally, the questionnaire will ask about the specific information and advice for engaging in physical activity during the first three months following discharge from hospital that health professionals in your hospital service provide to patients who have undergone CABG surgery.

Information from the patient handouts/resources will be used to clarify survey responses and to provide additional detail about the specific information or advice that is provided to patients regarding engagement in physical activity. It will also enable the research group to identify any topics relating to physical activity that were not covered in the questionnaire. The data collected will be securely stored in such a way that only the members of the research group will be able to gain access to it. Data obtained as a result of the research will be retained for at least 10 years. Electronic data will be stored on Dr Skinner’s password protected computer and the paper surveys and handouts will be stored in a locked filing cabinet in Dr Skinner’s office.
A hospital site identification number is written on the questionnaire. This number will allow the research group to track responses, as well as report the number of private and public hospitals and the countries and regions represented by the survey responses. This hospital site number and not the name of your hospital will be used when recording and analysing all data. Therefore any data from the survey responses or patient handouts/resources will not be linked to you or your hospital site in either the data analysis or reporting of the results. In this way, your anonymity and that of your workplace will be preserved in all circumstances. The results of the project may be presented and published and will be available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve your anonymity.

**Can Participants change their mind and withdraw from the project?**

You may withdraw from participation in the project at any time until you have posted the completed survey back without any disadvantage to yourself.

**Any questions?**

If you have any questions now or in the future, or if you wish to participate in this study please contact either:

**Dr Margot Skinner**  
Principal Investigator  
Primary Supervisor  
School of Physiotherapy  
University of Otago  

**Emily Gray**  
PhD Candidate  
School of Physiotherapy  
University of Otago  

**Dr Margot Skinner**  
Phone: +64 03 4797466  
margot.skinner@otago.ac.nz

**Emily Gray**  
Phone: +64 03 4795422  
emily.gray@postgrad.otago.ac.nz

This study has been approved by the Department stated above. However, if you have any concerns about the ethical conduct of the research you may contact the University of Otago Human Ethics Committee through the Human Ethics Committee Administrator (ph +643 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.
CONSEN FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:
1. My participation in the project is entirely voluntary;
2. I am free to withdraw from the project at any time without any disadvantage;
3. No data that can personally identify me (for example my name or contact details) will be collected and all information will be deidentified in order to preserve the anonymity of myself and the hospital site that I represent;
4. There should not be any risks or discomfort from participating in this project;
5. There will be no renumeration for participating in this study;
6. The results of the project may be published and will be included in a PhD thesis which will be available in the University of Otago Library (Dunedin, New Zealand).

I agree to take part in this project.

..........................................................................................
(Signature of participant) ..........................................................
(Date)

..........................................................................................
(Printed name)
Dear Dr Skinner,

I am writing to let you know that, at its recent meeting, the Ethics Committee considered your proposal entitled “Development of a Programme to Facilitate Engagement in Physical Activity During the First 12 Weeks Following CABG Surgery”.

As a result of that consideration, the current status of your proposal is:- Approved

For your future reference, the Ethics Committee’s reference code for this project is:- H19/171.

The comments and views expressed by the Ethics Committee concerning your proposal are as follows:-

While approving the application, the Committee would be grateful if you would respond to the following:

Questionnaire
Please provide the questionnaire, once this have been developed.

Data generated in the study (Question 6.5)
The response to question 6.5 states that “All data generated in this study will be published…” the Committee asks if this should actually read “All data generated in this study will not be published.”

Please provide the Committee with copies of the updated documents, if changes have been necessary.

The standard conditions of approval for all human research projects reviewed and approved by the Committee are the following:

Conduct the research project strictly in accordance with the research proposal submitted and granted ethics approval, including any amendments required to be made to the proposal by the Human Research Ethics Committee.
Final report: A Final Report is required by the Committee upon completion of the study. The Final Report template can be found on the Human Ethics Web Page

https://www.otago.ac.nz/council/committees/committees/HumanEthicsCommittees.html

Adverse or unforeseen events: Inform the Human Research Ethics Committee immediately of anything which may warrant review of ethics approval of the research project, including: serious or unexpected adverse effects on participants; unforeseen events that might affect continued ethical acceptability of the project; and a written report about these matters must be submitted to the Academic Committees Office by no later than the next working day after recognition of an adverse occurrence/event. Please note that in cases of adverse events an incident report should also be made to the Health and Safety Office:

http://www.otago.ac.nz/healthandsafety/index.html

Discontinuation: Advise the Committee in writing as soon as practicable if the research project is discontinued.

Amendments: Make no change to the project as approved in its entirety by the Committee, including any wording in any document approved as part of the project, without prior written approval of the Committee for any change. If you are applying for an amendment to your approved research, please email your request to the Academic Committees Office:

gary.witte@otago.ac.nz

jo.farrondo@otago.ac.nz

Locality authorisation: Studies requiring locality authorisation, i.e. permission from the organisations at which the study is taking place or from which participants are being accessed, must be confirmed before the study commences.

Approval period: Approval is for up to three years from the date of this letter. If this project has not been completed within three years from the date of this letter, re-approval or an extension of approval must be requested. If the nature, consent, location, procedures or personnel of your approved application change, please advise me in writing.

Yours sincerely,

[Signature]

Mr Gary Witte
Manager, Academic Committees
Tel: 479 8256
Email: gary.witte@otago.ac.nz

C.C. Professor L A Hale  Dean  School of Physiotherapy
Health Research South

3/09/2020

Project ID 01609

Ms Miranda Buhler
Physiotherapy Southern DHB

Dear Miranda

REF: The development of a programme to facilitate engagement in physical activity during the first 12 weeks following heart bypass surgery

I am writing on behalf of Health Research South to confirm that the project mentioned above has been granted Locality Authorisation, allowing you to commence.

According to our records:

This project is due to commence on: 3/09/2020

It is anticipated that this project will be completed by: 31/12/2021

Please note that we would appreciate receiving a copy of your final report to the Ethics Committee once your project is completed.

If you have any questions with regards to this process, please contact Health Research South, quoting the project ID number shown above.

Yours sincerely

Bianca Dobson
RESEARCH ADVISOR

CC: GLENN SYMON, GENERAL MANAGER, SOUTHERN DHB
JANINE COCHRANE, GENERAL MANAGER, SOUTHERN DHB
EMILY GRAY, SCHOOL OF PHYSIOTHERAPY, O&O

Health Research South
hrs@otago.ac.nz; www.otago.ac.nz/hrs
Monday, 18 November 2019

Dr Margot Skinner
School of Physiotherapy
325 Great King Street
Central
Dunedin 9016

Tēnā Koe Dr Margot Skinner

Development of a self-management support programme to facilitate engagement in physical activity during the first 12 weeks following heart bypass surgery.

The Ngāi Tahu Research Consultation Committee (the Committee) met on Tuesday, 12 November 2019 to discuss your research proposition.

By way of introduction, this response from the Committee is provided as part of the Memorandum of Understanding between Te Rūnanga o Ngāi Tahu and the University. In the statement of principles of the Memorandum it states "Ngāi Tahu acknowledges that the consultation process outline in this policy provides no power of veto by Ngāi Tahu to research undertaken at the University of Otago". As such, this response is not "approval" or "mandate" for the research, rather it is a mandated response from a Ngāi Tahu appointed committee. This process is part of a number of requirements for researchers to undertake and does not cover other issues relating to ethics, including methodology as they are separate requirements with other committees, for example, the Human Ethics Committee.

Within the context of the Policy for Research Consultation with Māori, the Committee base consultation on that defined by Justice McGechan:

"Consultation does not mean negotiation or agreement. It means: setting out a proposal not fully decided upon; adequately informing a party about relevant information upon which the proposal is based; listening to what the others have to say with an open mind (in that there is room to be persuaded against the proposal); undertaking that task in a genuine and not cosmetic manner. Reaching a decision that may or may not alter the original proposal."

The Committee acknowledges the aims and outcomes of this research project, and the engagement with Māori, and wishes, therefore, to advise that further consultation is not required.

This letter of suggestion, recommendation and advice is current for an 18-month period from Tuesday, 12 November 2019 to 12 May 2021. The Committee requests a copy of the research findings.
The recommendations and suggestions above are provided on your proposal submitted through the consultation website process. These recommendations and suggestions do not necessarily relate to ethical issues with the research, including methodology. Other committees may also provide feedback in these areas.

Nāhaku noa, nā

Claire Porima
Kaiwhakahaere Rangahau Māori
Office of Māori Development
Te Whare Wānanga o Ōtākou
Ph: +64 3 4798081
Email: claire.porima@otago.ac.nz
Web: www.otago.ac.nz
Centre for Health, Activity, and Rehabilitation Research

Have you had heart bypass surgery?

Our research team is aiming to develop a programme that supports people undergoing heart bypass surgery (otherwise known as coronary artery bypass graft surgery) to engage in physical activity following their discharge from hospital. In order to do this we want to consult with people who have undergone heart bypass surgery in the past two years.

If you would like to be involved, you can choose to complete some or all of the following options:
- phone or online interview
- two questionnaires
- two online focus group sessions.

For more information go to:
otago.ac.nz/heartbypass
Or contact:
School of Physiotherapy
0800 687 489
Email clinicalresearch.physio@otago.ac.nz

This project has been reviewed and approved by the University of Otago Human Ethics Committee (Health).
Reference: H19/17/1
APPENDIX 27: STUDY INFORMATION SHEET FOR FORMER PATIENT PARTICIPANTS (CHAPTER 6)

Development of a Programme to Facilitate Engagement in Physical Activity During the First 12 Weeks Following CABG Surgery

INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the aim of this research project?

After discharge from hospital following coronary artery bypass graft (CABG) surgery, engagement in physical activity is important in both the short term, to optimise the person’s recovery back to full function and return to daily activities, and in the long term, to improve their quality of life and reduce risk of further heart disease and death. However, engagement in physical activity during the first three months following CABG surgery has many potential barriers, such as fatigue, pain, fear of doing damage, low self-confidence and uncertainty. In addition, for many people access to help and support to engage in physical activity from health professionals during this period is limited, especially for those who are unable to access supervised outpatient cardiac rehabilitation programmes due to barriers such as distance, transport, and other life commitments such as work and involvement with whānau.

The aim of this study is to develop a programme that prepares and supports people who have undergone CABG surgery to engage in physical activity during the early recovery period (first three months) following their discharge from hospital. The programme will be developed through the creation of resources (e.g., information, people’s stories, tools for reflecting on progress) and a framework for the provision of support (for example from health professionals, whānau or others who have had CABG surgery).

In order to achieve this aim, our research team will consult with both people who have previously had CABG surgery and the health professionals responsible for their care. By consulting with these groups of people the aim is to create a programme that is designed to address the needs of the people who have undergone CABG surgery, but is also perceived by health professionals’ to be feasible to implement in the clinical setting.
This project is being undertaken by Emily Gray as part of the requirements for her PhD studies. The project is supervised by University of Otago academic staff members at the School of Physiotherapy, Dr Margot Skinner and Professor Leigh Hale.

**Who are we seeking to participate in the project?**

We are seeking people who have undergone CABG surgery at Dunedin Public Hospital in the past two years. If you underwent heart valve surgery or had heart valve surgery at the same time as the CABG procedure, you will not be eligible to participate in this study.

If you had CABG surgery more than two years ago and you are interested in participating, please register your interest with the research team as we may need to extend the timeframe if we are not able to recruit enough people to the study.

**What will Participants be asked to do?**

Should you agree to take part in this project, there are four options that you can choose to participate in. You can choose to take part in as many or as few of these options as you prefer. Some of the options only require a limited number of participants. Therefore, because we are seeking a wide representation of ages, genders, ethnicities and living localities (e.g. urban and rural) amongst these participants, you may not be required to undertake a particular option even if you consent to doing so.

**Option 1: Interview**

We are seeking 20 people to take part in an individual 30 – 40 minute face to face interview. The purpose of the interview is to explore your recovery experiences following CABG surgery, your perceptions of how prepared and supported you felt to be able to engage in physical activity following discharge from hospital, and your ideas about how to best prepare and support people to engage in physical activity following discharge from hospital in the future. You are welcome to have a support person/whānau present during the interview. The interview will be undertaken by the student researcher and will take place in your home, or at another place such as the School of Physiotherapy or a local community facility, depending on your preference. If face to face interviews are not possible due to Ministry of Health or University of Otago recommendations regarding Covid-19/Corona Virus, an online videoconference or telephone interview will be undertaken according to your preference.

**Option 2: Questionnaires**

We are seeking 30 or more people to complete two written questionnaires. Each questionnaire will take no longer than 30 minutes to complete. The questionnaires will contain options and examples of components that could be included in a programme that is designed to prepare and support people to engage in physical activity following CABG surgery. The purpose of the questionnaires is to ask you to indicate your preferences regarding these options. You will also be able to indicate your own ideas on the questionnaire if you wish to. Everyone who consents to participate in these questionnaires will be able to do so. These questionnaires may need to be conducted online, depending on the Covid-19/Corona Virus regulations at the time.
Option 3: Focus groups
We are seeking TWO people who are willing to take part in two 90 minute focus group sessions. Other participants in the focus groups will be health professionals (doctors, nurses and physiotherapists) who are responsible for providing healthcare to people following CABG surgery. The purpose of these focus groups is to discuss the findings from the questionnaires (as described above) and to come to a group decision about what will or won’t be included in the final programme.

All of the focus groups will take place either in Dunedin. If you are selected and you live outside of Dunedin, your travel and accommodation costs will be covered by the research team. If because of Covid-19/Corona Virus it is not possible to meet in person, these focus groups will be conducted online.

It may be possible that the questionnaires and focus groups may need to be repeated if the focus group participants and/or the research team consider that significant revisions need to be made that require additional feedback from the participants.

Option 4: Share your story
Having access to other peoples’ stories and experiences has previously been shown to be helpful for improving knowledge and building people’s self-confidence to manage their own health. If the participants in this study agree that peoples’ stories will be a valuable inclusion in the programme, we will be seeking 5 – 10 people from those who take part in an interview (option 1) who are willing to share their story in order to provide encouragement and support to people undergoing a similar experience in the future. Your story would be recorded, typed up word for word and then shared in written form. Ideally we would like to have a photograph and/or video of you to accompany your story, but this is entirely up to you. You can also choose whether your real name is used or a made-up name. These options are available on the consent form for you to indicate your preferences regarding the use of your photograph, video and real name. Please note that if you agree to share your story, the story may be included in a booklet, smartphone app and/or website and therefore will be able to be accessed by the public for an indefinite length of time. If you agree to share your story, a member of the research team may need to visit you for a second time in order to gather more information. If because of Covid-19/Corona Virus it is not possible to meet with you in person, these interviews will be conducted online or via telephone, depending on your preference.

Is there any risk of discomfort or harm from participation?

Interviews:
Because you will be asked to share your personal experiences of your recovery following CABG surgery, this may cause you to feel anxious or uncomfortable.

Focus Groups:
Because it is possible that the health professionals in the focus group may have been directly involved in your care before and/or after your CABG surgery, there is the possibility that you may feel intimidated or hesitant to share your views and ideas with the group. In order to make sure that everyone feels respected and that they can contribute honestly, the research group will use a particular technique that starts by allowing everyone time to share their ideas first before any whole group discussions begin. The researchers will also inform...
the whole group at the start of the session that everyone’s contributions are to be valued and respected and that anything shared within the group is to be kept confidential.

Please note that if at any time during a focus group session or interview you feel uncomfortable or hesitant about answering any questions, you do not have to. It is entirely up to you what you tell us, and you may also withdraw from the project at any stage without disadvantage to yourself of any kind.

There is no anticipated risk of participating in the questionnaires other than potential tiredness or fatigue.

**What data or information will be collected and what use will be made of it?**

You will be asked to provide information such as your age, gender, ethnicity and living locality (e.g. urban or rural). This information will be used to describe the participants as a whole group and to ensure that the people selected to take part in the interviews, focus groups and sharing their stories represent a wide range of these factors.

All interviews and focus group sessions will be audio-recorded and subsequently typed out word for word by one of the research team or a professional firm who specialise in doing this confidentially. Your name and any other personal information that may identify you will be removed from the transcript prior to any analysis of the data. If you take part in an interview, you will be sent a copy of the typed transcript and a summary of the key information (as interpreted by the research team). You will be given the opportunity to check the transcript and summary for accuracy and be given the opportunity to correct or add to this as you choose.

The interviews and focus group transcripts will be then reviewed by the research team and searched for themes or ideas relating to the study aim as previously described.

If you agree to share your story, the research team will extract information from your interview that they determine may be helpful for providing encouragement or support for other people undergoing CABG surgery. You will be sent a copy of the extracted information and given the opportunity to correct, or add to it as you choose. As stated above, your written story may be made available in a booklet, app and/or on a website, and therefore will be able to be accessed by the general public for an indefinite length of time in the future. If you prefer, all information in your story can be completely anonymised by using a made-up name and not including your photograph.

Data from the questionnaires will be collated, analysed and presented anonymously, as a group. The summary results from the questionnaires will be used to inform the focus group discussions, where a group of people who have previously had CABG surgery and health professionals responsible for their care will discuss and make a final decision, as a group, about what will or won’t be included in the final programme. Only the researchers named below, the student and staff members working on this project, will have access to the raw data or information of this project.

The outcomes of the study will result in a programme (a framework of resources and support) that will be tested in future research projects. The findings of this study may also
be published in a scientific journal and presented at national and/or international conferences.

The data collected will be securely stored in such a way that only the members of the research group will be able to gain access to it. Data obtained as a result of the research will be retained for at least 10 years. Electronic data will be stored on Dr Skinner’s password-protected computer and the paper surveys and handouts will be stored in a locked filing cabinet in Dr Skinner’s office.

**What about anonymity and confidentiality?**

Except where you have consented to use of your real name, photograph and/or video when sharing your story, all attempts will be made to maintain your anonymity in the reporting of the project findings. If you agree to share your story, you will be asked to sign an express waiver form that clarifies your consent regarding the use of your story, real name, photograph and/or video after you have had an opportunity to review the materials relating to your story that have been collated by the research team.

**Can Participants change their mind and withdraw from the project?**

You may withdraw from participation in the project at any time without any disadvantage to yourself.

**Any questions?**

If you have any questions now or in the future, please contact either:

**Dr Margot Skinner**
Phone: +64 03 4797466  margot.skinner@otago.ac.nz
Principal Investigator and Senior Lecturer, School of Physiotherapy, University of Otago

**Emily Gray**
Phone: 021 279 5422  emily.gray@postgrad.otago.ac.nz
PhD Candidate, School of Physiotherapy, University of Otago

*This study has been approved by the University of Otago Health Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (phone +64 3 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.*
APPENDIX 28: CONSENT FORM FOR FORMER PATIENT PARTICIPANTS (CHAPTER 6)

Development of a Programme to Facilitate Engagement in Physical Activity During the First 12 Weeks Following CABG Surgery

Principal Investigator: Dr Margot Skinner (margot.skinner@otago.ac.nz; 03 479 7466)

CONSENT FORM

Following signature and return to the research team this form will be stored in a secure place for ten years.

Name of participant: .................................................................

15. I have read the Information Sheet concerning this study and understand the aims of this research project.

16. I have had sufficient time to talk with other people of my choice about participating in the study.

17. All my questions about the project have been answered to my satisfaction, and I understand that I am free to request further information at any stage.

18. I know that my participation in the project is entirely voluntary, and that I am free to withdraw from the project before its completion.

19. I know that as a participant I can choose to participate in any or all of the following options:
   - An interview (30 to 40 minutes duration)

I know that the general line of questioning will ask about my experiences during my recovery following coronary artery bypass graft (CABG) surgery, how prepared and supported I felt to engage in physical activity during this time and my ideas for how to prepare and support other people undergoing the same surgery in the future. The precise nature of the questions have not been determined in advance, but will depend on the way in which the interview develops, and in the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable, I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.
- **Sharing my story**

I know that if I agree to share my story, the research team will collate from my interview information that they determine may be helpful to share with other people who will undergo CABG surgery. I know that I will be given an opportunity to review all aspects of my story prior to being included in any future programme materials. I know that if I agree to share my story, that it will be publicly available either in a book and/or website for an indefinite length of time. I know that I can decide whether my photograph and/or real name are included alongside my story. I know that I can choose to withdraw consent for sharing my story at any time up until the story is made available in the booklet or website.

- **Questionnaires**

I know that if I agree to participate in the questionnaires I will be requested to complete two written questionnaires about my preferences and ideas for the resources and design of a programme that aims to prepare and support people to engage in physical activity following CABG surgery. While the exact nature of these questions cannot be determined at this stage, I know that each questionnaire will take no more than 30 minutes to complete.

- **Focus Groups**

I know that if I agree to participate in the focus groups there will be two focus groups held approximately two months apart in Dunedin. I understand that there will be health professionals who may or may not have been involved in my care following CABG surgery. I know that the precise nature of the questions for these focus groups have not been determined in advance, but will depend on the way in which the focus group develops and that in the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable, I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.

20. I understand the nature and size of the risks of discomfort or harm which are explained in the Information Sheet.

21. I know that when the project is completed all personal identifying information will be removed from the paper records and electronic files which represent the data from the project, and that these will be placed in secure storage and kept for at least ten years.

22. I understand that the results of the project will be shared publicly in a booklet, website and/or smartphone app to help other people who are undergoing CABG surgery in the future.
23. I understand that the results of the study may be published and be available in the University of Otago Library (Dunedin, New Zealand), but that every attempt will be made to preserve my anonymity in these publications.

24. I, as the participant, consent to the following options (tick all that you prefer)

☐ A 30 – 40 minute face-to-face, online or telephone interview
☐ Two questionnaires
☐ Two 90 minute focus group sessions
☐ Sharing my story publicly (for example in a booklet, smartphone app and/or website)

☐ I know that I will be able to read and amend my story before it is used. I know I will sign consent for my story to be used before it is finally published.

*If consenting to share your story, please tick ONE option below (a, b or c):*

☐ a) I agree to being named in my written story, and my photograph and/or video-recording being used in the programme resources.
OR
☐ b) I agree to being named in my written story and my photograph (but not video) being used in the programme resources.
OR
☐ c) I agree to being named in my story but do not wish for my photograph or video to be used in the programme resources.
OR
☐ c) I would rather remain anonymous in the project by using a made up name in my written story and not using my photograph or video in the programme resources.

25. I know that there is no remuneration offered for this study, and that no commercial use will be made of the data.

Signature of participant: ___________________________ Date: ___________________________

Name of person taking consent: ___________________________ Date: ___________________________
APPENDIX 29: FORMER PATIENT PARTICIPANTS DEMOGRAPHIC QUESTIONNAIRE (CHAPTER 6)

Demographic Information – Former Patient Participants

Date of Birth (Date/Month/Year): ___________________  Sex: Male/Female/other

Ethnicity:  
- NZ European □
- Māori □
- Samoan □
- Cook Island Māori □
- Tongan □
- Niuean □
- Chinese □
- Indian □
- Other □ Please state: _______________________________

Employment Status:  
- Work full time □
- Work part time □
- Unemployed □
- Retired □
- Other □ Please State: ____________________________

Living situation:  
- Married/living with partner □
- Living alone □
- Other □ Please state: _______________________________

Living location:  
- Urban – city □
- Urban – town □
- Rural □

Date of surgery (Date/month/year): _______________________________
APPENDIX 30: STUDY INVITATION FOR HEALTH PROFESSIONALS (CHAPTER 6)

Dear _______

My name is Emily Gray and I am a physiotherapist and PhD student undertaking research at the University of Otago. We are currently undertaking research with the aim of developing a programme that aims to facilitate and support people who have had CABG surgery to engage in physical activity during the first three months following their discharge from hospital.

We have previously undertaken interviews with people who have undergone CABG surgery at Dunedin Public Hospital in order to determine their needs and preferences for information and support to engage in activity following their discharge from hospital. We are now seeking health professionals (cardiac nurse specialists, physiotherapists and doctors) who work with patients who have had CABG surgery in either the inpatient and/or outpatient setting in order to seek their views and ideas on preparing and supporting people to engage in activity following CABG surgery.

An information sheet about the study is attached to this email. Briefly, participation in this programme involves attendance at three focus group sessions each of one hour duration. The focus groups are to be held in October, November and February at a day and time outside of clinical/work hours that suits the study participants. Participants will be able to join the focus groups via Zoom if they live outside of Dunedin or are unable to attend in person. If you cannot attend all of these sessions that is fine – your participation at any of these sessions would be valued and appreciated.

This study has received locality approval from the Southern District Health Board. Ms Miranda Buhler (physiotherapist) is the DHB site principle investigator and Mr Richard Bunton (cardiothoracic surgeon) is an advisor on this project.

Please read the attached information sheet and consider if you would be willing and/or able to participate in this study. If you decide to participate, please sign the attached consent form and return to emily.gray@postgrad.otago.ac.nz. If you would prefer a paper copy sent to you, or if you have any questions about this research, please let me know.

Kind regards
Emily Gray
PhD Candidate
APPENDIX 31: STUDY INFORMATION SHEET FOR HEALTH PROFESSIONALS (CHAPTER 6)

Development of a Programme to Facilitate Engagement in Physical Activity During the First 12 Weeks Following CABG Surgery

INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the Aim of the Project?

The aim of this project is to consult with health professionals responsible for their care of people who have undergone coronary artery bypass graft (CABG) surgery as part of a larger study which is to develop a person-centred programme that prepares and supports people who have undergone CABG surgery to engage in physical activity during the early recovery period (first three months) following their discharge from hospital.

After discharge from hospital following coronary artery bypass graft (CABG) surgery, engagement in physical activity is important in both the short term, to optimise the person’s functional recovery and return to daily activities, and in the long term, to improve their quality of life and reduce mortality risk. However, patients have identified many potential barriers to engagement in physical activity during the first three months following CABG surgery such as: fatigue, pain, fear of doing damage, low self-confidence and uncertainty. In addition, for many people access to help and support from health professionals to engage in physical activity during this period is limited, especially for those who are unable to access supervised outpatient cardiac rehabilitation programmes due to barriers such as distance, transport, and other life commitments such as work and involvement with whānau.

Thus the aim of this study is to develop a person-centred programme that prepares and supports people who have undergone CABG surgery to engage in physical activity during the early recovery period (first three months) following their discharge from hospital. The programme will be developed through the creation of resources (e.g. information, people’s stories, tools for reflecting on progress) and a framework for the provision of support (for example from health professionals, whānau or other people who have had CABG surgery).

In order to achieve the aim, our research team will consult with both people who have previously had CABG surgery and the health professionals responsible for their care. By consulting with these two groups of people the researchers plan to build upon the existing resources and create a framework of resources and support that is designed to better
address the needs of the people who have undergone CABG surgery. At the same time it is important that framework is perceived by health professionals to be feasible to implement in the clinical setting.

This project is being undertaken by Emily Gray, as part of the requirements for her PhD studies. The project is supervised by University of Otago academic staff members, at the School of Physiotherapy, Dr Margot Skinner and Professor Leigh Hale. Ms Miranda Buhler, physiotherapist, is the Southern DHB principle investigator for this study, and Mr Richard Bunton, Cardiothoracic Surgeon, is a consultant advisor on the project.

Who are we seeking to participate in the project?

We are seeking a range of experienced health professionals (physiotherapists, nurses and doctors) who are responsible for delivering health care services to people during their inpatient post-operative hospital stay and/or during the first three months following their discharge from hospital after CABG surgery. You have been identified as a health professional who meets these criteria.

What will Participants be asked to do?

Should you agree to take part in this project, you will be asked to participate in three focus group sessions during Phases 1, 3 and 5 of the project. Each session will be approximately 60-90 minutes duration. In accordance with locality approval from the Southern District Health Board, all focus group sessions will take place at a time outside of clinical work hours, at times suitable to as many people as possible in the group. While it is preferable for you to attend all three focus groups, you are still able to participate in the study even if you can only attend one or two of the sessions. All of the focus groups will take place in Dunedin. Online Zoom video conferencing will be available to enable health professionals who live outside of Dunedin to participate. Participants living in Dunedin who would prefer to attend the focus group online are also able to do so.

Note: The focus groups are only one aspect of the current project. How the focus groups fit into the overall project is illustrated in the diagram below.

Focus Group 1 (October 2020):  
The first focus group (Figure 1) will consist entirely of health professionals as described above. Prior to the first focus group, our research team will undertake interviews with people who have previously undergone CABG surgery about their experiences of engaging in physical activity during the first three months following their surgery. At the start of the focus group with health professionals, the research team will present a summary of the findings from the patient interviews. This will be followed by a group discussion about your opinions on i) the strengths and limitations of the information and the support for engaging in physical activity following CABG surgery, that is currently provided in relation to the findings from the interviews; ii) the capacity of the services provided by each health professional group to address any perceived limitations; and iii) a sharing of ideas to address these limitations. Some possible examples include potential information and resources or support that could feasibly be utilised within the time and resources available in clinical practice.
Figure 1 Flow chart demonstrating the stages of consultation and feedback in the project

The research team will then analyse the information provided in the health professional focus groups along with the findings from the patient interviews, the literature, self-management principles and theories of behaviour. As part of this analysis, the research team will determine the programme objectives as well as identifying and collating potential components for the information, resources, structure and mode/s of delivery for the programme, in order to meet the objectives. A questionnaire about these potential components will then be distributed to people who have previously undergone CABG surgery in order to explore their preferences regarding the potential ideas.

**Focus Group 2 (November 2020):**
The second group (Figure 1) will consist of a combination of people who have previously had CABG surgery and the health professionals as described above. The purpose of Focus Group 2 will be to determine preferences and ideas for potential methods and applications, and a consensus or group decision about what will and won’t be included in the final programme will be achieved.

The session will begin with the research team providing a summary of the results from the questionnaire, followed by a group discussion, in order to reach a group agreement regarding the information, resources and support that will be included in the programme.

Based on the consensus decisions made by the group, the research team will then develop any resources needed to be included in the programme. A copy of the developed resources along with a second questionnaire will be sent to the study participants who have previously had CABG in order to seek their feedback about the perceived usefulness, content and design of the resources.
Focus Group 3 (February 2021):
A third focus group (Figure 1) will also comprise a combination of people who have previously had CABG surgery and the health professionals. The session will be held in early 2021 and will discuss the feedback received from the second questionnaire and members will come to a group agreement regarding the final content and design of the resources that were developed by the research team.

Because it is possible that the participants who have previously had CABG surgery may be former patients who were in your care, there is the potential for these people to feel intimidated or hesitant to share their views and ideas in Focus Groups 2 and 3. Likewise there is potential for you to feel uncomfortable sharing your views in front of former consumers of your health services. In order to make sure that everyone feels respected, and that they can contribute honestly, the research group will use a particular technique that starts by allowing everyone time to share their ideas first before any whole group discussions take place. The researchers will also inform the whole group at the start of the session that everyone’s contributions are to be valued and respected and that anything shared within the group is to be kept confidential.

Please note that if at any time during a focus group session you feel uncomfortable or hesitant about answering any questions you do not have to. It is entirely up to you what you tell us and you may also withdraw from the project at any stage without disadvantage to yourself of any kind.

It may be possible that the questionnaires and focus groups may need to be repeated if the focus group participants and/or the research team consider that significant revisions that require additional feedback from the participants, need to be made.

What Data or Information will be collected and what use will be made of it?

All health professional participants will be asked their gender, ethnicity, health profession and number of years’ experience working with people following CABG surgery. This information will be used to describe the participants as a group and to ensure that those who consent to participate represent a wide range of health professions and ethnicities.

All focus group sessions will be audio-recorded and subsequently typed out verbatim by one of the research team or a professional firm whose staff specialise in doing this confidentially. Your name and any other personal information that may identify you will be removed from the transcript prior to any analysis of the data. The focus group transcripts will be reviewed and searched in order to identify themes or ideas relating to the study aims as previously described. No data that can personally identify you will be included in any reporting of the outcomes of this study.

Only the researchers named below, the PhD student and staff members working on this project, will have access to the raw data or information relating to this project.

The outcomes of the study will result in a programme (a framework of resources and support) that will be tested in a future feasibility study. The findings of this study may also be published in an internationally peer reviewed journal and presented at national and/or international conferences.
The data collected will be securely stored in such a way that only the members of the research group will be able to gain access to it. Data obtained as a result of the research will be retained for at least 10 years. Electronic data will be stored on Dr Skinner’s password-protected computer and the paper surveys and handouts will be stored in a locked filing cabinet in Dr Skinner’s office.

**What about anonymity and confidentiality?**

While the profession that you represent will be reported in the study findings, every attempt will be made to preserve your anonymity in any reporting of the outcomes of this study.

**Can Participants change their mind and withdraw from the project?**

You may withdraw from participation in the project at any time without any disadvantage to yourself.

**Any questions?**

If you have any questions now or in the future, please contact either:

**Dr Margot Skinner**
Phone: +64 03 4797466  
margot.skinner@otago.ac.nz
Principal Investigator and Senior Lecturer  
School of Physiotherapy, University of Otago

**Emily Gray**
Phone: 021 279 5422  
emily.gray@postgrad.otago.ac.nz
PhD Candidate  
School of Physiotherapy, University of Otago

*This study has been approved by the University of Otago Health Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (phone +64 3 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.*
Development of a Programme to Facilitate Engagement in Physical Activity During the First 12 Weeks Following CABG Surgery

*Principal Investigator: Dr Margot Skinner* (margot.skinner@otago.ac.nz; 03 479 7466)

**CONSENT FORM**

Following signature and return to the research team this form will be stored in a secure place for ten years.

Name of participant:.................................................................

☐ 1. I have read the Information Sheet concerning this study and understand the aims of this research project.

☐ 2. I have had sufficient time to talk with other people of my choice about participating in the study.

☐ 3. I confirm that I meet the criteria for participation which are explained in the Information Sheet.

☐ 4. All my questions about the project have been answered to my satisfaction, and I understand that I am free to request further information at any stage.

☐ 5. I know that my participation in the project is entirely voluntary, and that I am free to withdraw from the project before its completion.

☐ 6. I know that as a participant I will be participating in three focus groups of 60-90 minutes duration each over the course of approximately six months.

☐ 7. I know that the focus groups will explore participants’ perceptions, ideas and preferences regarding the development of a programme that has the objective of preparing and supporting people who have undergone CABG surgery to engage in physical activity following their discharge from hospital. I understand that if the line of questioning develops in such a way that I feel hesitant or uncomfortable I
may decline to answer any particular question(s), and /or may withdraw from the project without disadvantage of any kind.

☐ 8. I understand the nature and size of the risks of discomfort or harm which are explained in the Information Sheet.

☐ 9. I know that when the project is completed all personal identifying information will be removed from the paper records and electronic files which represent the data from the project, and that these will be placed in secure storage and kept for at least ten years.

☐ 10. I understand that the results of the project may be published and be available in the University of Otago Library, but that any personal identifying information will remain confidential between myself and the researchers during the study, and will not appear in any spoken or written report of the study.

☐ 11. I know that there is no remuneration offered for this study, and that no commercial use will be made of the data.

Signature of participant: ____________________________________________________________________________ Date: ___________________________________________________________________

Name of person taking consent ____________________________________________________________________________ Date: ___________________________________________________________________
Demographic Information – Health Professional Participants

1) What is your health profession?

☐ Physiotherapist    ☐ Nurse
☐ Doctor           ☐ Other, please specify _______

2) Please indicate what ethnicity/ies you identify as (tick all that apply)

NZ European ☐        Māori ☐        Samoan ☐
Cook Island Māori ☐  Tongan ☐        Niuean ☐
Chinese ☐           Indian ☐

Other ☐ Please State: _______________________________

3) Please indicate the number of years that you have worked with patients who have undergone cardiac surgery?

☐ 0-2
☐ 3-5
☐ 6-10
☐ 11-15
☐ 16-20
☐ >20
APPENDIX 34: MATRIX OF LINKS BETWEEN COM-B AND INTERVENTION FUNCTIONS (CHAPTER 6)

From Michie, Atkins and West (2014). Table 2.3, p.117. Used with permission.

<table>
<thead>
<tr>
<th>COM-B components</th>
<th>Education</th>
<th>Persuasion</th>
<th>Incentivisation</th>
<th>Coercion</th>
<th>Training</th>
<th>Restriction</th>
<th>Environmental restructuring</th>
<th>Modelling</th>
<th>Enable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical capability</td>
<td></td>
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<td>Psychological capability</td>
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<td>Physical opportunity</td>
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<tr>
<td>Social opportunity</td>
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<tr>
<td>Automatic motivation</td>
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<tr>
<td>Reflective motivation</td>
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</tbody>
</table>
### APPENDIX 35: LINKS BETWEEN INTERVENTION FUNCTIONS AND POTENTIAL POLICY CATEGORIES (CHAPTER 6)

From Michie, Atkins and West (2014). Table 2.8, p.136. Used with permission.

<table>
<thead>
<tr>
<th>Intervention function</th>
<th>Policy categories that could deliver intervention functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Communication/marketing, Guidelines, Regulation, Legislation, Service provision</td>
</tr>
<tr>
<td>Persuasion</td>
<td>Communication/marketing, Guidelines, Regulation, Legislation, Service provision</td>
</tr>
<tr>
<td>Incentivisation</td>
<td>Communication/marketing, Guidelines, Fiscal measures, Regulation, Legislation, Service provision</td>
</tr>
<tr>
<td>Coercion</td>
<td>Communication/marketing, Guidelines, Fiscal measures, Regulation, Legislation, Service provision</td>
</tr>
<tr>
<td>Training</td>
<td>Guidelines, Fiscal measures, Regulation, Legislation, Service provision</td>
</tr>
<tr>
<td>Restriction</td>
<td>Guidelines, Regulation, Legislation</td>
</tr>
<tr>
<td>Environmental restructuring</td>
<td>Guidelines, Fiscal measures, Regulation, Legislation, Environmental/social planning</td>
</tr>
<tr>
<td>Modelling</td>
<td>Communication/marketing, Service provision</td>
</tr>
<tr>
<td>Enablement</td>
<td>Guidelines, Fiscal measures, Regulation, Legislation, Environmental/social planning, Service provision</td>
</tr>
</tbody>
</table>
## APPENDIX 36: THEMES, CATEGORIES AND SUPPORTING QUOTES FROM FOCUS GROUP ONE (CHAPTER 6)

<table>
<thead>
<tr>
<th>Theme/category</th>
<th>Supporting quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Theme 1: Strengths of current service delivery</strong></td>
<td></td>
</tr>
<tr>
<td>Discharge talk</td>
<td>I think the discharge talk is really important. (HPP1)</td>
</tr>
<tr>
<td></td>
<td>Both ourselves and (HPP1) kind of give similar talks so it gets very reinforced and most of the time that just ends up meaning we’d have gone round and done one and then (HPP1) does hers which I don’t believe are too dissimilar so they’re kind of getting that activity side of things reinforced to them. (HPP3)</td>
</tr>
<tr>
<td>Written information</td>
<td>I think one of the good ways we prepare is the booklet that we have which isn’t perfect but ... I think they like having something physical that they can take home with them that they can read through cause I think when you’re in hospital sometimes it all just is a bit much and it’s going to take them a bit of time to accept the fact that they’ve had this major surgery, even if there was a long, even if it was semi elective and they’ve had a longer lead up to it, but I think that’s probably one of the strengths. (HPP3)</td>
</tr>
<tr>
<td></td>
<td>You’ve sort of already touched on this but the booklet that they do come home with can be really good to refer back to because I mean just based on the patients I see they don’t really remember anything that’s discussed with them on the ward, they’re exhausted, in pain, it’s too loud or whatever’s going on the ward, but to have something physical to take home with them or refer back to can be really really helpful. (HPP6)</td>
</tr>
<tr>
<td>Including family</td>
<td>So I think it is important that physios will do education about it but I will also do the education and hopefully with family members present try to get them there because I know the patient isn’t always able to retain that information, their memory and concentration is sometimes all over the place, but at least if they’ve heard it once or twice, family hear it. (HPP1)</td>
</tr>
<tr>
<td>Continuity of inpatient care</td>
<td>I think it helps we also see them, or try and see them before their operation too and we try very hard to stick with whoever we’ve pre-apped ... I think that’s shown to be more helpful than just meeting all of us at random ... you build a good rapport so they’re more likely to perhaps trust the things you’re saying in your discharge talk. (HPP3)</td>
</tr>
<tr>
<td>Multiple health professionals providing positive messaging about physical activity</td>
<td>I think the consistency is good because the small group of people who are delivering the same message throughout so again what you said the consistency. (HPP3)</td>
</tr>
</tbody>
</table>
Facilitating people to resume physical activity in the inpatient setting

And the other thing that I think that is really important is the stair test that they do. I think that that actually builds a lot of confidence for them ...so I think that is hugely reassuring that they can do the stair test afterwards. (HPP1)

Outpatient cardiac rehabilitation

Some other advantage of rehab groups is that people gain support from one another, emotional support and they make friends. (HPP4)

I think it’s really good that we have a cardiac rehab exercise group in Dunedin because there is not anyone else in Otago and Southland really. So I think at least we have something here. (HPP1)

I think it’s really good that there are physiotherapists involved in the cardiac programme and that it’s joint led I think that’s an important aspect because of you know the fact that exercise can be a risk if the patient does push it too far and so to have that monitoring during the exercise session ... like I think that’s something that they find being taught what is appropriate for them to try and achieve is really important because they’re all a bit well what can I do, maybe I shouldn’t do this, maybe I should do this, can I go back to doing this and it like sets realistic expectations for them I guess too. (HPP5)

Theme 2: Perceived patient needs for service delivery

Individualisation is required

Some of our patients now have very poor ejection fractions, like you were saying, so they’re not going to be able to be as active. ... I guess the comorbidities, those people who have had stroke either as an inpatient or prior to their surgery or any other kind of comorbidity like osteoarthritis can hold them back from progressing their physical activity, to be aware of that and to make allowances for it. (HPP1)

Yeah that’s something even you know I have a patient at the minute in the cardiac rehab programme who has quite severe osteoarthritis in her knees and that does affect her and what she can do in the class. So we’ve modified quite a bit for her. (HPP5)

But I do try and assure them that everybody’s different ... and one size doesn’t fit all. (HPP3)

Follow up support is valuable

Some people almost need a support person, whether that’s a community physiotherapist, whether it’s a rehab assistant, they may need somebody if they don’t have a family member to actually go with them when they exercise to support them. (HPP4)

Some people need encouragement to do more and some need encouragement to do less. (HPP1)
And that is a big challenge for some of our patients because they do live alone. One of the risk factors for heart disease is that rogue male who has no friends or family, and they are the ones that we see who have cardiac surgery because they are risky people and so they’ve burnt through all their people, and they don’t have anyone at home with them they are going to be a difficult client to get up motivated and to get going and even though we try and get them into the gym and things they won’t even come. So the people who live alone and have very little support are a huge challenge. (HPP1)

It’s just keeping it in peoples minds. So they all know that they should do it when they leave hospital but they forget and get distracted so just raising the profile, reminding them, it’s time to get moving now. (HPP4)

<table>
<thead>
<tr>
<th>Theme 3: Perceived problems related to service delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of individualisation</td>
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<tr>
<td>And I don’t really do that (individualise) at all because of time. Sometimes I will see patients in their room but most of the time it’s in the lounge and it’s a group session and as I say to them before hand this is a very general discussion about some of your guidelines for when you go home. (HPP1)</td>
</tr>
<tr>
<td>It’s difficult to predict when somebody’s still in hospital how quickly they are going to be able to progress. There’s all sorts of factors such as level of anaemia and how much energy they have, how quickly it takes them to recover from surgery. And even things like their occupation, some people are going to have to go back to a physically demanding job and they might want to get back to it quickly but it’s going to take time for the sternum to heal and they can’t start doing heavy lifting until that sternum is ready for it. (HPP4)</td>
</tr>
<tr>
<td>Lack of equity of access to cardiac rehabilitation</td>
</tr>
<tr>
<td>Few alternative options for follow up support</td>
</tr>
</tbody>
</table>
and say they’re not doing so well. But that’s very challenging. (HPP1)

It feels like a gap between the hospital and the exercise programme though. Because really I would encourage patients to be active before they come to the exercise programme or they’ll find it’s quite tough. (HPP4)

And I guess that’s our stop gap in terms of referring to community physio cause we kind of touched on this earlier, we very rarely do it unless there’s a particular mobility concern. And it’s because the waiting list is reasonably long they actually probably won’t get the input they need when they need it because comparatively to some other urgent referrals we might put through for other patients there’s almost this, like yeah I agree with you there’s a missing gap. (HPP3)

I mean I don’t want to speak on behalf of my entire team but we definitely don’t consider cardiac rehab to be a part of our role. When we see the post CABG it’s for wound care, removal of sutures and that’s pretty much it. And as soon as they’re healed they’re off our books. I’ve been working with district for about six years and it’s never been you know promoted that that’s a big part of our role at all. And as you say they’re pushing back those referrals for people that don’t have complex wound care because that can sit with primary care. So I would be surprised if GP’s felt that cardiac rehab was part of their role as well. (HPP6)

So they do come and see me at one month ... so and I go over all those sorts of things again and their activity and ask, but that’s all I do I just ask them about their activity. (HPP1)

**Contracting services**  
There was one week they would see a district nurse, the next week they would see a physio, next week a district nurse, next week a physio, to help them progress... And the patients valued that support because it got them to the next level where they were then fit enough to come and take part in cardiac rehab. And they had the mindset that they were building up to that. (HPP4)

So that’s a change that’s occurred, because the cardiac pathway used to have a page that was for the district nurses and it was all part of that with activity and all that sort of stuff was part of what the district nurses did. So I don’t know where that came from and then when it left... So something has been lost over time, it’s fallen out the hole. (HPP1)

**Theme 4: Service capacity limitations and/or challenges**

**Service related factors**
| Finite resources | I think time pressures. Sometimes, it’s not rushed but you’ve got to do it at a certain time because you’ve got lots of other things to do. (HPP1) 
I guess sometimes there’s a struggle on making things as individualised as you would like them either cause of time pressures or staffing issues. (HPP3) 
So the rural areas it would be really great if we could have some exercise and even some, Southland you know Invercargill would be a great place to start and I think they’ve tried but again it would be fiscal, it’ll be getting time. (HPP1) |
| Multiple health professionals involved | I’ve worked with somebody for five days of their six day admission and on the sixth day they’re discharged by somebody on the weekend who doesn’t know them as much and is doing their discharge talk and that may alter how personalised the activity planning is for them. (HPP3) |
| Environmental factors | |
| Distracting ward environment | So there’s some other barriers, I mean just the environment as well. It can be noisy and busy and if I do some education in the patient room you’ve got people competing and talking loudly. (HPP1) |
| Differing perspectives between family and patient | Like their family’s perception then for what their expectations are for what they should be doing, or not doing. Wrap up in cotton wool, take you home and don’t do anything. (HPP1) 
We try to include families in our discussions and care but often we get triangulated in their battles so this is a tricky one. Certainly families come to us to clarify information but we also get asked to ‘lay down the law’ or ‘tell him I’m right’. Maybe a pamphlet for the support person with tips on how they can support would be helpful? (HPP6) |
| Technology limitations | So phone follow up is fine but you don’t get to see what they’re doing when they walk in the room towards you. So you can’t see that they’re having difficulty or they’re getting breathless or whatever. (HPP1) 
So some rural areas won’t have that with the connectivity issues. (HPP1) |
| Patient related factors | |
| Difficulty concentrating/ poor memory | I’m just thinking of some that have had a long stay in intensive care unit and then they’re up on the ward and sometimes it feels like the next minute they’re home, they’re going home and they’ve just come out of ICU they’re barely awake. I’ve had a patient like that and I’m like hmm they’re going home and they’re getting bombarded with all this information, they’ve only just realised what day it is and it is overwhelming amounts of |
information that they have to grasp. You’ve got to try and give them the salient points there, but they end up getting a lot of information. I know we’re talking about exercise here, but I’m telling them a whole lot of other stuff as well and it’s not just their activity, as well it’s other a whole bunch of other things that they get told as well. (HPP1)

I mean just based on the patients I see they don’t really remember anything that’s discussed with them on the ward, they’re exhausted, in pain, it’s too loud or whatever’s going on on the ward. (HPP6)

Yes I agree with you. I’ve seen patients having their second CABG and they say to me “oh this is wonderful you’re giving me so much information, I got none of this last time”. I was the person who told them last time, told them more or less the same thing and I well remembered the patient! So they just didn’t retain it. (HPP4)

<table>
<thead>
<tr>
<th>Physical activity may not be a priority to know about prior to discharge</th>
<th>And patients will categorise into what’s important to them. And so if it’s relating to their medication for example, that might be the thing that they’re most focused on and they want to be sure that they get that right, whereas physical activity may be something that they think they can just pick up. It just depends so much on the patient and what is important to that person. (HPP4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor literacy skills</td>
<td>And a lot of patients are not good at writing things down, that’s not they way they roll ...Yeah, literacy skills are a challenge. (HPP1)</td>
</tr>
<tr>
<td>Variable individual recovery trajectories and physical activity needs</td>
<td>I sometimes think people want a formula which we just can’t give them an individualised formula. Yeah same as like how long until I can do x, y and z, it varies person to person depending on comorbidities, age, other factors but people almost want the definite answer of I can do this on this date. (HPP3) It’s difficult to predict when somebody’s still in hospital how quickly they are going to be able to progress. There’s all sorts of factors such as level of anaemia and how much energy they have, how quickly it takes them to recover from surgery. And even things like their occupation, some people are going to have to go back to a physically demanding job and they might want to get back to it quickly but it’s going to take time for the sternum to heal and they can’t start doing heavy lifting until that sternum is ready for it. (HPP4)</td>
</tr>
</tbody>
</table>
28th August 2020

Dear

Thank you again for participating in our study. We have completed the analysis of the interviews from all of the participants and have identified various factors that helped (facilitators) and factors that limited (barriers) people to engage in activity during the first three months following heart bypass surgery.

The attached table contains the barriers and facilitators to activity that we identified from analysing the interviews. We would appreciate your feedback in order to help us to know if we have captured these concepts accurately and have identified all of the key barriers and facilitators to activity following heart bypass surgery that you mentioned.

Could you please read the attached table and:

1) Comment/indicate whether you think that the information presented captures/contains ALL of the key factors that were relevant to you OR if you think that we have missed something that is important to you. (If we have missed something there is space under the table for you to comment about this).

2) Place a tick beside the barriers and facilitators that you feel were important to you personally – that is, the barriers that affected you the most and the facilitators that you found/would have found most helpful. You can tick as many barriers and facilitators as you like.

When you have finished, please place these documents in the postage paid envelope provided and return it to us. You are able to post these envelopes at any post-box, including New Zealand post boxes.

In addition to providing feedback on the attached table, the questionnaire that I mentioned during the interview has been completed and is nearly ready to be sent to you. If we have your email address, a link to an online questionnaire will be emailed to you. If you would prefer to receive a paper copy of the questionnaire instead of completing it online please let us know. If we do not have your email address we will post you a paper copy of the questionnaire. We anticipate that the questionnaire will take approximately 20 minutes of your time to complete, though you will not have to do it all at once!

Thank you again for your participation in our study. Your time and willingness to contribute is very much appreciated.

Kind regards
Emily Gray, PhD candidate
emily.gray@postgrad.otago.ac.nz
021 279 5422
Barriers and facilitators to engaging in physical activity during the first three months following heart bypass surgery

Reminder: Place a tick √ beside the barriers and facilitators to activity that were important to you during the first few months after your surgery (you can place a tick beside as many barriers and facilitators as you like).

<table>
<thead>
<tr>
<th>Concept</th>
<th>Barriers</th>
<th>√</th>
<th>Facilitators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Feeling uncertain about how much activity is safe to do or how hard I can push myself</td>
<td></td>
<td>Know how to initiate and progress engagement in activity</td>
</tr>
<tr>
<td></td>
<td>Feeling that the written guidelines/information about activity was too restrictive</td>
<td></td>
<td>The information provided in written guidelines was a helpful guide for progressing activity</td>
</tr>
<tr>
<td></td>
<td>Feeling that the written guidelines/information about activity was too general or not at my level</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Need/want more information about other types of exercise other than walking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioural regulation</td>
<td>Modify the way an activity is performed to allow activity engagement e.g. walk/perform task slowly, keep loads close to the body</td>
<td></td>
<td>Modify the way an activity is performed to allow activity engagement e.g. walk/perform task slowly, keep loads close to the body</td>
</tr>
<tr>
<td></td>
<td>Self-monitor my activity e.g activity diary, FitBit or smartphone app</td>
<td></td>
<td>Self-monitor my activity e.g activity diary, FitBit or smartphone app</td>
</tr>
<tr>
<td></td>
<td>“Listen to my body” to determine activity limits e.g monitor pain, fatigue or breathlessness</td>
<td></td>
<td>“Listen to my body” to determine activity limits e.g monitor pain, fatigue or breathlessness</td>
</tr>
<tr>
<td></td>
<td>Establish a habit or routine of engaging in activity</td>
<td></td>
<td>Establish a habit or routine of engaging in activity</td>
</tr>
<tr>
<td></td>
<td>Have a plan to engage in activity e.g where, when, how and with whom</td>
<td></td>
<td>Have a plan to engage in activity e.g where, when, how and with whom</td>
</tr>
<tr>
<td>Memory, attention and decision making</td>
<td>Solve problems e.g come up with solutions to overcome barriers to activity such as feeling tired, unfavourable weather or living on a steep driveway/street</td>
<td></td>
<td>Solve problems e.g come up with solutions to overcome barriers to activity such as feeling tired, unfavourable weather or living on a steep driveway/street</td>
</tr>
<tr>
<td>Focus on my recovery</td>
<td>Access resources e.g ask for help or source equipment to enable activity engagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflect on my progress in activity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical skills or ability</th>
<th>Perceived loss of strength following surgery compared to pre-operatively</th>
<th>Gradual increase in strength following surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Perceived loss of fitness following surgery compared to pre-operatively</td>
<td>Gradual increase in fitness following surgery</td>
</tr>
<tr>
<td></td>
<td>Need to overcome physical barriers to activity such as fatigue, pain/discomfort and breathlessness</td>
<td>Having good pre-operative fitness or activity levels made engagement in activity following surgery easier</td>
</tr>
<tr>
<td></td>
<td>Engaged in easy tasks initially and gradually increased in difficulty or duration</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Fear of doing damage to sternum or heart during activity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cautious approach to activity engagement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feeling down or “blue”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feeling frustrated at perceived lack of progress with activity</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intention</th>
<th>Lack of motivation or desire to engage in activity</th>
<th>Need self-motivation and a desire to engage in activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Need perseverance to continue regular engagement in activity</td>
</tr>
<tr>
<td>Optimism</td>
<td>Need a positive attitude</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>Reinforcement</td>
<td>Experience positive physical and/or psychological effects from engaging in activity e.g. it makes me “feel good”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Activity engagement relieved boredom</td>
<td></td>
</tr>
<tr>
<td>Beliefs about capability</td>
<td>Lack confidence to engage in activity, e.g. during the initial days or weeks following discharge from hospital</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feel confident about my ability to engage in activity</td>
<td></td>
</tr>
<tr>
<td>Beliefs about benefits of physical activity</td>
<td>Believe that engagement in activity will result in positive physical and psychological benefits e.g. improved health or quality of life</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Have realistic expectations about engagement in activity</td>
<td></td>
</tr>
<tr>
<td>Goals/targets</td>
<td>Have a target of a specific amount of activity to achieve e.g. distance, time or step count</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Have a target of a particular activity related outcome e.g. return to work or hobbies, regain independence</td>
<td></td>
</tr>
<tr>
<td>Social opportunity</td>
<td>Absence or lack of support (encouragement or practical support) from spouse, family or friends</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Presence of support (encouragement or practical support) from spouse, family or friends</td>
<td></td>
</tr>
<tr>
<td>Barriers/Environmental factors</td>
<td>Barriers/Environmental factors</td>
<td>Barriers/Environmental factors</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Absence or lack of support (encouragement or guidance) from health professionals specifically to engage in activity following hospital discharge</td>
<td>Encouragement, advice or reassurance about activity engagement from health professionals</td>
<td></td>
</tr>
<tr>
<td>Lack of opportunity to talk with others who have also undergone bypass surgery about activity</td>
<td>Encouragement to engage in activity following talking with others who have had bypass surgery</td>
<td></td>
</tr>
<tr>
<td>Environmental factors</td>
<td>Unable to access group education and/or exercise sessions due to e.g distance, lack of transport or other commitments</td>
<td>Attendance at group education and/or exercise sessions</td>
</tr>
<tr>
<td>Environmental factors</td>
<td>Unfavourable weather conditions e.g. hot, cold, frosty or raining</td>
<td>Living alone created a need for earlier return to household activities and chores</td>
</tr>
<tr>
<td>Environmental factors</td>
<td>Features of the home or local landscape that make it hard to engage in activity, e.g. stairs, steep driveway, steep street</td>
<td>Have access to indoor and outdoor spaces that are conducive to activity engagement, e.g. flat section or street when initiating activity</td>
</tr>
</tbody>
</table>

1) Do you think that the table above contains all of the barriers and facilitators to activity engagement that were important to you following your heart surgery? (circle one)

Yes   No

2) If you answered ‘No’, please write below what barriers or facilitators limited or helped you engagement in activity following heart surgery that has not been included in the table:

Thank you for completing the questionnaire.
Please now place it in the envelope provided and post it in any post box or at post shop.
APPENDIX 38: QUESTIONNAIRE 1: PROGRAMME COMPONENTS AND MODE OF DELIVERY PREFERENCES (CHAPTER 6)

Questionnaire: Ideas to Support People to Engage in Physical Activity Following Heart Bypass Surgery: What do you think might help?

Thank you for agreeing to participate in this research. As you know, we are looking for the best ways to support people to engage in physical activity after heart bypass surgery. Your feedback will help us to revise the information people receive, the ways the information is provided, and the support that is available to ensure people feel safe when doing physical activity and are confident to progress it.

We know that physical activity can provide many benefits for people who are recovering from heart bypass surgery. We are also aware that getting back into activity following heart bypass surgery is not always easy and has many challenges. As you are someone who has had heart bypass surgery in the past, we would like to find out your ideas about things that could motivate or help other people to progress their activity as they recover from heart bypass surgery.

We want you to reflect back and think about how helpful you think each of the items in this questionnaire were or would have been helpful to assist you personally, to progress your engagement in physical activity during the first three months following heart bypass surgery (Note: the questions are not asking you if you did or had these things, but we would like to know how helpful you think these things would have been in order to help you to engage in activity following your surgery).

Remember, when we refer to ‘physical activity’, this includes both daily activities such as dressing, housework or gardening, and exercise such as walking. Some of the items may look strange to you, but that is just because we need to include various things that might apply to a whole range of people.

We think it will take approximately 30 minutes to complete this questionnaire. However you do not need to complete it all at once. You can take breaks or come back to it on another day. However we would appreciate if you could return the questionnaire with your answers within two weeks. Please post it back in the envelope provided.

For each item please place a tick (✓) in the box that BEST indicates how helpful the item was for you or could have been for you. For example:

In order to engage in physical activity following your heart bypass surgery, how helpful was it, or how helpful do you think it would have been, to:

<table>
<thead>
<tr>
<th></th>
<th>Extremely helpful</th>
<th>Very helpful</th>
<th>Somewhat helpful</th>
<th>A little bit helpful</th>
<th>Not at all helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have a family member or friend accompany me for a walk?</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There is also space available at the bottom of each page for you to write comments and suggestions for any of the items listed in the questionnaire if you wish to.
For each of the items below, please place a tick (v) in the box that best indicates how helpful you think the item would be.

In order to engage in physical activity following your heart bypass surgery, how helpful was it, or do you think it would it have been, to:

<table>
<thead>
<tr>
<th>Item</th>
<th>Extremely helpful</th>
<th>Very helpful</th>
<th>Somewhat helpful</th>
<th>A little bit helpful</th>
<th>Not at all helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Know about the short term benefits of physical activity, e.g. improved mood and sense of well being; increased confidence; help to return to daily activities and/or regain independence earlier?</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Know about the long term benefits of physical activity, e.g. reduced risk of future heart disease and improved quality of life?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Know about the potential risks or consequences of not engaging in physical activity, e.g. delayed recovery; risk of blood clots forming in legs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Know how to engage in physical activity, e.g. know ‘how hard I can push myself’ or ‘how to increase my activity’?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Know how to manage physical symptoms such as fatigue, pain or breathlessness so that I can engage in physical activity?</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Know about other exercises I could do indoors when it was too cold, wet or hot to go walking outside?</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Know about other types of exercise I could do apart from walking, e.g. cycling or swimming?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Know it was safe to engage in activity despite my recent heart surgery?</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Comments (optional):
In order to engage in physical activity following your heart bypass surgery, how helpful was it, or do you think it would it have been, to:

<table>
<thead>
<tr>
<th></th>
<th>Extremely helpful</th>
<th>Very helpful</th>
<th>Somewhat helpful</th>
<th>A little bit helpful</th>
<th>Not at all helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be told about and shown how to modify the way I did various activities so that I could do things safely while my wounds healed, e.g. keep loads close to the body when lifting; perform activities slowly at first; or do an activity in several short sessions rather than all at once?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Know how to 'listen to my body' during activity in order to know my limits, e.g. fatigue, pain or breathlessness?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have a plan for doing an activity, e.g. where, when, with who, how often, or for how long?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-monitor my physical activity by writing my progress in an activity diary?</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Self-monitor my progress using an activity tracker, e.g. a step counter, FitBit or smartphone app (if I had access to one of these)?</td>
<td></td>
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</tr>
<tr>
<td>Think about and/or write down how I felt after activity to recognise the positive physical, mental or emotional effect it had?</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Think about and/or write down how I felt physically after activity in order to know if I had done enough or done too much?</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Develop a habit of doing physical activity regularly e.g. where practical go for a walk at a certain time each day?</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Comments (optional):
In order to engage in physical activity following your heart bypass surgery, how helpful was it, or do you think it would it have been, to:

<table>
<thead>
<tr>
<th></th>
<th>Extremely helpful</th>
<th>Very helpful</th>
<th>Somewhat helpful</th>
<th>A little bit helpful</th>
<th>Not at all helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify things that might stop have stopped me from doing physical activity e.g. lack of motivation, weather, fatigue, pain or living on a steep street, and think of ways to overcome these things?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Know where to find more information about engaging in activity after my heart surgery if I needed it?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Know about the need to be realistic and that the time to return to activity would vary from person to person?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be told about exercises I could do to strengthen my arm muscles?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be told about exercises I could do to strengthen my leg muscles?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have a health professional from the hospital advise my spouse/partner, family/whānau or friends about the importance of providing me with support and encouragement to engage in activity?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have a health professional to advise me when it was safe to engage in activity following heart bypass surgery and also that it was important?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receive follow up guidance and support from a health professional (e.g. a nurse or physiotherapist from the hospital) after I left hospital about engaging in activity? E.g. follow up phone calls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments (optional):
In order to engage in physical activity following your heart bypass surgery, how helpful was it, or do you think it would it have been, to:

<table>
<thead>
<tr>
<th>In order to engage in physical activity following your heart bypass surgery, how helpful was it, or do you think it would it have been, to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be given names, contact phone numbers and/or email addresses for health professionals so that I could ask for advice about activity if I need it?</td>
</tr>
<tr>
<td>Receive automated text messages providing encouragement and ‘tips’ to engage in activity?</td>
</tr>
<tr>
<td>Talk with other people who had the same surgery, about their experiences with engaging in activity?</td>
</tr>
<tr>
<td>Read or watch stories about other people who had heart bypass surgery to learn from or be encouraged by their experiences in getting back into activity?</td>
</tr>
<tr>
<td>Have a “walking buddy”/someone to walk with me outside, until I feel confident to go by myself?</td>
</tr>
<tr>
<td>Attend group information sessions to learn about activity suitable for people who had had heart bypass surgery (if it was available in my local area)?</td>
</tr>
<tr>
<td>Have access to funding to see my local physiotherapist for help with exercise if I could not go to the exercise classes at the hospital?</td>
</tr>
<tr>
<td>Comments (optional):</td>
</tr>
</tbody>
</table>
In order to engage in physical activity following your heart bypass surgery, how helpful was it, or do you think it would it have been, to:

<table>
<thead>
<tr>
<th></th>
<th>Extremely helpful</th>
<th>Very helpful</th>
<th>Somewhat helpful</th>
<th>A little bit helpful</th>
<th>Not at all helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have access to pre-recorded information from health professionals (e.g. online or DVD) about engaging in activity following bypass surgery?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attend online group exercise sessions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attend online group information sessions about physical activity</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Have access to videos (online or DVD) that provided examples of exercises that were safe to do at various stages of my recovery?</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Have some triggers or cues to prompt/remind me to engage in activity, e.g. notes around the house; or cell phone alarm ring at certain times?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have a set schedule for progressing walking/exercise and daily activities that I could follow? E.g. Week 1 walk for 10 minutes per day, week 2 walk for 15 minutes ...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have general guidelines for progressing walking/exercise and daily activities so that I could progress at my own pace?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have my own goals or targets for exercise, e.g. walk for a certain distance/time, or achieve a certain daily step count?</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Have my own goals or targets for certain activities that I wanted to return to?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In order to engage in physical activity following your heart bypass surgery, how helpful was it, or do you think it would it have been, to:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Extremely helpful</th>
<th>Very helpful</th>
<th>Somewhat helpful</th>
<th>A little bit helpful</th>
<th>Not at all helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have my own goals or targets for certain activities that I wanted to return to?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review my activity goals regularly, readjust them if needed and set myself new targets when I reached my goals?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Write myself a list of reasons for wanting to and not wanting to engage in activity e.g. a ‘pros and cons’ list?</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Provide myself with a reward for engaging in activity, e.g. buy myself a special treat or go on a special outing?</td>
<td></td>
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</tr>
<tr>
<td>Mentally rehearse or imagine myself engaging in an activity before I did it?</td>
<td></td>
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</tr>
<tr>
<td>Tell myself that I had the ability to engage in activity?</td>
<td></td>
<td></td>
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<tr>
<td>Tell myself to try and stay positive even when things felt difficult?</td>
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</tr>
</tbody>
</table>

Comments (optional):

If you have any other ideas that you think might help people to engage in activity during the first few months after heart bypass surgery that have not been mentioned in the table above, please feel free to write them here (optional):
The following questions are about how a programme to support people to engage in physical activity could be delivered.

**Mode of delivery:**
Please rank (by indicating “1, 2 or 3” in each of the boxes below), how you would have preferred to receive information about engagement in physical activity following heart bypass surgery (‘1’ being your most preferred option and ‘3’ being your least preferred option).

- Booklet/written handout
- Phone App
- Online/website

**Support from health professionals:**
If support for engagement in physical activity was available from a health professional (eg. nurse or physiotherapist) following your discharge from hospital, please rank from 1-5 how you would have preferred this follow up support to occur (‘1’ being your most preferred option and ‘5’ being your least preferred option)

- In person
- Over the phone
- Online video conference
- Via email
- Via text
  - e.g Skype or Zoom
Timing of receiving follow up support:

If follow up support for engaging in activity from a health professional was available during the first 12 weeks following your surgery, please indicate how frequently and at what particular stages between Weeks 1-12 you would have liked to receive this follow up support? For example, would support from health professionals have been more helpful during the first week, at the end of the first month (week 4), at 6 weeks, at another time or at multiple time points?

Hearing about the experiences of former patients:

If other people who had heart bypass surgery were able to share their experiences of getting back into physical activity, place a tick (v) in the box below that indicates your preferred method of access.

- Booklet/written form
- Online video
- Both
Programme name and images:

The current booklet given to people who have had heart bypass surgery at Dunedin Public Hospital is called “Road to Recovery”. We are interested to know if you like this name and also if you have any ideas for a new name (optional). You can provide more than one suggestion if you wish:

This image is the current picture on the front of the Road to Recovery booklet.

We would like your ideas on whether this picture appeals to you, or if you would prefer something else, for example a picture of a real person. Please comment below:
Please rank your preferences from 1 – 4 for an image to go on an information booklet to be given to people on discharge from hospital after their heart surgery ('1' being your most preferred option and '4' being your least preferred option)

<table>
<thead>
<tr>
<th>Cartoon heart with face, arms and legs</th>
<th>Cartoon person</th>
<th>Photo of a real person</th>
<th>Heart shaped logo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If you have any ideas for new logo/image/photo please write them here. If you wanted to draw/design an image please feel free to draw something at the bottom of this page or include a picture of an idea you have seen (optional).

Thank you very much for taking the time to complete this questionnaire!

*Please place the completed questionnaire into the postage paid envelope provided and return it to us at the School of Physiotherapy.*
APPENDIX 39: QUESTIONNAIRE 2: SEEKING FEEDBACK ON
PROGRAMME COMPONENTS AND RESOURCES (CHAPTER 6)

Dear

Thank you again for your ongoing participation in our study, which is aiming to develop a programme that prepares and supports people to engage in physical activity during the first three months following CABG surgery.

Thank you also for completing the previous questionnaire in October last year. You will recall that it related to your thoughts about a range of ideas that may have helped you to engage in physical activity during the first few months after your heart surgery. We have now gone through all the feedback from the responses to the questionnaires. As well, we asked a group of health professionals and some people who have previously had heart bypass surgery, for their views. Based on all this information we have now decided on the key ideas to include in the programme.

So we have reached the final stage of the study! This stage involves providing you with the feedback on what has been decided to include in the programme and asking you what you think about the written resources that have been developed and posted to you with this letter.

The package that you have received includes two booklets and a copy of the questionnaire. Please browse through the booklets and then complete the questionnaire. You can write any comments or suggestions on the questionnaire or directly onto the booklets themselves. When you have finished, please place the questionnaire and booklets into the return post courier bag provided and return it to us here at the School of Physiotherapy by the end of February if possible.

Meantime, if you have any questions, please feel free to contact me by email emily.gray@postgrad.otago.ac.nz or phone 021 279 5422.

Thank you again for participating in our study. Your contributions to the study are greatly appreciated.

Kind regards

Emily Gray
PhD Candidate, School of Physiotherapy
Questionnaire

Section 1: Feedback on the “Road to Recovery” booklet

The following table includes the decisions regarding the programme name and materials.

<table>
<thead>
<tr>
<th>Programme materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferences for accessing information in booklets and on an online website were expressed by participants. Therefore, both options will be included in the programme if funding allows. Current funds available have enabled the development of the booklets, however the research group will seek additional funding in order to develop the videos and online resources in the future.</td>
</tr>
<tr>
<td>Keep the name “Road to Recovery”.</td>
</tr>
<tr>
<td>The cartoon heart was over all the most preferred image for the front page (ahead of real people or cartoon people). At the focus group it was decided to contract the services of an illustrator to redraw the image on the front cover and develop more illustrations to enhance the appeal of the booklet and convey key messages about physical activity engagement.</td>
</tr>
</tbody>
</table>

Please write any comments or suggestions about these decisions below. (This is optional. If you do not have any comments or suggestions you do not need to write anything):

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

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Please explore the booklet “Road to Recovery” and answer the questions below by placing a tick in the appropriate box. Feel free to write any additional feedback directly onto the booklet itself.

a) Please indicate, by placing a tick (v) in the appropriate box, the visual appeal of the illustrations in the “Road to Recovery” booklet.

Extremely appealing  Very appealing  Somewhat appealing  A little bit appealing  Not at all appealing

Comments (optional):
_____________________________________________________________________
_____________________________________________________________________

b) Please indicate how easy the information included in the “Road to Recovery” booklet is to understand.

Extremely easy  Very easy  Somewhat easy  Somewhat hard  Very hard

Comments (optional):
_____________________________________________________________________
_____________________________________________________________________

c) Please indicate how helpful the information is in the “Road to Recovery” booklet.

Extremely helpful  Very helpful  Somewhat helpful  A little bit helpful  Not at all helpful

Comments (optional):
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________


Section 2: Feedback on the “Stories from the Road to Recovery” booklet

The “Stories from the Road to Recovery” booklet contains excerpts from various participants in this study who have agreed to share some of their experiences about getting back into physical activity. Please explore this booklet and answer the following questions by placing a tick in the appropriate box. Feel free to write any additional feedback directly onto the booklet itself.

Note that this booklet has not been fully developed with illustrations or photographs, but this will be done after we receive the feedback from yourself and the other study participants.

a) Would you prefer that the “Stories from the Road to Recovery” be included in the “Road to Recovery” booklet, or keep them in a separate booklet?

- Keep them in separate booklets
- Combine them into one booklet

b) If the “Stories from the Road to Recovery” are to be kept in a separate booklet, please indicate below your preference (by rating 1, 2 or 3) for the image to be used on the front cover of the booklet:

- A cartoon illustration
- A photo of a real person
- Photos of several real people


c) Would you prefer that a photograph and some additional information about the people who are sharing the stories (e.g. 52 year old electrician) be included alongside the stories (if the person gives their consent to do so)?

- Yes
- No

Comments (optional):

_____________________________________________________________________
_____________________________________________________________________
d) How helpful do you think the stories/excerpts contained in the “Stories from the Road to Recovery” booklet are in relation to engaging in activity following heart bypass surgery?

<table>
<thead>
<tr>
<th>Extremely helpful</th>
<th>Very helpful</th>
<th>Somewhat helpful</th>
<th>A little bit helpful</th>
<th>Not at all helpful</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Comments (optional):

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

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e) Please indicate how you feel about the number of stories/excerpts in the booklet.

<table>
<thead>
<tr>
<th>Too many</th>
<th>About right</th>
<th>Too few</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Comments (optional):

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

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f) Please indicate how you feel in general about the length of the stories/excerpts in the booklet.

<table>
<thead>
<tr>
<th>Much too long</th>
<th>Too long</th>
<th>About right</th>
<th>Too short</th>
<th>Much too short</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

Comments (optional):

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
g) Please indicate how relevant you feel the various topics for the stories are.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Extremely relevant</th>
<th>Very relevant</th>
<th>Somewhat relevant</th>
<th>A little bit relevant</th>
<th>Not at all relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting back into activity (general)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building confidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefits of physical activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Having the right attitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Solving problems</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Getting back into lifting activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Minimising pain in the chest wound during activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Balancing rest with activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Knowing when to stop and rest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Pacing yourself</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Dealing with set-backs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The importance of support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Making exercise a part of life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefits of cardiac rehabilitation</td>
<td></td>
<td></td>
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</tbody>
</table>
### Section 3: Feedback on decisions for what is to be included in the programme

The purpose of this section is to provide you feedback on the decisions that have been made about what to include in the programme. The table below includes a list of the the items to be included in the programme. If you would like to make any comments about any of the items, please write these in the table. If you are happy with the decisions and have no comments to make, you do not have to write anything.

<table>
<thead>
<tr>
<th>Include</th>
<th>Comments (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short and long term benefits of activity</td>
<td></td>
</tr>
<tr>
<td>Risks or consequences of not engaging in activity</td>
<td></td>
</tr>
<tr>
<td>How to engage in activity</td>
<td></td>
</tr>
<tr>
<td>How to manage physical symptoms (such as pain, fatigue and shortness of breath) in order to engage in activity</td>
<td></td>
</tr>
<tr>
<td>How to monitor my levels of exertion when engaging in activity (including knowing when to stop and rest)</td>
<td></td>
</tr>
<tr>
<td>When it is safe to engage in activity</td>
<td></td>
</tr>
<tr>
<td>How to engage in other types of exercise apart from walking</td>
<td></td>
</tr>
<tr>
<td>Exercises that can be done indoors</td>
<td></td>
</tr>
<tr>
<td>Arm strengthening exercises (these will be provided by a health professional after the 8 week period of protecting the sternum by limiting lifting loads has finished)</td>
<td></td>
</tr>
<tr>
<td>Include</td>
<td>Comments (optional)</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Be realistic about recovery time and that people recover and progress at different rates</td>
<td></td>
</tr>
<tr>
<td>Leg strengthening exercises</td>
<td></td>
</tr>
<tr>
<td>Have an example of a set walking schedule AND general guidelines so people can progress at their own pace</td>
<td></td>
</tr>
<tr>
<td>Know where to find more information about engaging in activity</td>
<td></td>
</tr>
<tr>
<td>Contact details for health professionals to use if I have any questions</td>
<td></td>
</tr>
<tr>
<td>Attend group information and exercise sessions (if it was available in my local area)</td>
<td></td>
</tr>
<tr>
<td>Have health professionals inform my spouse/whanau/support person how to support me</td>
<td></td>
</tr>
<tr>
<td>Read or watch other people’s stories about how they got back into activity</td>
<td></td>
</tr>
<tr>
<td>Receive follow up support from health professionals. This follow up support is currently proposed to be phone calls or online video conference (depending on person’s preference) with a nurse or physiotherapist at weeks 2, 4, 8 and 12 following discharge.</td>
<td></td>
</tr>
<tr>
<td>If funding is available, see a private practice physiotherapist in their nearest town if the person needs additional help with activity/exercise and lives a long way from hospital services.</td>
<td></td>
</tr>
<tr>
<td>Try and stay positive</td>
<td></td>
</tr>
<tr>
<td>Set my own goals for activity</td>
<td></td>
</tr>
<tr>
<td>Include</td>
<td>Comments (optional)</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Develop a plan for engaging in activity</td>
<td></td>
</tr>
<tr>
<td>Have a “walking buddy”/someone to accompany me on walks until I am confident to walk on my own. (This will be done by identifying a family member or friend to be a walking companion)</td>
<td></td>
</tr>
<tr>
<td>Identify barriers to activity engagement and plan ways to overcome them</td>
<td></td>
</tr>
<tr>
<td>Self-monitor progress with an activity diary</td>
<td></td>
</tr>
<tr>
<td>Self-monitor with an activity monitor e.g. FitBit (if the person has one)</td>
<td></td>
</tr>
<tr>
<td>Tell myself that I have the ability to engage in activity</td>
<td></td>
</tr>
<tr>
<td>Online video of a health professional talking about how to engage in activity after heart bypass surgery (similar to the “discharge talk” which is done prior to leaving hospital)</td>
<td></td>
</tr>
<tr>
<td>Online videos of health professionals demonstrating how to perform the range of movement and strengthening exercises</td>
<td></td>
</tr>
</tbody>
</table>
The following items were decided *not* to be included in the programme. If you would like to make any comments about any of the items, please write these in the table. If you are happy with the decisions and have no comments to make, you do not have to write anything.

<table>
<thead>
<tr>
<th>Exclude</th>
<th>Comments (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated text messages to encourage and/or remind people to engage in activity</td>
<td></td>
</tr>
<tr>
<td>Read short messages or “tips” for how to engage in activity</td>
<td></td>
</tr>
<tr>
<td>Attend live group information sessions online about engaging in activity (if such sessions are not available in local area)</td>
<td></td>
</tr>
<tr>
<td>Triggers of cues to remind the person to engage in activity e.g. alarm on cell phone or notes around the house</td>
<td></td>
</tr>
<tr>
<td>Talk with others who have heart surgery (It was decided for this to be encouraged informally, however there were concerns that people may receive incorrect or unhelpful advice or support about physical activity engagement)</td>
<td></td>
</tr>
<tr>
<td>Write a pros and cons list for reasons to engage in exercise</td>
<td></td>
</tr>
<tr>
<td>Mentally rehearse (e.g visualise doing the activity) before engaging in an activity</td>
<td></td>
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</table>
APPENDIX 40: PROGRAMME OUTLINE (CHAPTER 6)

Programme outline

The aims of this programme are to:

1) Optimally prepare people to engage in physical activity before they leave hospital following CABG surgery.
2) Provide follow up support for physical activity as part of the transition from hospital to home/community and to bridge the gap between hospital discharge and cardiac rehabilitation.

Overall principles in order to facilitate autonomy:

- Offer choices and let the person make their own decisions regarding physical activity where possible.
- Acknowledge the person’s perspective, acknowledge any challenges and affirm efforts.
- Use of non-controlling language (e.g avoiding terms such as “you should...”).

Pre-operatively:

- Determine current mobility and exercise capacity in order to identify the person’s baseline capability for physical activity engagement.

- Discuss the person’s exercise/physical activity history; elicit and acknowledge their previous experiences and emotions towards physical activity in order to:

  1. Identify the person’s perceived capability and intrinsic motivation to physical activity based on interest and enjoyment. (People with lower perceived capability or intrinsic motivation may need more support and encouragement for engaging in physical activity. This could be useful if have to prioritise those who receive follow up support)

  2. Provide the health professional with an understanding of what activities are important to the person when discussing/planning activity following discharge from hospital.

- Provide brief information about the need to gradually progress physical activity engagement and the benefits of physical activity following CABG surgery.

Prior to discharge:

- When mobilising on the ward, facilitate practise for self-monitoring during walking and activities on the ward (activity milestones; distance and frequency of walks; rate of perceived exertion; determining how far/how often to walk).
- Facilitate practise for functional tasks such as getting in/out of bed, raising from a chair, showering and dressing prior to discharge.

- Pre-discharge conversation (with whānau or support person/s present):
  - Go through the “Road to Recovery” booklet including information regarding 1) Health and well being benefits of physical activity; 2) how to gradually engage in physical activity (including self-monitoring and graded return to activities) (i.e increase knowledge)
  - Encourage the person to identify and record meaningful recovery and activity goals that reflect their interests and values. If required/relevant record on the ‘Road to Recovery’ infographic when a particular activity of importance may be commenced.
  - In collaboration with the person: discuss a general plan for activity e.g graded activities of daily living and individualised exercise plan (walking programme or something else that they enjoy) that takes into account the person’s physical capability at hospital discharge, home environment and outdoor spaces, available support, their living situation/context and interests.
  - Facilitate the person to create a plan for what, when, where and with who they will engage in exercise when they first return home.

Follow up support:

Note: There is currently no capacity for increasing the provision of follow up support with the existing resources available. Weeks highlighted below in green refer to when patients currently see health professionals following discharge. Weeks highlighted in yellow refer to new opportunities for follow-up support (if additional staffing resources were available). By doing this the programme is making the most of existing contacts with health professionals and minimising the amount of service expansion required. The additional follow up appointments (highlighted in yellow) would only be possible if additional staffing resources were available.

**Week 1-2:**

District nurse (if seeing patient) to check/ask about activity engagement. Affirm efforts (no matter how small), encourage and/or remind about activity (including reminding them to refer to booklet). Refer to GP/surgical team if the person has medical problems limiting activity, for example low blood pressure or review of pain relief medications. Refer to outpatient cardiac rehabilitation physiotherapist if the person has questions about activity. Refer to community physiotherapy if there are mobility concerns.

**Week 2:**

Phone or online videoconference call with physiotherapist or cardiac nurse specialist. Focus on self-management support for engaging in physical activity e.g facilitate problem solving to overcome barriers as required; encourage person to talk about what they have done and reflect on successes/progress (as well as things that have not gone so well), and planning the next steps they would like to make. Facilitate person to identify where to access further resources (e.g. information or support) if required. Reassure and answer any questions (in order to reduce fear and uncertainty).
Week 4:
Phone, videoconference or in person follow up with cardiac rehabilitation nurse specialist for risk factor management clinic. Discuss with person about physical activity engagement as per week 2 follow up.

Week 8:
Follow up appointment with cardiothoracic surgical team:
  Ask about physical activity engagement (encourage, reassure, affirm efforts and answer questions as appropriate).
  Assess sternal stability and upper limb range of movement.
  Clear for increasing exercise intensity and engaging in upper limb resistance exercises.

Phone or online video-conference call with cardiac nurse specialist or physiotherapist. Alternatively, this follow up could be done in person at the same time as the appointment with the surgical team.
Discuss with person about physical activity engagement as per week 2 follow up.
Discuss re-introduction of loaded upper limb activities and plans for returning to work/community involvement/activities of importance as appropriate for the person.
Discuss options for cardiac rehabilitation (in person or via telehealth).

Introduce upper limb resistance exercises (only to commence after they have received cleared by surgical team):
  Surgical team provide theraband and written exercise handout
  OR theraband and written exercise handout sent to patient via post
  +/- online video providing instructions and demonstrating exercises.

Week 12:
Phone or online video-conference call with cardiac nurse specialist or physiotherapist as per week 2 follow-up.
Discuss progress with re-introduction of loaded upper limb activities (including resistance upper limb exercises) and progress for returning to work/community involvement/or other community activity as appropriate for the person.
Discuss options for cardiac rehabilitation (in person or via telehealth).
Arm Strengthening Exercises

Because you have not been able to lift or use your arms as much as you normally would during the first six to eight weeks following your surgery, you may notice a loss of strength in your arms. Doing some strengthening exercises for your arms will increase your strength and may help you to return to heavier upper limb activities with more confidence.

You are able to start doing these exercises after your follow up appointment with the cardiac surgical team at approximately 6-8 weeks following your discharge from hospital. At this follow up appointment the doctor will check that your sternum has healed well and will confirm that you are able to start doing arm strengthening exercises.

When you start doing these exercises you may expect to feel a slight pulling sensation in your chest and arms. However, these exercise should not feel painful to perform. If you feel any pain, especially in your sternum, during any of these exercises either try not raising your arm as high, or stop the exercise completely and try again in a week’s time.

1. Shoulder Flexion

Stand on one end of the elastic.
Begin with your arms at your side and elbow straight.
Raise one arm as high as you feel comfortable or able.
Slowly lower your arm back down.
Repeat ______ times.
Repeat on the other arm.

2. Shoulder Abduction

Stand on one end of the elastic.
Begin with your arms at your side and elbow straight.
Raise one arm away from the side of your body, keeping your elbow straight. Raise your arm as high as you feel comfortable or able.
Slowly lower your arms back down.
Repeat ______ times.
Repeat on the other arm.
3. Elbow Flexion

Stand on one end of the elastic. Begin with your arms at your side and your elbow straight. Pull the elastic upward, bending at your elbow. Slowly return to the start position and repeat ____________ times. Repeat using the other arm.

4. Upright Row

Stand on both ends of the elastic. Grip the elastic with both hands and pull upward towards your chin, bending your elbows. Keep your hands close to your chest. Slowly lower and repeat ____________ times.

5. Wall push-ups

Stand with your feet approximately 0.5 metres away from the wall. Place both hands on the wall in front of you at shoulder level. Start with your arms straight. Bend your elbows and allow your chest to move towards the wall. Straighten your arms and return to the starting position. Repeat ____________ times. As you become stronger and feel more confident doing this exercise, you can move your feet further away from the wall to make it more challenging.
Road to Recovery

Your guide to getting back into activity after heart bypass surgery

Layout and Illustration Rebecca Gibbs 2020
A message from your health professional team

Physical activity is important for helping people to fully recover after heart surgery. Getting back into activity after heart surgery can be hard going at first, but as your body heals and recovers activity will become easier with time. Also, the more you do the easier it gets.

This booklet gives some guidance for getting back into your daily physical activities and exercise. Getting back into activity is a gradual and progressive process – it can take several months to fully recover.

Everyone is different so it is important to progress at your own pace.

Contact details

If you have any questions about activity after you go home and you cannot find the answers in this booklet, please phone or email any of the health professionals listed below for help.

Name: Inpatient cardiac rehabilitation physiotherapist
Phone: Email:

Name: Cardiac nurse educator
Phone: Email:

Name: Outpatient cardiac rehabilitation physiotherapist
Phone: Email:
Benefits of physical activity after heart surgery

Being physically active is an important part of ensuring that you make a full recovery following your heart surgery.

In the initial weeks and months after heart surgery physical activity can:
- Help your body to regain its strength and fitness
- Help you to return to your daily activities earlier
- Boost your enjoyment of life and sense of well being

Make exercise a regular activity for life

Regular exercise has benefits for your health in the long term as well. Your operation has restored blood flow to your heart and has dramatically reduced your risk of having a heart attack. However because heart disease is an ongoing problem, ongoing exercise will help to ensure that your heart blood vessels don’t reblock in the years to come.

Taking your heart medications, eating a healthy diet, remaining a non smoker and engaging in regular exercise can all help to keep your heart and the rest of your body healthy for the years to come.

Everyone, including you, benefits from doing regular physical activity!

Regular physical activity:
- Reduces blood pressure and improves cholesterol levels
- Helps to reduce or maintain body weight
- Improves the function and strength of your heart
- Makes it easier to cope with daily tasks
- Improves your overall quality of life

The Ministry of Health has physical activity guidelines for New Zealanders. They recommend that each week people do at least 150 minutes of exercise at a level that makes you ‘puff a little bit’ in order to maintain good health. If this target seems too hard for you at present, don’t worry – when it comes to activity something is better than nothing, so anything you can do will benefit your health and well-being. You can gradually build up the activity over the coming months.

If you are not active you won’t benefit from the things listed above and you will put yourself at increased risk of developing problems with circulation in your legs, your recovery taking longer and you may end up with less strength, fitness and function compared to your before your operation.

It is important to remember that the information in the booklet is a guide to your road to recovery from your surgery. Progress at your own pace and if you have any questions please contact a health professional.
My recovery goals/target

Before we talk about how to get back into activity, it is good to first think about what is important to YOU for YOUR recovery. These can be things that are important to you in relation to your health and well-being, your family/whanāu, community involvement, work or activities that you really want to get back to.

Write down your goals or things you want to be able to achieve on your road to recovery.

1. 

2. 

3. 

4. 

5.
The next few pages are all about how to engage in physical activity safely during the first few months after your heart surgery...

**Monitoring your effort during activity**

For the first few months after your heart surgery you should aim to keep to a light to moderate intensity during activity. There are several ways that you can monitor if you are working at a light or moderate intensity.

1. **The talk test**

   When you are working at a light intensity your breathing will increase slightly but you should still be able to sing during the activity. When you are working at a moderate intensity you should be breathing more deeply, but not becoming short of breath. At a moderate intensity you should also be able to *talk a full sentence, but not sing*. If you can only say one or two words at a time you are working too hard.

2. **Rate of perceived exertion (RPE)**

   When you are doing activity you can rate how hard you feel that you are working using a scale from 0 – 10, with zero being no effort and 10 being the maximum effort possible. The effort you are rating may be either for how short of breath you feel or for how fatigued you feel.

   For the first 6 weeks, you should aim to be at 3-5 out of 10 during walking or other exercise. You can increase this to 6-8 out of 10 after 6 weeks.

   - 0 - resting
   - 1 - very easy
   - 2 - easy
   - 3 - moderate
   - 4 - somewhat strong
   - 5 - strong/hard
   - 6 -
   - 7 - very strong/hard
   - 8
   - 9 - very, very strong/hard
   - 10 - hardest you can work

3. **Heart rate**

   The final way you can monitor your effort is by monitoring your heart rate. If you have a FitBit/ activity watch it may measure your heart rate for you. *A word of caution: Some of the medications that you are on after heart surgery may mean that heart rate is not a reliable measure of how hard you are working during activity.* Your physiotherapist will talk to you about whether heart rate is a suitable measure for you to use, and if so what the range for your target heart rate should be during activity.
Whatever the time of day or night, there is always help available – if in doubt, don’t hesitate to seek it!

If any symptoms concern you, call your GP, medical centre or after hours medical services.

**Warning signs during exercise**

If you get any of the following during activity, please slow down or stop and rest. If they are present every time you exercise, seek medical advice from your GP.

- Chest pain
- Shortness of breath
- Headache
- Dizziness or nausea

*If you get the following symptoms, please seek immediate medical advice:*

- Severe pain, especially if it is made worse by breathing and is different from that which you experienced in hospital.
- Excessive shortness of breath, especially at rest.
- Swelling of both ankles (you will get some swelling from the leg that your graft was taken from).
- Irregular heart beat or feeling your heart is racing at rest.
Looking after your sternum (breast bone) following heart surgery

Your sternum will take 6-8 weeks to heal. Doing too many activities that puts extra pressure on your sternum e.g. carrying heavy items, may delay the sternum’s healing process. Before you leave hospital, you will have learnt how to get up out of a chair and get out of bed without putting too much pressure through your arms.

For the first 8 weeks after your surgery, please try to limit the amount that you lift, push or pull to 2-3 kg (that is the same as a full 2 litre bottle of milk).

Another way that you can protect your sternum while it heals is to keep your arms close to your body when performing activities that put a lot of force on your arms. Lifting, pushing and pulling with your arms out to the side or behind your body will put more pressure on your sternum.

Here are some pictures which show how to sit up in bed and stand up from a chair in a way that puts less pressure on your sternum.

Sit to Stand: Shuffle forward to bring your bottom to the front of the seat. Try to stand up using only your legs. If you need to use your arms, keep your trunk upright and keep your hands beside your body rather than pushing off with your hands behind you.

Lying to sitting on the edge of the bed: Bend one knee up and roll onto the opposite side. To sit up push evenly through your elbow on the bottom and hand from the top arm. At the same time swing your legs over the side of the bed.
Introducing heavier arm activities

After 8 weeks, (and after the surgeon has checked that your sternum has healed well), you are able to gradually introduce arm activities that involve heavier loads. When you start back into heavier arms activities, continue doing them with your arms close to your body initially. An example of how to carry loads close to your body is shown below.

It can be normal to feel some slight discomfort or a pulling sensation during lifting for several months after your surgery. However if anything that you attempt feels painful, stop and wait for a week before attempting the same activity again. Once there is minimal discomfort when carrying loads close to your body, you can gradually do more activities with your arms further away from your body.

After your appointment with the surgical team around week 8, you will be given some arm strengthening exercises to do. Doing these arm exercises will also help to build up your strength and confidence for doing heavier activities that involve using your arms.
Returning home

Returning home from hospital after heart surgery can be a big adjustment. During the first week at home, just focus on getting used to being at home and getting yourself into a new routine. Doing simple activities such as showering and dressing, getting yourself a drink and making breakfast is all many people will feel up to doing when they first get home.

Rest is important during the first few weeks, and you may find that you need to rest after activities such as showering. However remember not to lie/sit with your legs crossed and try to make sure that you get up and move around every half an hour or so during the day to keep your circulation pumping around especially in your legs.

Try and keep up your walking like you were doing on the ward (short walks several times a day, perhaps inside the house initially) when you return home. If you feel up to walking outside during the first week that is great, but some people take a week or so before they feel confident to venture outside. When you do start to walk outside, you might like to take someone with you for peace of mind until you feel confident to go walking for longer distances by yourself. If you are walking by yourself, it is a good idea to take a mobile phone with you, just in case you need to phone someone for help.

It can feel like hard work getting up and moving around, especially during the first few weeks. People have told us that it often requires a lot of effort and self-determination to do things. Many people have also told us that it helps to try and stay positive and that having people around you to encourage and support you is very important.
Returning to daily activities

On the following page you will see a chart that guides you through the time when you can expect to return to various activities. Some people will take a little longer to get back to doing some of these activities. That’s okay – just progress at your own pace.

Below are some “tips” for how to start back into activities:

- Do activities and movements slowly and gradually speed up as you feel comfortable.
- Try to avoid reaching too far away from your body when doing things like wiping benches or sweeping floors.
- Some people find twisting and bending forwards uncomfortable, so make sure you do these things slowly at first.
- It is normal to feel a bit tired after doing an activity, but stop and rest before you feel completely exhausted.
- Do activities in small “chunks” rather than doing it all at once.
- If you find standing for a long time tiring, try sitting down to do activities if you can.
- Get someone to help with the “heavy” part of a task e.g get someone to carry the washing basket so that you can then hang light items onto the drying racks.
My activities of importance

There are likely be other activities that are important to you that you will want to get back to doing. Under “My activity targets” below list any activities that you are particularly interested in getting back to doing. Your physiotherapist will talk to you about when and how you might be able to resume these activities.

My activity targets:

1. 
   Date Achieved: 

2. 
   Date Achieved: 

3. 
   Date Achieved: 

4. 
   Date Achieved: 

5. 
   Date Achieved: 


Getting into exercise

The following information will give you a guide as to how to gradually build up your time spent exercising.

What is exercise?

Exercise is any activity that increases your breathing and your heart rate for a sustained period of time, and that you plan to do in order to improve your strength or fitness. Exercise can be things like walking, cycling and swimming, but can also include activities such as gardening, dancing and golf. It is important that you choose a type of exercise/s that you are able to do and enjoy doing – this will mean that you will be more likely to stick at it and enjoy the exercise.

For most people, walking is the easiest thing to do for exercise after heart surgery. It doesn’t cost anything, you can walk inside or outside, it doesn’t put any pressure on your arms and you can go at your own pace. However for some people walking is not a good option, for example those who have arthritis in their hips or knees. It may be that you simply do not enjoy walking. If walking is not for you, your physiotherapist will talk with you about how to get back into other types of exercise to do instead of walking.

Tracking your progress

Tracking your activity over time will help you to see the progress that you are making. At the end of this booklet there is an activity diary for you to write down what activity you have done. This could be walking distance, walking/exercise duration and/or step counts (if you have a Fit Bit or similar device that can count your steps).

Please note that when you first get home the amount of walking you can do and step counts might appear very low. This is because you will need a lot of rest and you may feel like you tire easily when doing activity, especially during the first few weeks after your surgery. Do not worry if your walking distance or step counts look low initially. The important thing is that they will increase over time as you recover and you feel like you can do more activity.
Starting off with your walking programme...

- When you first get home try and get up every 30 minutes or so or move your legs and ankles when seated in order to keep your blood circulating and reduce your risk of clots forming in your legs.

- It can feel scary walking outside for the first time. You can start by walking inside your house for the first week if you don’t feel confident to go outside or when the weather is bad.

- When you feel ready to walk outside, you might like to have someone with you for peace of mind until you feel confident walking by yourself.

- It is important to start and finish your walks by walking at a slower pace and effort (RPE 2-3 out of 10) for a couple of minutes to help you warm up and warm down.

- After you have warmed up, aim to increase your breathing, but do not go over RPE 5 out of 10 and/or ensure that you can still talk during walking at least for the first 6 weeks.

- Slow your pace or stop and rest if you get too puffed. Speed up if you are finding it too easy.

- You will feel a bit tired by the end of your walk but you should still feel like ‘there is a little bit of energy left in the tank’. You will feel like you need to rest after your walk, but you should feel recovered within an hour or so.

- Start with walking for the length of time and amount that you walked in hospital. Initially you will probably be doing several short walks per day.

- As a rough guide, aim to progress your walking time by a couple of minutes every few days (though you may progress faster or slower than this depending on how you feel). You are ready to walk for longer/go further when you can complete the walk without having to stop and rest.

- Once you can walk for 10 minutes at a time you can reduce your walking frequency to twice a day. When you get to 20 minutes you can reduce to walking once a day.
• Start by walking on flat ground. You may need someone to drive you to a flat area if you live on a hill (remember you are not allowed to drive initially after heart surgery). You can start walking on gentle slopes at around 4-6 weeks and on hills after 8 weeks (depending on how you feel). You will find walking on hills more challenging and you will puff a lot more. Start with a slow pace and stop and rest whenever you need to. If you don’t live near any slopes or hills you could find some steps to go up and down instead.

• It is ok to have a rest day from walking once or twice/week. On those days make sure that you are still getting up regularly and moving around the house (especially in the first few weeks when you might be feeling tired).

• The aim is to build up to walking for 30 – 45 minutes at a time.

• An example of a walking programme is provided on the following page.

Remember, some people will progress faster than others.
That’s ok – just progress at your own pace.

How much exercise do I need to do to stay healthy?

Remember physical activity guidelines recommend people do at least 150 minutes of exercise at a level that makes you puff a little bit every week in order to maintain good health. It will likely take you two to three months (or maybe even longer) to be able to build up to this target after your heart surgery. If this target seems too hard don’t worry – when it comes to activity something is better than nothing, so anything you can do will benefit your health and well-being.
### Example of a walking programme

<table>
<thead>
<tr>
<th>Recovery Week</th>
<th>Minutes</th>
<th>Times per Day</th>
</tr>
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<td>3 - 4</td>
</tr>
<tr>
<td>3</td>
<td>10 - 15</td>
<td>2 - 3</td>
</tr>
<tr>
<td>4</td>
<td>15 - 20</td>
<td>1 - 2</td>
</tr>
<tr>
<td>5</td>
<td>25 - 30</td>
<td>1</td>
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<td>6</td>
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</tr>
<tr>
<td>Recovery Week</td>
<td>1</td>
<td>2</td>
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<tr>
<td>---------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Times per Day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
My exercise plan

This page is for you to decide what you want to do for exercise in the initial weeks following your discharge from hospital. Your physiotherapist will help you come up with a plan so that you can start at a level that is right for you.

What activity/activities will I do for exercise?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

Where will I do this and (if applicable) how will I get there?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

When will I do this activity?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

How long/far should I go for initially?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

Who will come with me until I feel confident on my own?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
Stretches

There are a few general stretches you can start a few days after your operation to prevent getting stiff shoulders, neck and back. They should be done gently. Do the exercises twice a day, repeating each exercise three times.

A small amount of discomfort is expected during these exercises, however if it is painful stop.

1. Neck Bends

Bend your head forward until you feel a stretch behind your neck. Then bend head backwards as far as comfortable.

2. Neck Turns

Turn your head to one side until you feel a stretch. Then turn head to the other side.

3. Arm Lift

Keeping your arms straight, lift one arm above head, then lower it as you raise the other arm above your head.

4. Trunk Rotation

In sitting or standing, cross arms in front of body. Turn your trunk to one side and then the other, while keeping hips in the same position.
**Leg Strengthening exercises**

These exercises will help you to regain strength that you may have lost in your legs, and even your arms, following your operation. Your physiotherapist will tell you how many of each exercise you should do initially and how to progress. Aim to do these exercises every couple of days – though you can also do them on the days that you cannot go out for a walk. Sometimes if you have a leg wound it can feel a bit tight when you first start moving the leg. It should free up after you have done a few movements but please stop the exercise if it causes any pain.

**Straight leg raises**

Lie on bed. Keeping your leg straight, lift one leg off the bed and slower lower. Repeat on the other leg.

Repeat ___________ times on each leg.

**Seated marching**

Sitting in a chair, alternately lift one leg up and down as if marching in your chair.

Do this for ___________ seconds.

**Seated knee extensions**

Sitting in a chair, straighten one leg and slowly lower back down. Repeat on the other leg.

Repeat _____________ times.
Heel Raises

Stand with your hands resting gently on a chair in front of you. Push yourself up onto your toes and slowly lower back down again.

Repeat _______________ times.

Squats

Stand behind a chair with your feet shoulder width apart. Bend your knees (ensure that it is comfortable and not pulling on your leg wound) and straighten.

Repeat ___________ times.

Sit to Stands

You can do this exercise once you can stand up from a chair without using your arms. Sit in a chair then stand up without pushing off with your arms. Sit down again.

Repeat ___________ times.
Challenges to getting back into activity following heart surgery

Getting back into activity after heart surgery isn’t always easy. Here are some common things that other people have said make it hard to get back into activity.

Fatigue

Following heart surgery it is normal to feel some tiredness, especially during the first few weeks after your operation. Some people feel only a little bit tired while others feel very tired and fatigued. Because you feel tired you will need to rest, but it is important that you balance your rest time with getting up and moving around. The following ideas may help you to balance your rest with activity:

- Choose a time of day to do your exercises when you feel that you have a bit more energy. Some people feel like they have more energy in the morning while others feel more energetic in the afternoon.
- Pace yourself when doing activities. Take it slowly and stop and rest if you need to. Try breaking tasks into smaller chunks and do a little bit at a time.
- Initially it is normal to feel very tired even after simple tasks such as showering. If you feel tired, make sure you rest until you feel ready to move onto the next task or activity.
- You will have some days that you feel too tired to go for a walk. On these days it is okay to rest a bit more and try again the next day when you have a bit more energy.

Wound pain or discomfort

It is normal to feel a degree of discomfort in your wounds when moving. Some people describe being aware of a pulling sensation in their chest or leg wounds during activity. This pulling will lessen over time but it may last for a couple of months. This feeling is normal and it does not mean that there is any damage being done to your wounds.

Some people experience higher levels of pain in their wounds during activity. Your doctor will have prescribed you some pain medications before you left hospital. Make sure that you take the pain medication regularly as prescribed by your doctor. Don’t try to ‘tough it out’ initially as it may result in you feeling miserable and the pain may stop you from being able to do things.

The following ideas may help you to perform activities with less discomfort:

- Do activities and movements slowly and gradually speed up as you feel comfortable
- Try to avoid reaching too far away from your body when doing things like wiping benches or sweeping floors
- Use both arms and keep loads close to your body when you are able to start lifting things again
Fear and lack of confidence

Many people feel anxious or fearful at times after their heart surgery. This is normal and can be helpful to stop you charging into activities which may put too much strain on your body before it has had time to heal. However, it is also good to remember that it is safe to do activity (following the guidelines in this booklet) and that activity and movement will provide many benefits for your health and well-being.

In order to gradually increase your confidence with activity, start by doing easy tasks first and slowly do more as you are able. Having someone with you during activity can also help you feel more confident to try things. Remember, the more you do the more your confidence will increase over time.

Feeling uncertain about what you can do

Recovering from heart surgery is a new experience and you will likely have times when you feel unsure about what you can do. If you have questions that cannot be answered by the information in this booklet, please contact one of the health professionals whose name and contact details are found at the start of this booklet. There is also room near the back of this booklet for you to write down any questions that you have so that you can ask a health professional (doctor, nurse or physiotherapist) at your next follow up appointment.

Weather

Weather conditions can obviously stop people from getting out and about (especially down here in the south!). If it is frosty in the mornings and you are worried about slipping it may be a good idea to wait until later in the day before venturing outside for a walk. If it is hot, try to do your walk or outdoor activity in the morning or later in the day. If the weather is poor and you cannot get outside, you can do the arm and leg exercises that have been included in this booklet instead of going for a walk.

Lack of motivation

Things like fatigue, discomfort and reduced confidence mean that getting back into activity after heart surgery isn’t easy. It requires motivation, will power and determination to get up and move around. If you feel like you are lacking motivation to do activity you are not alone – others have also said that it can be hard to find the motivation that they need.
If you are struggling to feel motivated the following ideas might help:

- Look back at your recovery goals that you wrote down at the start of this booklet. Think about how activity might help you to reach your goals sooner.

- Sometimes the best way to get some motivation to kick in is to just make a start and do something – even if it is a small thing. Feeling a sense of achievement (even from completing simple tasks) can boost your motivation levels.

- Motivation is often higher when people do activities that they find enjoyable. For other people motivation is higher when they do tasks that have a purpose (like activities around the house or property). Try to identify activities that you enjoy or have some sort of purpose that you can do safely given your stage or recovery – you may find that you have more motivation for doing these sorts of tasks or activities.

Feeling down

The need to have heart surgery often comes as a big shock and many people can feel down or blue after their surgery. Some people find that getting out and about, doing some exercise and getting some fresh air helps them to feel a bit better. If you are feeling down, talk about it to someone you trust – this could be a friend, family member or health professional.
Information for family/whānau

The support that you as a spouse, whanau member or friend can provide to your loved one during their recovery is extremely important. They will likely be feeling tired, uncomfortable and anxious at times. It will also feel like a very big adjustment going from the secure hospital environment to being home. Having you there will provide them with a sense of security as well as some much needed encouragement.

Sometimes they will need your encouragement to do things, like getting up and going for a walk. However it is also important to let them do things in their own time. They will know when they feel ready to do things, so if they feel ready to do something then let them try.

It can take a while for people's confidence to return after heart surgery. They may feel like they need someone to accompany them when they go walking outside until their confidence increases. Having company when going walking can also help with motivation and enjoyment as well.

During the first month or so they may also need help doing things like getting out of bed or a chair and dressing. The physiotherapist will show you how to assist the person out of a bed or chair before leaving hospital. They may need you to drive them to a flat area so that they can go for a walk.

During the first few days when they get home they may not feel like or be able to do very much. Often by the end of the first week home people will start to feel like they can do more. It is important that you let them start to do things like making their own hot drinks, fixing their own breakfast or helping out with easy tasks like doing the dishes when they feel ready. The movement that they do during these tasks will help their body to get stronger and it will provide them with a sense of empowerment and purpose.
Frequently Asked Questions

When can I make love?

In general, it is advised that you wait for approximately six weeks before having sexual intercourse following cardiac surgery. However, this time frame may differ between individuals, so talk to your surgeon or doctor if you have any concerns or questions about when it is safe for you to resume sex.

With sexual intercourse it is generally advised that the amount of exertion required is similar to undertaking a brisk 20-minute walk or climbing two flights of stairs. So once you can walk briskly for 20 minutes or walk up two flights of stairs without getting breathless, then you are probably safe to have sex. Studies have shown that engagement in regular exercise may also improve sexual satisfaction following heart surgery.

When you resume sex, the person who had the surgery should avoid positions that keep him or her leaning on their arms, as this puts pressure on the healing chest.

When can I start playing golf again?

You can start putting around four weeks after your surgery, but do not start any full golf swings until 12 weeks post-surgery. Sometimes sternal discomfort can come on after you have finished playing golf. So start with just doing a few golf swings per day and gradually build up to doing a few holes and then a full 18-holes over a period of several weeks (or longer depending on how you feel).

When can I start bike riding?

If you have an exercycle at home, you can start using this within two weeks of going home. However, during the first 8 weeks make sure that you sit upright and just rest your hands on the handlebars. Do not lean through your arms on the handlebars for at least 8 weeks following your surgery.

Because of the risk of falling off a bike and damaging your sternum, it is recommended that you do not ride a bicycle outdoors on the road for at least 12 weeks. When getting back into using your exercycle or bicycle, follow the same general principles of starting with short distances/times at the suggested rate of perceived exertion. Remember to build up gradually, at your own pace, as your fitness improves.
When can I start swimming again?

You can resume water-based activities such as aqua jogging, aqua-aerobics and swimming (freestyle) at around 8 weeks and after your surgeon has checked that your sternum has healed well. Backstroke, butterfly and breaststroke put a bit more pressure on your sternum, so it is suggested that you wait until 12 weeks before starting these.

Where can I find more information?

The New Zealand heart foundation website has very helpful information about recovering after a heart attack or heart surgery.

www.heartfoundation.org.nz

If you have any questions that are not answered either by this booklet or the Heart Foundation website, please write them in the back of this booklet and contact one of the health professionals listed in the front of this booklet.
### Activity Diary

Reminder: RPE = rate of perceived exertion, it is a rating out of 10 of how hard you felt like you were working during the activity.

<table>
<thead>
<tr>
<th>WEEK 1</th>
<th>Monday Rāhina</th>
<th>Tuesday Rātu</th>
<th>Wednesday Rāapa</th>
<th>Thursday Rāpare</th>
<th>Friday Rāmēre</th>
<th>Saturday Rāhoroi</th>
<th>Sunday Rātapu</th>
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<tr>
<td>Time/Distance Walked</td>
<td></td>
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<tr>
<td>Activities</td>
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</tr>
</tbody>
</table>

**Notes:**
## Activity Diary

Reminder: RPE = rate of perceived exertion. It is a rating out of 10 of how hard you felt like you were working during the activity.

### Time/Distance Walked

<table>
<thead>
<tr>
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<th>Tuesday</th>
<th>Wednesday</th>
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<td>Rāapa</td>
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<td>Rāhoři</td>
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### RPE

<table>
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<th>Activities</th>
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<th></th>
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</thead>
</table>
## Activity Diary

**Reminder:** RPE = rate of perceived exertion. It is a rating out of 10 of how hard you felt like you were working during the activity.

<table>
<thead>
<tr>
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**Notes:**
## Activity Diary

**Reminder:** RPE = rate of perceived exertion. It is a rating out of 10 of how hard you felt like you were working during the activity.

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### Activity Diary

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**Notes:**
Questions for follow up appointments:
This booklet contains the stories of real people who have had heart bypass surgery. These people have generously shared their experiences, in their own words, in the hope that their experiences might help you and others on their road to recovery following heart surgery.

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Topic 1: Getting back into activity

David
Lecturer and researcher, 53 years old
When I came out of hospital I was in shock because I couldn’t believe this had happened to me. Because I didn’t smoke, I used to do a lot of exercise as well even though I had put on weight, it was just that I sat at work all day long. On the second day I was back home I started going for a walk from our front door to the gate and then I just kept on extending it. My wife would drive me into South Dunedin, because it’s flat and where I live there’s nowhere I can really walk very far. And I just started walking through the shopping centre and the next day I’d go a bit further and the next day go a bit further. So I kept on extending that, so I was just walking and walking and walking. By three months I could walk from Bayfield School through to St Clair and back again. So I just worked on my own and I just set goals and I walked everywhere. And then I started carrying a backpack, first off empty and then some weights in it. We had this information saying just do light housework and don’t lift any weights over two kilograms and so on, so I kind of worked through that and just got back to doing my normal you know going to work and going walking and carrying a backpack and just increasing the weights.

Sid
Farmer, 58 years old
Initially it was pretty hard yakka. The first few days I didn’t do much at all. I was shuffling for a start a bit, quite a bit slower than what I normally walk at ‘cause I do walk at a pretty good clip normally. And then after about a week it was like righto let’s see if I can do this and the old brother-in-law shuffled down the road with me and shuffled back again but the goal was to do it without stopping and my brother-in-law would go “yeh yeh yeh that’s good” and I said “yeah, yeah no I feel good.” And then after we’d cracked that one a few times, it was like I want to go down to the end of the paddock, I want to go down to the end of the boundary and back and we’d get out and shuffle off down there and back again. So you just sort of set yourself little challenges and the once you get going it was pretty good. Just listen to your body ‘cause your body will tell you if you’re overdoing it and you’ve just got to set yourself little goals and go for it each day.
Murray
Retired farmer, 80 years old
I had to take things quietly at the start because you did feel if you’re going for a walk and whatnot, you got pretty tired but I just gradually built up. When I got home my son was with me and by the next day we went just down the street a wee bit and back He went with me just in case and he did that for the first three or four days and then I’d go by myself. I said “I’ll just go for a quick walk down the block and back” and I always carried a phone with me to ring him if I needed a rest or something but I always turned up back here again. Initially I did two or three smaller walks each day and you’re doing quite a bit of walking around in your house too. And then we gradually increased it and so on right up till once my son left I was doing about 300 or 400m no trouble. I had a block around the streets here and you could do that in seven minutes and I’d double it up and then gradually once I got around that two or three times (in a row) and then righto, it’s time (to go further). I live right beside Queens Park and so now I walk just about every day for quite a long time, up to an hour.

Tom
Slow but steady would be the best way to describe it. I haven’t been spectacular, I’m still not fully recovered but I’m well on the way would be how I’d put it now. But through that first period it was day by day you know, gentle but I did try to lift the walking continuously, I’m still trying to do that. Initially it was just walking up and down the hall. And then the next step I went round the house, we’ve got a path and so I went round the path and then slow walking around the district, building eventually to do some hill work which you can’t really avoid to do in Dunedin. But I did ease into that so it was flat walking for the first few months. This is a fairly steep part of town there’s not a lot of flat stuff around here so I did find the hill between here and walking over toward the golf course and all those walks around there quite difficult for a while. But I can walk it now. But just doing it really has been the important part and being sensible enough to stop at the beginning. Now I can do most of those things without having to stop. The more that I do the easier it gets.
Alastair
Landscape gardner, 64 years old
We’ve got a nice flat driveway so for the first day I walked ever so slowly for 10 minutes out on the driveway. I was pathetically slow, I was just terrible. People would be thinking it was like watching paint dry me walking along but I didn’t want to push it but then I’d think oh yeah that went alright. And then it just increased to three 10 minute walks. Sometimes I may have overdone it a wee bit but I always knew if I had. I never felt dizzy or I wanted to lie down but I just stopped and had a wee spell and I’d come right again. Just probably felt tired more than anything. And then the following week, I went to 15 minutes, two, three, four times a day and then after that I was going for 20 minute walks the next week. And then we’ve got a wee hill that goes up to the neighbours and I had a crack at that. I’d go up that hill every day after that. It’s not a big hill but it’s quite a steep one and that’s what was my measure and it was hard work at the top of that one. I’d been walking 1.5km and they were good walks but they were just flat and my pace was getting better but that hill was the one that, you know I felt good enough and I needed to be starting to think about getting a better rather than just lulling along.

Neville
We went for a walk every day with, you know gave walking a go and gradually we got a bit further away from home and what have you. Probably the day after we came home we went down to the corner and back, it’s only two houses away to the corner. We’d get up to the corner and we’d stop there for a couple of minutes and have a bit of a rest and then turn around and come back again so that was our initial one but yeah, gradually we got a bit further and further away from home. Within a few weeks we’d walked around the block here which is just under 2km. And once I got a bit better at walking and what have you, then I started bringing the firewood, that was sort of my daily chore so that sort of kept me going for a while. I did one block at a time and it took me probably about an hour (at first). When I first started doing the lawns again, I think I did it in sort of three spells so about three 15 minute spells. I’d do 15 minutes and go inside and have a drink of water and sit down for a bit and then go back out about half an hour later or so and do a bit more and that type of thing. So I did it like that for quite a while, probably six months actually ’cause it is quite surprising ’cause I had no upper body strength and it was quite a mission doing it.
Allan
Technician, 72 years old
 Initially I was a bit sore naturally, but my wife and I started walking the first day we were home. We did it easily just walking around the one block for the first few days. I was confident but I was just wondering how far I could get round that block before if I had to sit down and have a rest or what not but we didn’t have to stop. I got a couple of aches half way through but we just carried on but a couple of days after that I was more confident. I wasn’t getting out of breath so we could extend our blocks. After about three or four days we extended it to two blocks and then extended it later on to three blocks. And my wife was going to the physio at the stadium so I’d go to the top of the stadium and walk around the cycling track on the outside and it’s got stairs down the outside then you walk along and then you go down a few more and walk straight and then up some walk straight then up some. So I was getting some stairs too which was good. I could’ve just stayed below and walked flat and I thought no cause I’ve had to walk up quite a few stairs to get to that level and I knew the stairs should help me. The stadium was a blessing in disguise cause for all of those days that were too wet and you could walk round and round as dry as a bone. And yeah I found the stairs helpful cause they just put a wee bit more pressure on you. ‘Cause unfortunately here unlike Dunedin where you’ve got a few hills, I have to go to the other end of town to get a hill. When I started back at work, I did four hours the first week, one hour a day just to see how it would go and then the second week I did two hours a day. That first week I was sharpening chisels and plane blades because they hadn’t been done since my operation but yeah no it was all good using my shoulders and arms and those sort of things.
Topic 2: Building confidence

Dot
Retired accounts administrator, 68 years old
I felt scared and alone when I first come home. Even though I knew help was only a phone call away, it had knocked my confidence. Probably for the first couple of weeks when I came home, I just walked around the property. We own a property with a large amount of land, so I found that was good. I was still a bit wary even if my husband was there of going out on the street. I did not feel I could venture too far and as it was June it was getting colder. I was worried too about the streets because they do get quite wet and slippery due to moss on some parts of the footpaths. It was just a thing I would not normally even think about, but I was really worried about venturing out on the street. I suppose it was a fear of something happening. My husband came with me initially and I had a good friend who used to come and meet me and go for walks as well. I think I would feel insecure if I did not have somebody with me in the first few months to be fair. So slowly each day I just tried to go a bit further to build my confidence up again. Some days I went further than others, depending on how my body was feeling. Then when I felt more confident, I lost some of that fear, and started back walking on my own.

Sid  Farmer, 58 years old
I was just doing farm stuff initially, apart from stock work, I’d promised the surgeons that I wouldn’t go near stock until the 12 week mark. You know, I was capable of doing stuff but they said if you go into the yards and you get smacked by a ewe, that’s gonna undo all the good work we’ve done so, yeah no. With the farm work I started with helping the old man and my nephew who were doing the lambing for me with break fences on the winter crop. I was just giving them a hand. I wasn’t carrying the reels or anything I was just doing the standards and hooking in the live strand. So wandering along slipping them off. Once I was able to get back doing all those jobs, your top two inches starts thinking yeah I am healing up because I can do the things that I was doing before which helps really good. It gives you that confidence once you start doing pretty much everything you were doing before, you start feeling like yeah, I am on the road to recovery, things are getting better. (So once your’re allowed to do things) don’t be scared to try things because you know, I was a little bit, sort of, probably a little bit hesitant, a little bit scared about doing the wood stuff and that and then I thought oh bugger it, just get in and do it and your body’s gonna tell you if you’re not doing it right ‘cause you’re gonna hurt and nothing hurt, so yeah, it can’t have been too bad.
Topic 3: Benefits of physical activity

Allan
Upholsterer, 61 years old
Getting out and walking helped a lot. I think just being able to get out and walk again and just get back to some sort of reasonably good physical activity because I’d been getting so tired before the surgery in the months for ages leading up that by the time my weekend came, I was absolutely knackered. I couldn’t even mow the lawns and it would take ages to do things like that and so weekends you sort of end up mostly just resting. And so to be able to get back to just walking again and that sort of thing, it was good. I really enjoyed that, just getting out especially on the nice sunny days ‘cause it was sort of summer time after surgery. Whenever I could I tried to get out rather than being stuck at home here, ‘cause my wife was working and I couldn’t drive so it was quite important just to get out and go for the walk along the street almost just to clear your head sort of thing.

Murray
Retired farmer, 80 years old
My biggest thing I want to do is keep myself active because I think that’s a big help. I’ve been talking to one or two that more or less have taken a long time to recover from a bypass and they’re quite surprised when I tell them what I’ve done in the first three weeks or four weeks and so on and I think it’s just a matter of keep going. You’ve gotta keep yourself fit and and it helps to keep you mobile. I think that’s the biggest thing is to keep your mobility.
Topic 4: Having the right attitude

Dot
Retired accounts administrator, 68 years old
Some mornings I was reluctant to go for a walk. At times I felt quite tired and unmotivated and I would say in my mind oh no I am not going to go today. I thought if everybody had this attitude and it was after all for my own benefit, so I made myself go. I am a great believer in you have really got to help yourself and if you are going to sit feeling sorry for yourself, it is not going to help anybody, family, friends, or anybody else so you do have to try and, you know, rise above that and it is not easy. I know some people found it exceedingly difficult, everybody is so different, but I think you have got to try and think well, you know, it is up to me. Other people cannot fix everything for you, I am speaking for myself you have got to think well what I can do to make myself feel better and to me I find exercise, and I love my garden and those two things helped me, and if I did not do that, I know I would sit there feeling sorry for myself. The physical activity definitely helps with your mental wellbeing also.

Nelson
Oh, I was very prepared to do something but that’s my nature a wee bit. I’m pretty competitive and gotta give things a go all the time. So I was really sort of determined and it was always a goal from day one to get myself back going again Everybody around me wanted me to do nothing and it was only my own determination that got me going really. You’ve really got to sort of push yourself and get going, yeah.
Allan
Upholsterer, 61 years old
I think it was just my own desire to get out and move. I mean for me it was like a new lease of life and so for me it was, you know get out and make the most of it. ‘Cause my mindset right from day one after surgery was I was itching to get up and get moving in some ways ‘cause I remember, I think it was about the second or third day I was able to walk around the ward with all my things hanging off me and those first few steps across the ward, that was magic and from then on it was let me get going, you know, just get on with things. I think that was just my mindset.

Richard
Contractor, 72 years old
I just had to do things even though you didn’t feel like it, it was just a matter of you just had to do them and yeah, at the end of the day, it paid off. You really had to force yourself just to go and do it, you know it was dead easy to say oh nah, I’m not feeling 100% so I won’t. Still get up and try and do it and afterwards you sort of felt as if, well that was good, felt a bit better about it. I mean there’s the mind working isn’t it. If you’re going to just sit there and accept that side of it, then you’ll achieve nothing but once you’ve done it, you sort of think, ha, that feels better.

Alastair
Landscape gardner, 65 years old
I was determined. That was part of it. I mean, one of the surgeons, they said you need to be doing some physical activity, you know, don’t overdo it but you need to and so yeah, I got into it just as soon as I felt I could. I like to think I stayed very positive and I mean, when you’re coughing, it’s bloody sore and it’s very hard work and so if you can just remain positive, get out there and start walking. Definitely remain as positive as you can.
Tom
I did take it day by day and I realised I wasn’t going to be spectacular but I was always determined that I would ease back in at a steady rate, not a crazy rate but a steady rate and I’ve tried to maintain that right through like I said I’m trying to push myself a little bit more now. It was quite hard at first. But it was just a matter of persisting. My friend (who has had the same operation) said to me ‘I’ve got something to tell you’ and I thought I know what this going to be and he said ‘this idea that it’s all going to be easy and instant forget about it you’ve just got to stick with it and persist’.

Allan
Technician, 72 years old
But I knew I had to do it anyway cause if I just sat here on the couch then there was no sense going up and having the operation so having the op gave me the incentive to go out anyway.

Sid
Farmer, 58 years old
I’ve never been a walker. I used to run (as part of my old job), we had a fitness test every year so you’d just do it for that. But I’ve got all the old standard rugby injuries with your knees so I didn’t run but I did a lot of on my feet stuff with the work at work and on the farm here so I never actually did any extra exercise. But since my operation I am, I have been doing the walking. It was just my own attitude, like I wanted to get back to being healthy. I’ve been, apart from rugby injuries and that, I’ve been pretty healthy all my life and you know. I like my outdoors and I hunted and I was involved in search and rescue for years and that sort of stuff so I wanted to get back doing that sort of thing. I don’t like sitting around in chairs twiddling my thumbs so it was, yep right today we’re gonna do this and just go and do it.
Topic 5: Solving problems

- Getting back into lifting activities

Sid
Farmer, 58 years old
The thing that I was never too sure about was how much I could do with my arms but they said you don’t lift any more than a litre of milk or whatever it was. (And then after eight weeks ) I went to get firewood out of the shed and I remember thinking gosh that’s bigger than a litre of milk. I’d pick it up and go well nothing hurts so it can’t be that bad so I’d pick it up and put it in the barrow and then pick up another one and, oh nothing hurt so put it in the barrow so I’d get a barrow load of wood and then wheel it down ‘cause I figured that once it was in the barrow, then the old fulcrum effect took over and it wasn’t really that heavy that you were lifting a barrow load of full because it was actually pivoting on the wheel and that so I was able to barrow wood back down the lane into the wood box and things and like, mmh this was, yeah it’s good.

- Minimising pain in the chest wound during activity

Richard
Contractor, 72 years old
It was the chest really that, you know, like bending over to do something or to pick up something, we weren’t supposed to pick up anything heavier than say a jug of water so like picking up a bit of wood or something like that, depending on how you’re stretched or how you were balanced, it would either hurt or it wouldn’t. If it hurt, you didn’t do it again. Any bending over your chest is sort of concertina’d a bit and they were the sort of things that hurt whereas if you could stay upright that was fine. Or a cough at the wrong time, if you didn’t get to hold your chest quick enough, just little things like that that you just had to be aware of. But lifting was the big thing. It was just judging what you were going to lift and the weight of it and obviously it affects all the upper body and that’s where the sore bits were. It was only when you did something, you just stretched a couple of inches more than what you should of. You just had to try different ways and just do it slowly and work out a way of how to do it without the damage.
- Balancing rest with activity

Dot
Retired accounts administrator, 62 years old
When you first get home you really must make yourself rest and make sure that you eat well and have a bit of a routine in your life. I think that was a big thing for me as I was sitting a lot more than my body was used to. I kept myself moving as much as I felt I was capable of without extending myself too much. I have known of people who tend to sit around, and they say how awful and unwell they feel, I advised them that you really need to get out there and keep your body moving. I know a few years ago, you were encouraged to sit down and rest, and you still do have to, you must also reach a balance. I think getting the right balance is the biggest thing, and do not over-do it.

- Knowing when to stop and rest

Allan
Upholsterer, 61 years old
I found out really quickly when I was walking, I knew when I had to stop and have a wee rest. It was just a physical thing that just told you you’ve gotta stop now and just have a wee rest and then carry on. It was a bit of breathlessness and also just really muscle fatigue in the legs sort of thing. Especially walking around the steeper part of the street here coming back home, I’d sort of stop and get my breath back a wee bit before I tackled the heavier bit. Then when I got home and I’d rest up, have a drink of water and something to eat and rehydrate and put a bit of food in and recover that way. Yeah, just take it easy and listen to your body especially. It soon tells you when you’ve overdone it and when you think you’re feeling like you’ve overdone it, stop and have a rest and then carry on later.
- **Pacing yourself**

**Richard**

**Contractor, 72 years old**

I had a circular drive and a circuit around that was about 32m so to start off with I got that one circuit done and just gradually increased it. If you tried to do it a wee bit too quick, then the short of breath department caught up but then I established just a pace that I could get right around my circuit without having to stop or getting breathless. So once we slowed down that was a lot better. By the next day, it was a lot easier just by doing something simple like slowing down. (The walking schedule they give you) I reckon it’s taking the average of most people as they come out of it. Some people probably handle it quite well, others probably wouldn’t but I read it as if it’s a guide and a guide only. It’s really how you feel yourself, whether you want to go an extra 20m one day instead of keeping it to a certain level for so many days then increasing it. You know, if you could sneak in that odd slightly longer walk and you think oh that was better.

- **Dealing with setbacks**

**Richard**

We were given all that literature and the book says about what you should be doing at so many days and whatever and you tend to look at it sort of thinking well I had the handbrake with the leg problems and the swelling virtually right from that first week but we still managed to get there. (If you have complications) just persevere. It will come right. I think the whole thing just hinges around attitude. If you get a setback, just overcome it as best as you can and you know, just get on with it. In some occasions, grit the teeth and yes, just carry on and it was the mere fact that I wanted to do something sooner than later that I had like a target and I really wanted to reach that and I did. And as time went on, you know I still had to be careful but it just got a little bit easier.
Topic 6: Importance of support

Alastair
Landscape gardener, 65 years old
Having the support at home was certainly helpful, it would’ve been much more difficult if I didn’t have that support at home. The surgeons told my wife that he’s not to be molly-coddled. He is to be doing things around the house that he’s capable of doing and she took that on board, I took that on board and he said there’s just no lying around on the couch or sitting down on the chair. I mean initially I did a bit of sitting down but he said there’s none of that, you’re not to be lying about and so that was good too and she kept me a bit more motivated I think in those areas. She would say “oh when are you you going for a walk today?” And so we’d plan a bit of an attack and also she encouraged me to do keep that activity diary which I’m very pleased I did now.

Milton
Retired/Volunteer, 60 years old
I went down to Invercargill and stayed with my sister for a fortnight after I came home from Dunedin. I think my sister maybe had to help me with my shirt on the first couple of days and she’s a pretty, sort of a stickler sort of a person so she had me out walking to a regime which I stuck to pretty well, just short walks every day for about three or four weeks. I probably could’ve got by on my own at home but it was really good, it made it easier and we got on like a house on fire really and it turned out alright.
Neville
People actually looked at me and said what are you in here for and then I told them, they couldn’t believe it and they said that I don’t look ill. But I mean there’s people in there that have got all sort of illnesses and I found it quite shocking but when you get talking to those people it’s amazing how much resilience they’ve got. And there’s all sorts of people. There’s people there with liver and kidney problems and there’s people that have been in car accidents themselves and it’s changed their lives but they still manage to put on a smile and carry on and what have you. So yeah, I think it’s probably pretty critical that you meet people and talk about it with them and what have you, yeah.

Dot
Retired accounts administrator, 62 years old
I think having support from other people is important, you know no matter how good you are, you do have days where you feel down. I do not know if I was depressed, but certainly I had days where I was feeling bluer than others. Especially, around my surgery scars, they were uncomfortable and painful, that sort of took its toll sometimes. I think encouragement from other people, was particularly important.
Topic 7: Making exercise a part of life

David
Lecturer and researcher, 53 years old
At one point I said to my friend well I’m going out walking as much as I can would you like to come with me or can I go with you. So I got a companion and we walked and that was really good. And after some months he invited me to a walking group. They were doing 10 k’s two nights a week. One night was flat and the other was up and down hills. So I joined them and I was very very worried. I thought oh I can’t walk 10 k’s, what am I going to do? I’m going to embarrass myself and all the rest of it. But anyway I joined them. And they were lovely and they just said well you walk with us and we’re doing this circuit walk at the beach so they said if you can’t stay with us you can just quickly go up John Memorial Drive and go back to where we started from. And anyway I persevered and did the walk and it took me three days to recover! I got back to the car and I put my arms out and they were shaking and I couldn’t hold the steering wheel and it was just because of the physiological response. But after about four or five months doing this all the time I’d get back to the car and it’s just normal. And I thought to myself this is fantastic.

Anyway what happened next was this group said they would do longer walks and they said we walk the Routeburn track and we do it all in one day. And I thought “What?! You can’t do that!” And I asked how long is it and they said whatever it is 40 or 50 k’s and I thought you can’t walk that. I just thought they were lying. Anyway they said we’re going to walk the Central Otago Rail Trail this coming winter. We’d love you to come, but you’ve got to be fit. We’d expect you to be able to walk 30 k’s day the week before we do it. So I had this goal and so I went with them and I walked and I walked and I walked and I walked. And we had five months to build up to this, and in the week before I was doing 30 kilometer walks every day. And then we did it. And it was fantastic for me because I did it. It took us four days to walk from Clyde to Middlemarch. And I’d never done anything like that in my life before! So these people were a godsend to me because they encouraged me to do things which I’d never ever done in my life before and I wouldn’t have on my own left to myself because I just didn’t think that you could do that. So subsequently I’ve cycled the Alps to Ocean and I’ve walked the Clutha Gold and lots of other walks with these people. And you know it’s been 13 years since I had the operation. I can walk out the door and walk for three hours and probably cover about 15 or 16 kilometers and I know I can do that right now. I never thought of doing things like that before my operation.
Topic 8: Benefits of the Cardiac Rehabilitation programme

Milton
Retired/Volunteer, 60 years old
I went to a heart rehabilitation classes in Invercargill on a Wednesday once a week for four weeks so that was quite helpful. They’re just put on by a couple of nurses in Invercargill. I could drive by then so I drove down and it was two hours and they discussed your medications and different things like that. They gave us a drugs, ambulance talk and they talked about activity. It was really good, really informative. They made it interesting.

Tom
And the other exercise I did there was going to the (cardiac rehabilitation) exercise classes. I did my eight week course, I completed that and got a lot better for it so you know so they’ve really got a great team there and it really helped a heck of a lot. They really did build your confidence as well as your strength and a lot of the exercises are easy to reproduce at home you know things like jumping (stepping?) up and down off steps and that kind of stuff - it’s all pretty straight forward. I think (cardiac rehabilitation) really turned me from feeling invalided to feeling relatively normal. A lot of people in the group were quite a bit older than me and some were much younger. The younger ones seemed to be heading into more vigorous things than me, the other ones much less so well you’d expect that. But you know the degree of disablement if I can use that awful word was extremely variable and so we were all in very different places so the recovery needed an awful lot of adjusting to each individual.
Dot
Retired accounts administrator, 68 years old

I went to the Cardiac Rehabilitation classes; they ran twice weekly for eight weeks and were run by professional physiotherapists at no cost. I thought it was amazing as I had no idea about all these options that were available. I booked myself into the classes once I got a clearance from the Hospital Heart Nurse. For me that was the start of good things happening when I went to those classes. It was great because I was mixing with people who had had similar surgery to me, the exercise was good for your body and mind. I found for myself it was important to talk to other people because after the exercise class we had a social time and a cup of tea and I found that important, to discuss what you have been doing and how you are recovering.

After the class on a Thursday, I went to the Heart Foundation talks, they have eight topics, and I went to every one of those. I think it is important to do that personally because they explain a lot of things about your medications and what your heart’s doing and how to help with your recovery.

When I finished the eight-week Cardiac Rehabilitation classes I joined another Cardiac Rehabilitation Club that provides exercise and ongoing support for heart patients.