A feasibility study to investigate the impact of a dietitian-led low FODMAP diet group education programme for adults with Irritable Bowel Syndrome (IBS).

A thesis submitted in partial fulfilment of the requirements for the Masters of Dietetics at University Of Otago by Dorcas Chan

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Abstract

Background: Irritable Bowel Syndrome (IBS) is a functional bowel disorder that affects approximately 10-20% of New Zealanders. Currently, there is no curative treatment for IBS and IBS management focuses on symptomatic relief. The low FODMAP diet taught in a one-to-one setting by a dietitian, is a validated dietary therapy in managing IBS symptoms. Yet, the number of patients requiring low FODMAP education is exceeding dietetic capacity. Group education and alternative delivery models have to be investigated.

Objective: This was a feasibility study for an non-randomised, interventional pilot study investigating the impact of a dietitian-led low FODMAP group education programme for adults with IBS living in Christchurch, New Zealand. This study aimed to examine the effects of this programme on gastrointestinal symptoms in a sample of New Zealand adults with a clinical diagnosis of IBS. It also aimed to explore participants’ perspectives and acceptability of the low FODMAP diet and the group education programme itself.

Design: The group education programme was advertised to general practices in the surrounding areas of the proposed session venues. Due to low referral rates from general practices, the sessions were also advertised on Community HealthPathways and Health Info Canterbury, promoted by the Canterbury Initiative leadership team on their practice visits and in the Pegasus Health email newsletter. The study aimed to recruit twenty-five adults with IBS. Information on baseline characteristics was provided and participants were booked to attend the first education session. The first session focused on how to implement and follow a low FODMAP diet. Participants followed the low FODMAP diet for six weeks. Participants were then called to determine if they found their IBS symptoms to be improved by ≥ 50% whilst being on the low FODMAP diet. Those that improved by ≥ 50% were invited to attend the second education session which focused on the reintroduction and rechallenging of FODMAPs. Participants completed the Structured Assessment Gastrointestinal Symptoms
Scale (SAGIS) and Hospital Anxiety Depression Scale (HADS) questionnaires at baseline and after the intervention. They also completed a semi-structured interview that elicited participant’s perspectives around barriers and facilitators in adhering to the low FODMAP diet as well as their perceived acceptability of the group education programme.

**Outcomes:** In total, twenty-five participants were recruited. Twenty-two participants were booked into the first education session and three participants dropped out due to work and day commitments. The majority of the mean SAGIS scores significantly decreased between baseline (1.844) and follow-up (0.607) (p<0.05). There was a non-significant improvement in the HADS anxiety and depression scores from baseline to follow-up. Thirteen out of seventeen (76.5%) participants reported symptomatic improvement while two participants (11.8%) did not improve and two others (11.8%) did not implement the diet at all. Overall, participants were positive and grateful for the changes the low FODMAP diet made to their symptoms. Common barriers of the low FODMAP diet included eating out, social situations and restricting garlic and onion containing foods from the diet. Factors that helped participants adhere to the diet included having supportive partner/family, using the web apps and websites and meal planning.

**Conclusion:** A dietitian-led low FODMAP diet group education programme in a sample of twenty-two Christchurch adults diagnosed with IBS predominant diarrhoea (IBS-D) or IBS mixed (IBS-M) was found to be feasible.
Preface

The current study was a feasibility study to assess the effectiveness and acceptability of a dietitian-led low FODMAP group education programme for patients with irritable bowel syndrome (IBS). The initial concept for this feasibility study was developed by Sally Watson (Canterbury Initiative). Professor Richard Gearry, Dr Paula Skidmore and Leigh O’Brien were responsible for developing the study, obtaining ethical approval and overseeing the project.

The candidate was responsible for the following tasks:

- Drafting initial ethics
- Making amendments to the initial ethical approval document (University of Otago Human Ethics Committee, Category A)
- Making amendments to participant information sheet and consent forms
- Explaining the study protocol and intervention to participants
- Confirming and booking participants for the sessions
- Sending questionnaire and consent forms to participants
- Collecting questionnaires and consent forms
- Compiling written resources for participants
- Development of research protocols to be used throughout the study
- Contributing and reviewing the study data collection process
- Development of semi-structured interviews
- Conducting and recording all semi structured interviews
- Transcribing semi-structured interview verbal data
- Thematic analysis of transcribed interview
- Determining if participants had sufficient symptomatic improvement on the low FODMAP diet and hence invited to the follow up sessions
- Write up of this thesis
Assembling quantitative questionnaire data for analysis in SPSS, with advice from Professor Chris Frampton (Biostatistician, Department of Psychological Medicine, University of Otago) and Dr Simone Bayer (PhD)

This research was undertaken from July 2018 to November 2018.
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Firstly, a huge thank you to my supervisors Professor Richard Garry and Dr Paula Skidmore for your guidance throughout the course of this research. Your support, expertise and belief in me have been invaluable.

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A big thank you goes to my participants. Without you, this research would not have been possible. I appreciate your commitment to the study and I thank you for sharing your experiences with me.

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List of Abbreviations

BMI- body mass index

CDHB- Canterbury District Health Board

CI – Canterbury Initiative

FODMAP- Fermentable Oligosaccharide Disaccharide Monosaccharide and Polyols

GI- gastrointestinal

gp- general practitioners

HADS- Hospital Anxiety Depression Scale

HR-QoL- health-related quality of life

IBS – Irritable Bowel Syndrome

IBS-C – Irritable Bowel Syndrome- Constipation

IBS-D- Irritable Bowel Syndrome- Diarrhoea

IBS- M- Irritable Bowel Syndrome – Mixed

IBS-U- Irritable Bowel Syndrome-Unspecified

NICE- National Institute of Health Care and Excellence

QoL- quality of life

SAGIS – Structured Assessment Gastrointestinal Symptom Scale
Introduction

Irritable Bowel Syndrome (IBS) is a common functional bowel disorder that affects approximately 11% of the population of the developed world (1). It is predominant in females (64% of those with IBS) and the peak onset is between 25-54 years of age (2). In New Zealand, it is estimated that IBS affects approximately 10-20% of individuals (3). No formal research on trends has been conducted in New Zealand but with the increasing referral rates for IBS management, it can be assumed that the prevalence of IBS in New Zealand is increasing.

IBS is often a debilitating condition and characterised by symptoms of abdominal pain, bloating and altered bowel habits (4). IBS can also negatively affect one’s quality of life. Psychological distress and psychiatric disorders such as anxiety and depression are often comorbidities of IBS (5, 6). Somatisation is found to be a key aspect of IBS and many argue that psychological distress exacerbate severity of IBS symptoms (7, 8). IBS has also proven to be a financially costly condition, with management involving an array of health professionals, medications and dietary management in addition to indirect costs (9).

There is currently no curative treatment for IBS and hence the management of IBS is to provide symptomatic relief. Most individuals perceive food as triggers to their IBS symptoms and dietary management is considered to be first-line IBS management (10, 11). General first line dietary advice includes fibre modification, adequate fluids and general health eating guidelines (12-14). Such advice can be delivered by a health professional unrelated to dietetics. However, these dietary modifications only work for some individuals.
In the past 13 years, the low FODMAP diet has become a front-line therapy for IBS management. A diet low in fermentable carbohydrates collectively termed fermentable oligosaccharides, disaccharides, monosaccharides and polyols (FODMAP) has been extensively studied and shown to reduce symptoms in approximately 68-70% of patients (5, 6). Yet, the low FODMAP diet is complex and restrictive, which can result in nutritional concerns, nutrient deficiencies and disordered eating patterns. A guided implementation of the low FODMAP diet is required for safety and efficacy. Registered dietitians have extensive knowledge and skills regarding nutrition and dietary counselling. Dietitians have been effective in delivering low FODMAP education in an increasing number of randomised controlled trials (RCTs) and non RCTs (5, 15-22). Traditionally, patients attend a one-to-one consultation with a dietitian for two to three sessions. However, the number of patients requiring low FODMAP education is exceeding dietetic capacity and hence other more effective delivery methods have to be considered.

A landmark study from King’s College (London, UK) found that a dietitian-led low FODMAP group education programme is as clinically effective as the traditional one-to-one pathway (20). Their findings suggested that group education has potential benefits in patient acceptability and interactive learning as well being more cost effective (20). No formal research regarding low FODMAP group education has previously been conducted in a New Zealand population and setting. Consequently, the aim of this thesis is to assess the feasibility of a dietitian-led low FODMAP group education programme in Christchurch, New Zealand.
2

Literature Review

2.1 Irritable Bowel Syndrome (IBS)

2.1.1 What is Irritable Bowel Syndrome

Irritable Bowel Syndrome (IBS) is a functional gastrointestinal disorder that is characterised by symptoms of abdominal pain, bloating and altered bowel habits such as constipation, diarrhea or both (4).

2.1.2 IBS Prevalence and Trends

IBS affects 10-20% of the Western world's population (1). The prevalence of IBS changes according to geographic location (23). The varying prevalence could be due to different diagnostic criteria, environmental and genetic influences and other factors, such as health care utilisation, sanitation and diet (23, 24). In New Zealand, IBS is estimated to affect 21% of New Zealanders (3). The prevalence of IBS is greater in women than in men and lower in individuals aged over 50 years (1, 23).

2.1.3 IBS Diagnosis

There are no structural abnormalities of the gastrointestinal tract in people with IBS (25). Hence, clinicians use an exclusion and symptomatic approach to make a clinical diagnosis for IBS (26, 27). The newly revised ROME IV criteria are currently used and are considered the gold standard for IBS diagnosis (Table 1) (28). Four bowel patterns (defined using the ROME IV criteria) may occur in IBS; IBS-D (diarrhoea predominant), IBS-C (constipation predominant), IBS-M (mixed constipation and diarrhea) and IBS-U (unspecified) (29). Questionnaires such as the validated Structured Assessment Gastrointestinal Symptoms Scale
(SAGIS) have also been developed to assess the severity and frequency of gastrointestinal symptoms experienced in IBS patients (30).

Table 1. Rome IV Criteria for Diagnosing IBS (28).

Recurrent abdominal pain at least 1 day/week in the last 3 months, with at least two of the following criteria:

- Related to defecation
- Associated with a change in frequency of stool
- Associated with a change in form (appearance) of stool

The criteria should be met for the last 3 months and the symptoms begin at least 6 months before diagnosis.

2.1.4 IBS Pathogenesis

The exact cause of IBS is unknown, however there is increasing research concerning its possible pathogenesis including visceral afferent hypersensitivity, changes in the brain-gut axis and genetic predisposition (31-33). Hence, the cause of IBS is most likely to be multifactorial. The management of IBS is aimed less at the cause of IBS symptoms but to relieve the patient of their symptoms. In particular, the effects of diet on IBS are well described. It has been hypothesised that the stimulation of nutrient specific receptors in the gut leads to the activation of neurohumoral pathways that influence sensitivity, motility and intestinal barrier function (34). Components of an individual’s diet could be directly related to the IBS symptoms experienced. Thus, diet should be considered as a cornerstone of IBS treatment.

2.1.5 IBS Consequences

IBS can negatively affect one’s quality of life and when compared to other chronic illnesses (e.g. inflammatory bowel disease, diabetes and end stage renal disease) those with IBS reported a lower quality of life (35, 36). Furthermore, psychiatric disorders such as anxiety
and depression are often co-morbidities of IBS and other functional gut disorders (37). In comparison to inflammatory bowel disease (IBD) patients, IBS patients are more likely to have more severe comorbidity depressive and anxiety symptoms (38). Conversely, somatisation is a key aspect of IBS and research shows that psychiatric disorders and psychological distress are likely to exacerbate gastrointestinal symptoms and in some cases provide the onset of IBS symptoms (7, 8). Questionnaires like the Hospital Anxiety Depression Scale (HADS) have been validated and widely used in clinical settings, community settings as well as primary care practice (39).

IBS is also a financially costly condition for the economy. Productivity costs are significant in conditions like IBS that have a higher burden of morbidity compared to mortality (40). Individuals with IBS are twice as likely to take time off work compared to their colleagues and 72% report that IBS affects their productivity at work (41, 42).

2.1.6 Effect of IBS on the health budget

Approximately one third of IBS sufferers will seek medical advice, nevertheless IBS generates a substantial cost to the health care system (2, 43-45). IBS patients generate a substantial workload for primary and secondary health care providers, which is comparatively greater than patients with diabetes, hypertension and asthma (9). The cost of IBS can be broken down into general practice consultations, gastroenterologist consultations, diagnostic tests and drug prescriptions (9). Variations in overall healthcare costs for IBS management are considerable worldwide. In the United Kingdom, the estimated annual cost per patient is between £90 and £316 and in the United States is between $742 and $7,547 (41,46,47,48). In New Zealand, there is little research into the cost of IBS, however, it is likely to be expensive and a significant burden on the health care system. Furthermore, New Zealand’s ageing population is predicted to substantially increase health care costs in the future (49). Some argue that the incidence of IBS increases with age, which would further substantiate the
financial burden (50, 51). However, a meta-analysis study conducted by Lovell et al concluded that IBS prevalence decreases with age (1). Regardless, the high prevalence of IBS and an ageing population puts great financial burden on society (49).

2.2 Management of IBS

Currently, there is no curative treatment for IBS and the aims of IBS management are to relieve patients of their symptoms (Figure 1). Management should be tailored and individualised to the patient as not all patients will have the same symptoms nor will they respond to treatment in the same way (52). Traditional pharmaceutical approaches using antispasmodics, anticholinergics, bulking agents and antidiarrheals do not relieve patients of all symptoms when used alone (53, 54). Instead, when used in combination with non-pharmaceutical methods such as dietary manipulation, exercise and behavioural therapy patients report greater overall symptomatic relief (55). Section 2.2.1 explores evidence for some of the dietary manipulations developed to relieve the global symptoms of IBS.

2.2.1 Role of Diet in IBS Management

Most patients believe that food plays a role in their IBS symptoms (70-80%) with many consequently excluding or avoiding certain foods to decrease the likelihood of symptom development (10, 11). Common foods that patients reported to aggravate their symptoms include milk and milk products, wheat, caffeine, cabbage, onions, peas, beans, hot spices, fried foods and smoked products (56, 57).

Early studies looking at strict dietary exclusions in IBS patients followed by reintroduction of common trigger foods (e.g. milk, wheat) suggested that individual foods exacerbate symptoms (57, 58). In a study by Jones et al, 25 participants diagnosed with IBS-D were asked to limit their food intake to a single meat, a single fruit and distilled or spring water for
a week (59). Four participants refused to implement the diet and only 14 participants (56%) found an improvement in their symptoms. Nevertheless, six out of the 14 participants

Figure 1. NICE guidelines: Management of IBS in adults.
underwent a double blinded food challenge. A liquidised preparation of test foods (foods believed to provoke symptoms) vs control foods were administered via a nasogastric tube and food intolerance was confirmed. A subsequent study that followed the same dietary restrictions and protocols but included other subtypes of IBS, found that only six out of 40 (15%) of participants with IBS had seen symptomatic improvement, with the majority being subtype IBS-D (60). The variability in the responses of exclusion diets is likely due to the differences in study duration, types of foods excluded and differing recruitment criteria. There is also a lack of randomised controlled trials to support exclusion diets. Due to the nature of dietary interventions, designing randomised controlled trials is difficult in regards to blinding participants. Furthermore, the mechanism and theories as to why some participants experience improvements on exclusion diets are not well explained.

In more recent times, dietary supplementation through the use of probiotics have been shown to help with some IBS symptoms but not all (61, 62). One randomised controlled trial found that probiotic treatment significantly improved abdominal pain in 400 patients (62). However this study only included patients with IBS-D meaning that its findings cannot be generalised in all IBS subtypes. Probiotic supplementation could be used to manage some IBS symptoms but other approaches are required for an overall IBS symptomatic improvement.

There is variable evidence for the efficacy of fibre supplementation in IBS patients. The theory is that dietary fibre is slowly, incompletely or essentially not fermented in the gut and therefore, able to provide bulk and help regulate bowel function. Recently, Singh et al conducted a systematic review of 17 randomised controlled trials and concluded that there were no significant benefits of dietary fibre in the treatment of IBS patients (63). Only one study concluded that wheat bran was able to reduce the severity and/or frequency of symptoms significantly (64). Conversely, another study found that bran supplementation worsened patients’ IBS symptoms (65). In conclusion, there is limited evidence for the
supplementation of dietary fibre. As part of a healthy diet, patients with IBS should aim for the same amount of dietary fibre as normal individuals.

Wheat or gluten avoidance in the absence of coeliac disease is common but there is mixed evidence to support a gluten free diet in those with IBS. A double blinded, randomised controlled study of 34 patients with IBS, found that bloating, pain and stool consistency worsened in the gluten inclusive diets when compared to those on a gluten-free diet (66). Subsequently in the same study, 14% of subjects were classified as having non-coeliac gluten sensitivity and the rest had IBS (67). A double blinded, cross over trial of the same group found that there were no specific effects of dose responses to gluten while symptoms were improved while being on the low FODMAP diet (67). This suggests fructans and galacto-oligosaccharides found in wheat may trigger IBS symptoms, rather than gluten. There is emerging research highlighting concerns about a gluten free diet in the absence of a gluten-mediated immunological disease. Potential concerns of following a gluten-free diet include deficiencies in micronutrients and fibre, hyperlipidaemia and hyperglycaemia (68). As the current evidence stands, a gluten-free diet should only be recommended for patients with clinically diagnosed coeliac disease or dermatitis herpetiformis.

The FODMAP concept was first published by Gibson and Shepherd as a hypothesis for Crohn’s Disease in 2005(69). They suggested that an excessive delivery of highly fermentable but poorly absorbed short chain carbohydrates to the small and large bowel affected intestinal permeability, a risk factor in Crohn’s disease (69). Though the hypothesis was intended for Crohn’s Disease, researchers theorised that these highly fermentable but poorly absorbed short chain carbohydrates also played a part in inducing symptoms experienced in patients with IBS. In 2006, a retrospective study found that a diet restricted in fructose and fructans gave relief to 76% of participants with IBS (70). In a subsequent blinded rechallenge study, the participants that had responded positively were randomly challenged by graded doses introduction of fructose, fructans or both, or glucose taken as drinks. Overall symptoms and
severity were markedly less for groups that received glucose drinks (control) as opposed to the groups that received fructans or fructose drinks alone or combined (70). These studies were the first to demonstrate that dietary restriction of poorly absorbed carbohydrates led to symptomatic improvements. At the time there was no collective term for these carbohydrates and eventually in 2004, the Monash Group agreed on the term; Fermentable Oligosaccharides, Disaccharides and Monosaccharides and Polyols (“FODMAP”) (71). Today, the low FODMAP diet is one of the most studied dietary therapies for the treatment of IBS symptoms (72). As discussed, there are many dietary factors that can contribute to IBS symptoms, however, FODMAPs are the most researched and have the most consistent results. The following sections will explore the evidence and application of the low FODMAP diet.

2.2.2 The low FODMAP diet

FODMAPs is a term given to a group of carbohydrates that are poorly absorbed in small and large intestine (71). The low FODMAP diet focuses on reducing the consumption of foods that contain high amounts of FODMAPs (69, 70, 72). Table 2 lists examples of common foods that are found to be high in FODMAPS and examples of low FODMAP alternatives. Clinical implementation of the low FODMAP diet occurs in a two phases. Firstly, patients are given in-depth dietary advice on FODMAP restriction followed by dietary exclusion of FODMAPs for two to six weeks (72). Where symptomatic improvement has been achieved, patients are taught to reintroduce these carbohydrates individually into the diet while symptoms are closely monitored (72). The overall aim of the low FODMAP diet is to identify the specific carbohydrates that trigger IBS symptoms whilst achieving a diverse and nutritionally adequate diet for the individual in the long term.
<table>
<thead>
<tr>
<th>Types of sugars</th>
<th>High FODMAPs foods</th>
<th>Low FODMAP food alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fructans and Galactans</strong></td>
<td>Wheat, barley, rye, garlic, onions, dried fruit, nectarines, watermelon, split beans, red kidney beans, baked beans, pistachios and cashews.</td>
<td>Bok choy, bell peppers, carrots, broccoli, cabbage, cucumber, eggplant, green beans, kale, lettuce, potatoes, rice, quinoa, corn chips, oats, polenta, corn, tortilla, pecan, chia, peanuts, walnuts, flax, pumpkin seeds, sesame seeds and sunflower seeds.</td>
</tr>
<tr>
<td><strong>Lactose</strong></td>
<td>Milk (fresh, evaporated, condensed, long life and milk powder), custard, ice cream, yoghurt, dairy food, ricotta, cottage cheese, sour cream and cream cheese.</td>
<td>Colby, cheddar, brie, edam, camembert, feta, mozzarella, gouda, parmesan, lactose free cow’s milk, almond milk, rice milk, lactose-free yoghurt and some soy milks.</td>
</tr>
<tr>
<td><strong>Fructose</strong></td>
<td>Apples, figs, boysenberries, pears, watermelons, asparagus, snap peas, honey, rum, cherries and fruit juice.</td>
<td>Blueberries, grapes, mandarins, kiwifruit, lemons, limes, pineapples, raspberries, strawberries and papaya.</td>
</tr>
<tr>
<td><strong>Polyols</strong></td>
<td>Apples, apricots, blackberries, nectarines, peaches, pears, cauliflower, mushrooms, snow peas, sugar alcohol additives such as mannitol, sorbitol and xylitol.</td>
<td>Blueberries, mandarins, grapes, honeydew, melon, lemon, limes, oranges, pineapples, strawberries, table sugar, glucose, maple syrup, sucralose and stevia.</td>
</tr>
</tbody>
</table>


**Abbreviations:** FODMAP, fermentable oligosaccharide, disaccharide, monosaccharide, and polyols, FOS, fructo-oligosaccharides, GOS, galacto-oligosaccharides.
2.2.3 How does a low FODMAP diet work in IBS

FODMAPs are responsible for two main mechanisms that contribute to the common symptoms experienced by patients diagnosed with IBS. FODMAPs are short chained carbohydrates that are poorly absorbed in the gastrointestinal system. First, the poor digestion of FODMAPs leads to excess water moving osmotically into the small intestine. This may result in luminal distention and abdominal pain as well as the increase of water being delivered to the proximal colon. A variety of studies have demonstrated the effect of FODMAPs in the small intestine. In a study that included ileostomates, ileal effluent was increased by up to 22% and output was increased by 95ml after a meal containing high FODMAP foods (73). This mechanism is supported by a more recent study that used magnetic resonance imaging (MRI) (74). This randomised controlled trial used MRI technology to visualise intestinal responses to intake of lactulose in IBS patients and healthy controls and found that small bowel water content was significantly higher in IBS patients compared to controls (74).

Secondly, as FODMAPs are not absorbed by the small intestine they move to the large intestine for further digestion. Once here, FODMAPs are fermented by the colonic microbiota and during this process excess gas is produced. Due to gas production and water retention, this leads to luminal distension and expansion of the intestines. A study that used hydrogen breath testing found that FODMAPs prolonged hydrogen and methane gas production in IBS patients compared to healthy controls, inducing the gastrointestinal symptoms experienced by IBS patients particularly bloating and abdominal pain (75). Thus this supports the hypothesis that the rapid fermentation of FODMAPs in the colon results in luminal distension, gas production and bloating of the large bowel.
2.2.4 Clinical studies of low FODMAP diet and IBS

In the past 10 years, a range of studies have been performed that support the efficacy of a low FODMAP diet in the management of IBS symptoms. Approximately 50-76% of patients with IBS report symptom improvement after implementing the low FODMAP diet as shown in Table 3 (5, 15-19, 22). Hence, it has been adopted for use in clinical practice. Although there is research supporting the efficacy of a low FODMAP diet, not all who follow the diet will experience the same degree of relief or improvement which aligns with the pathophysiology of IBS (76).

Many studies of the low FODMAP diet are limited by retrospective study design, or lacking a control or comparator group making these studies vulnerable to confounding and bias. Furthermore, randomised controlled trials that include dietary interventions mean that blinding participants to dietary interventions is particularly difficult. In addition, there are psychological factors involved in symptom genesis of IBS and hence the placebo effect can lead to bias (12). In a meta-analysis conducted by Patel et al (77), the placebo response averaged to be 40% across 45 IBS RCTs. Currently, there are few dietary assessment tools to analyse adherence when following the low FODMAP diet. Nevertheless, some good quality RCTs have been conducted and are reviewed in Table 3. These studies were conducted in Australia, New Zealand, USA, Sweden, Canada, Denmark and the United Kingdom.

The majority of the studies were small in size, ranging from 30 -123 participants (58-64). The studies were conducted in Western countries, in predominantly Western populations (58-64). The mean age of participants was 42 years and a mean proportion of 70% female participants across the studies. IBS diagnosis was made using the ROME III criteria, with Staudacher et al being the only exception, using the National Institute for Health Care and Excellence (NICE) guidelines (78). Studies that used ROME IV criteria were not available at the time of this thesis. Randomised, double blinded, placebo controlled studies are considered to be the gold
standard of evidenced based research. However due to the nature of dietary interventions, only four out of seven of the studies were blinded and in most cases only the participants were blinded. The majority of the studies were two armed RCTs, with one arm being the low FODMAP diet and the other being the control diet. The duration of the study period varied between studies from three weeks to six months and in nearly all the studies that provided dietary education, this was delivered by a dietitian in one to one setting. Almost all the studies measured gastrointestinal symptoms in some form and a few looked at IBS related quality of life also. Only three of the studies looked at adherence to the allocated diets. Adherence was measured using food diaries, 24 hour recall and hydrogen breath testing.

Over the past 10 years, the efficacy of a low FODMAP diet to manage IBS symptoms remains consistent. Most studies demonstrate that the gastrointestinal symptoms are reduced and alleviated after following a low FODMAP diet. Furthermore, psychological measures and, hence, quality of life has also shown to improve after following a low FODMAP diet. In a prospective, single blind study of 84 patients, anxiety scores measured by the HADS improved significantly following a low FODMAP diet and additionally IBS-QoL scores improved significantly also. Another study of 209 IBS patients found that high FODMAP containing foods worsened IBS symptoms and severity was intensified if the patient had anxiety and/or depression (56). Overall, there is high quality literature that supports the use of the low FODMAP diet in the management of IBS patients in terms of symptomatic improvement as well as psychological and health-related quality of life outcomes (Table 3).

2.3 Who should deliver the low FODMAP diet

Clinical studies support the role of the low FODMAP diet in the management of IBS, however there is currently no statement on who should be delivering the low FODMAP diet (5, 15-17, 19). Table 4 provides an overview for the evidence as to who has delivered low FODMAP diet education in patients with IBS in clinical studies.
2.3.1 Dietitians

Registered dietitians have extensive knowledge about diet and nutrition. They are governed by ethical code to practice using evidence based guidelines only. Dietitians have also been directly involved in research to investigate IBS and the mechanisms behind low FODMAPs among other health-nutrition related issues (79). There have been an increasing number of RCTs and non-RCTs that support the use of the low FODMAP diet in IBS management, most of these studies utilising dietitians to deliver advice and education about the diet (5, 15-21, 80). Reflective of the standard treatment pathway, most studies involved two intensive one-to-one consultations with a registered dietitian. The initial consultation provided education on the low FODMAP diet and tailored dietary advice was given. In some cases, patients were advised to complete a food diary prior and adjustments were made with the patient accordingly. A dietitian-led approach is the most researched and established in low FODMAP education. Furthermore, it is the only approach that aligns with current evidence-based practice and guidelines.

2.3.2 Medical staff

There have been studies of a nurse-led approach to improve IBS symptoms; however these studies predominantly looked at IBS first line dietary management. The studies had a high dropout rate (20-40%) and one of the studies failed to find any significant differences in gastrointestinal symptoms between the intervention and control groups (81). Yet, another nurse-led dietary education programme with an emphasis on FODMAPs found a significant increase in patient reported quality of life scores after attending the programme(82). While no published studies had been completed, doctors have reported to provide patients with basic information. One survey reported 79% of doctors gave advice of IBS and dietary management to their patients on the low FODMAP diet (for example, a one page leaflet or links for webpages online)(83). However this deviates from evidenced based practice and due to the
challenges and restrictive nature of the low FODMAP diet, it is unlikely that patients benefit from this sort of education delivery. It seems intuitive that a person providing low FODMAP education needs to be trained in that area. Dietitians are experts in diet and nutrition and hence would be the favourable health professional to deliver low FODMAP advice.

**Other sources of information**

With the increasing awareness of the low FODMAP diet, there are an increasing number of websites, blogs and social media posts proclaiming to assist individuals with the low FODMAP diet. The individuals behind these media platforms are usually bloggers, fitness experts or ‘internet gurus’ with no qualifications or evidence to support their messages. However, there are emerging resources online and thus research in this area to investigate the efficacy and effectiveness of these resources. Schneider et al found that the use of a self-help guidebook and had a positive impact on IBS related quality of life (85). However, it failed to assess any differences in gastrointestinal symptoms, did not assess dietary adequacy and had a high dropout rate of 25%.

An unguided implementation of the low FODMAP diet creates uncertainty in regards to the diet being correctly followed. This may also prove to be more problematic in specific populations such as in vegetarians, vegans, pregnant women or individuals with other diseases and medical conditions. Due to the restrictive nature of the low FODMAP diet, this also has the potential to create overly restrictive eating patterns. These concerns further support the need for dietetic input in the delivery of the low FODMAP diet.
<table>
<thead>
<tr>
<th>Study</th>
<th>Study Design</th>
<th>Participants</th>
<th>Intervention vs control/comparator group</th>
<th>Dietary intervention</th>
<th>Duration</th>
<th>Outcome measures</th>
<th>Key results</th>
</tr>
</thead>
</table>
| Harvie et al(15)      | Randomised, unblinded controlled trial. | ROME III IBS n = 50 | LFD n = 23 ND n = 27 | • LFD group received LFD education at baseline and then reintroduction of foods at 3 months.  
  • Control group received dietary education 3 months after study commenced. | 6 months | IBS-SSS IBS-QoL FODMAP FFQ Stool sample | • Significantly lower IBS-SSS score and higher IBS-QoL scores in LFD at 3 months compared to baseline. Lower IBS-SSS score sustained at 6 months.  
  • Similar affects seen in control group however not to as great effect as LFD group.  
  • 27 participants lost to follow up 54% drop out rate. |
| Pedersen et al(16)    | Randomised, unblinded controlled trial. | ROME III IBS n = 123 | LFD n= 42 LGG n=41 ND n=40 | • LFD group attended a one-to-one, one-hour session by nutritionists or dietitians. List of high FODMAP foods were provided at the session.  
  • LGG group were to administer LGG capsules twice daily.  
  • ND group were advised to make no changes to their normal diets. | 6 weeks | IBS-QoL IBS SSS Both completed on a weekly basis using web based questionnaire. | • IBS-QoL not significantly altered across the three groups.  
  • IBS-SSS scores were significantly reduced in all groups.  
  • LFD -75 vs ND -32 p<0.01  
  • 13% drop out rate, 108 participants completed the study. |
| McIntosh et al (17) | Controlled, single blind study. | ROME III IBS n= 40 | LFD n=18 HFD n= 19 | • All participants met with dietitian for a 30-60 minute consult to review components of their diets and make the suitable changes.  
• Dietary booklet given that included sample menus for either high or low FODMAP depending on participant's allocation. | 3 weeks | IBS-SSS Lactulose Breath Test Urine Mass Spectrometry Analysis of Metabolome | • IBS-SSS score significantly reduced in LFD group compared to HFD (p<0.001).  
• 37 participants completed the study, 7.5% drop out rate. |
|---|---|---|---|---|---|---|---|
| Bohn et al (18) | Multi center, parallel, single blind study | ROME III IBS n= 75 | LFD n= 38 ND n= 37 | • All participants met with dietitians individually to discuss LFD or ND dietary advice according to their group allocation.  
• Traditional IBS dietary advice given to ND. | Four weeks | IBS-SSS Four day food diary | • IBS SSS scores reduced in both groups after 4 weeks (p<0.0001).  
• No significant difference between the two groups  
• 65 participants completed the study, 13% drop out rate. |
| Halmos et al (5) | Placebo controlled, feeding RCT, cross over study design (single blind). | n= 38 ROME III IBS n= 30 Healthy controls n=8 | • Randomly assigned to LFD or ND. All food was provided for.  
• Wash over period of 21 days before crossing over alternate diets. | Three months | 100mm VAS Stool frequency Stool water content Food diaries on habitual diet (one week prior to diets) | • Participants with IBS that followed LFD had significantly lower GI symptoms scores than ND.  
• Bloating, pain and gas reduced with the LFD in IBS subjects.  
• Symptoms minimal and unaltered in controls.  
• 7 participants did not complete the study, 15% drop out rate. |
<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Criteria</th>
<th>Intervention</th>
<th>Duration</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staudacher et al (78)</td>
<td>Randomised, unblinded controlled trial</td>
<td>NICE criteria n= 82</td>
<td>LFD n= 43 ND n=39</td>
<td>All participants were seen by a dietitian. Two consultations with dietitian. LFD group given education on low FODMAP diet and how to reduce intake of FODMAPs. Controls given standard dietary guidelines based on the general NICE guidelines.</td>
<td>Nine months</td>
</tr>
<tr>
<td>Eswaran et al (84)</td>
<td>Randomised, single blinded controlled trial, parallel design.</td>
<td>ROME III IBS n=92</td>
<td>LFD n= 45 mNice n= 39</td>
<td>All participants met with dietitian to discuss their allocated diet. LFD was given LFD education. mNice group given general dietary IBS education.</td>
<td>Four weeks</td>
</tr>
</tbody>
</table>

**Abbreviations:** FODMAP, fermentable, oligosaccharide, disaccharide, monosaccharide and polyols; IBS, irritable bowel syndrome; n; number, LFD; low FODMAP diet, ND; normal diet, HFD; high FODMAP diet, IBS-SSS; irritable bowel syndrome symptom scoring system, QoL; quality of life, FFQ; food frequency questionnaire, LGG; lactobacillus rhamnosus GG, VAS; visual analogue scale, GI; gastrointestinal, NICE; National Institute for Healthcare and Excellence, mNice; modified National Institute for Healthcare and Excellence.
2.4 How should the low FODMAP diet be delivered

The efficacy of the low FODMAP diet has been largely achieved by the traditional dietitian-led service delivery models. While the duration, content, number of sessions may differ between institutions, intensive low FODMAP education and tailored dietary advice as well as close monitoring of gastrointestinal symptoms are imperative. As discussed previously, the number of patients requiring low FODMAP education is exceeding dietetic capacity, particularly in the public sector. Group education has produced successful results in the management of a range of chronic health conditions and is particularly useful when the demand outweighs supply. Section 2.4.1 aims to look at group education as an alternative to deliver the low FODMAP diet.
### Table 4. Delivery of IBS Management

<table>
<thead>
<tr>
<th>Study</th>
<th>Study Design</th>
<th>Participants</th>
<th>Delivery of low FODMAP diet</th>
<th>Number of consultations</th>
<th>Outcome measures</th>
<th>Key results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietitian led</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
| Whigham et al (20) | Non randomised Interventional study. | NICE criteria Total n= 364 Group session n= 263 One to one session n= 101 | • Both groups were advised low FODMAP education by IBS dietitians and received the same FODMAP diet resources.  
• Group sessions took up to 90 minutes and included up to 12 participants.  
• One-to-one sessions took 60 minutes.  
• Same approach at follow up session. | One at baseline One at 6 weeks | GSRS  
BSC  
Acceptability questionnaires (group session participants only) | • Decrease in both groups after following low FODMAP diet (p<0.001), however no differences between the two groups.  
• 54% that attended group session versus 60% that attended one to one session reported improvement (p<0.001).  
• No difference between groups at follow up (p<0.27).  
• Acceptability questionnaire: most reported that session provided enough information without need to seek further advice, 85% reported that they felt comfortable in asking questions within the group setting, 36% preferred one-to-one sessions, with the remainder reporting preference for group session (22%) and no preference (42%).  
• Cost calculated for one to one £139.20 per patient and group session £67.19 per patient. |
<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>ROME II</th>
<th>Intervention</th>
<th>Duration</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shepherd and Gibson (70)</td>
<td>Retrospective uncontrolled study.</td>
<td>ROME II</td>
<td>Fructose, fructans free diet. Dietary education was delivered in an individual consultation 1 hour with the dietitian. The diet was reinforced 4-6 weeks later at the participants' request or if the dietitian thought that the diet was not well understood by participant.</td>
<td>One session or two if needed</td>
<td>77% of participants adhered to diet. 74% responded positively to the diet. Positive response overall was significantly better in the adherent vs non adherent (85% vs 36%, p&lt;0.01).</td>
</tr>
<tr>
<td>Bohn et al (18)</td>
<td>Multi center, parallel, single blind study</td>
<td>ROME III IBS</td>
<td>All participants met with dietitians individually to discuss LFD or CG dietary advice according to their group allocation. Traditional IBS dietary advice given to CG.</td>
<td>One IBS-SSS Four day food diary</td>
<td>IBS SSS scores reduced in both groups after 4 weeks (p&lt;0.0001). No significant difference between the two groups.</td>
</tr>
<tr>
<td>De Roest et al (21)</td>
<td>Prospective observational study.</td>
<td>IBS patients</td>
<td>Expert dietitian in IBS who had been involved in the implementation of low FODMAP diet.</td>
<td>Two sessions six weeks apart</td>
<td>13.5% of patients reported never following the diet or were not adherent to the diet. Significant positive change from baseline to follow up.</td>
</tr>
</tbody>
</table>
An initial 1 hour appointment with dietitian and then 30 minute follow up 6 weeks later.

All participants completed a 6 day food record prior to consultation, dietitian worked with participant to develop meal plans.

| Mazzawi et al (81) | Non randomised, observational study. | ROME III criteria | Total n=46 | Each participant received three sessions of individual dietary guidance by a registered nurse with a background in IBS. management | 3 sessions Each session greater than, equal to 2 weeks apart. | Birmingham IBS symptom score questionnaire IBS QoL FFQ Baseline and >3 months after last consult | Symptoms reduced significantly (p<0.001).

IBS-QoL score increased significantly (p<0.003).

40% of participants dropped out of study. This high number of drop outs is due to several factors; 4% due to noncompliance and collaboration leading to exclusion, 9% due to a marked improvement in symptoms following the dietary guidance leading to lack of motivation to continue with the study, 7% due to diagnosis of an organic disease during the study and 4% due to pregnancy and moving abroad. |
<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Criteria</th>
<th>Total n</th>
<th>IBS Guided n</th>
<th>IBS Non Guided n</th>
<th>Controls n</th>
<th>Interventions</th>
<th>Outcomes</th>
</tr>
</thead>
</table>
| Ostgaard et al (82)   | Randomised controlled study | ROME III criteria Total n= 175 IBS guided n= 70 IBS non guided n= 63 Controls n= 42 |         |              |                  |            | • The four questionnaires sent by mail.  
  • Guidance on dietary management with IBS was provided 2 years prior to the study.  
  • Two sessions with a nurse were scheduled for ~1 hour, regarding the disease and the role of diet.  
  • Diet instructions were focused on low FODMAPs diet, regular meals and healthy eating habits. | 2 sessions FFQ IBS –QoL Birmingham IBS symptom score  
• Drop out of 20%, mostly due to participant’s not replying or returning questionnaire.  
• Greater improvement in quality of life of guided IBS participants compared to unguided (p= 0.015) (IBS-QoL). Reduction in quality of life was significantly lower in the guided than unguided IBS patients.  
• Symptom score was lower in guided IBS group than non-guided, however this was not significant. |
| Schneider et al (85)  | Prospective observational study | ROME III criteria n= 71 |         |              |                  |            | • Self help guidebook.  
  • QoL questionnaire completed at baseline, Questionnaire was sent out and completed at 3 months and 6 months.  
  • Self help | None FDDQL PHQ  
• Quality of life improved at 6 months compared to baseline (< 0.001). Depression, anxiety scores were lower at 6 months compared to baseline (p=0.001).  
• Drop out of 25%. |

Self-led
A guidebook was also given at baseline. The guidebook was named ‘Managing your Life with Irritable Bowel Syndrome’ last updated 2009 in English. Translated into German.

**Abbreviations:** IBS, irritable bowel syndrome; NICE, National Institute for Healthcare and Excellence; FODMAP, fermentable, oligosaccharide, disaccharide, monosaccharide and polyols; GSRS, gastrointestinal symptom rating scale; BSC, Bristol stool chart, LFD, low FODMAP diet; CG, control group; IBS-SSS, irritable bowel syndrome symptom scoring system; QoL, quality of life; FFQ, food frequency questionnaire; FDDQL, Functional Digestive Disorders Quality of Life; PHQ, Patient Health Questionnaire.
2.4.1 Dietitian-led low FODMAP group education

Whigham et al., were the first to investigate the clinical effectiveness of low FODMAP group education sessions in IBS patients. In this newly published observational study, patients were offered a telephone consultation by a registered dietitian to assess their suitability for the group or individual sessions (20). At the initial appointment (baseline), all patients were educated on the low FODMAP by gastroenterology dietitians and both groups received the same low FODMAP diet resources. The initial appointment for the group session lasted 90 minutes and included up to 12 patients while the individual consultations took up to 60 minutes. At the second appointment (follow up), dietary education was delivered in the same approach six weeks later. A total of 263 patients who attended the group sessions were compared to 101 patients who attended one-to-one education sessions. There were no significant differences between groups for IBS subtypes and symptoms at baseline. At the end of the study, the global symptom scores indicated that patients were satisfied with their symptoms following dietary advice, in both groups (p<0.001). Overall, there was a significant decrease in symptom severity from baseline to follow-up (p<0.001) with no difference in symptom response between group and one-to-one education (p=0.271). It was concluded that a dietitian-led group education on the low FODMAP diet is clinically effective as one-to-one education.

Whilst, the study found no differences in clinical effectiveness, a cost analysis found that the group sessions were substantially more cost effective than the individual sessions. The cost calculated was £67.20 ($131.70 NZD) per patient for group education, assuming there were 12 patients in one group and £139.20 ($272.83 NZD) per patient for one-to-one education. In addition, patients allocated to the group sessions also completed an acceptability questionnaire at follow up. Patients responded positively, with the majority of patients (81%) reporting that group education had provided sufficient information and almost of half of
patients (49%) reported the diet being easy to follow. Following group education, 36% preferred to have one-to-one education sessions while the remaining 64% preferred group education or expressed no preference. Overall, the group pathway provides a more cost effective approach in delivering low FODMAP education and an approach that was acceptable and satisfactory to most participants.

However, there are still limitations and the main weakness is the design of the study. This study failed to assess any psychological or quality of life measures. As mentioned in the Section 2.1.5, such aspects are severe consequences of IBS and hence it is essential to measure anxiety, depression and/or quality of life for a new group delivery model. Instead, the study attempted to assess acceptability of the programme using patient interviews however the structure and questions asked were not specified and the analysis of these questionnaires were also vague. Another limitation is that patients were allocated into group education or one-to-one sessions based on their suitability during the initial telephone consultation, rather than by randomisation.

2.4.2 Other dietitian-led dietary group education

The evidence for group education session in IBS management is sparse, yet more research has been conducted in other dietitian-led dietary intervention that utilises group education. Type 2 diabetes mellitus (T2DM) is a common and increasing chronic condition and similar to IBS, T2DM requires intensive dietary education, yet the number of patients requiring education is outstripping the numbers of dietitians to deliver it. Research assessing the effectiveness of group-based education compared with the traditional one-to-one dietitian consultation has found benefits in patient outcomes, including tighter glycaemic control fasting blood glucose levels, diabetes knowledge and treatment satisfaction (86-90). A group based T2DM education programme conducted in Australia looked at patient acceptability using semi-structured interviews (91). Participants reported that the group session facilitated further
learning and increased motivated achieved through normalisation, peer identification or by talking with, and learning from the experiences in others. Such results support the use of patient centred programmes that use group interactions to meet the psychological needs of people diagnosed with same conditions and improve their motivations and behaviours. As IBS can be a debilitating as well as an isolating condition, the use of a group based education has the potential to enhance participant motivation and learning. As seen in other medical conditions that require dietary interventions, dietitian-led group education programmes have proven to be effective. Therefore, similar group service delivery models could be implemented into low FODMAP education.

**Conclusion**

Neither feasibility nor clinical effectiveness have been previously investigated when providing group education for low FODMAP advice in IBS patients in a New Zealand setting. Yet, there is emerging evidence to suggest that group based low FODMAP education has positive results. Hence, the present study aims to investigate the clinical effectiveness of low FODMAP education in patients with IBS and to explore the feasibility and patient acceptability of a group delivery model.
Objective Statement

Group based education for dietary interventions has the potential to be as clinically effective as well as more cost effective than traditional one-to-one dietitian consultations. In New Zealand, the demand for low FODMAP education outstrips the supply of registered dietitians able to deliver it, particularly in the public setting. The overarching aim of the study is to assess the feasibility and effectiveness of a dietitian-led low FODMAP education group session in Christchurch, New Zealand. Therefore, the objectives of this study are to: (i) examine the feasibility of group education in IBS patients referred from general practitioners within the Christchurch city area, (ii) to assess how the approach affects patients’ gastrointestinal symptoms and psychological states and (iii) to assess patients’ experiences and perspectives of the low FODMAP diet after attending the initial session.

3.1 Hypothesis

We hypothesise that: (i) General practitioners in Christchurch will refer IBS patients to attend the sessions and participants will attend the sessions, (ii) Patients’ gastrointestinal symptoms and psychological state will improve as indicated by their SAGIS and HADS questionnaire scores (at baseline and follow up) and (iii) Patients will have implemented the low FODMAP diet successfully for up to six weeks after the initial session.
Participants and Methods

The study is a non-randomised, interventional pilot study, comprising of IBS patients referred by their general practitioners (GPs) who live within the Canterbury District Health Board (CDHB) catchment area in New Zealand. The study is a small scale, pilot study to determine the feasibility and clinical effectiveness of a dietitian-led low FODMAP group education programme. The free programme occurs in two sessions as low FODMAP education involves two stages: elimination phase and reintroduction/rechallenging phase. This study also aims to explore participants’ experiences of the low FODMAP diet.

4.1 Ethics

The study was approved by the Human Ethics Committee of the University of Otago in March 2018 (ethics committee number H18/002) (Appendix A). Further additions were made to enhance the study design and amendments were approved by the Human Ethics Committee in April and July (Appendix B). All subjects were given a participant information sheet (Appendix C) and gave written informed consent before entering the study (Appendix D).

4.2 Participants

4.2.1 Recruitment

At the start of June 2018, the low FODMAP education sessions were advertised to general practices in the surrounding areas of the venues to be used for delivering the intervention (Cashmere and Halswell). A member of the research team phoned each general practice and, depending on their interest in participating, an information pack was sent out by email or post. The info pack contained brief information for both the GP and the patient and also a referral form (Appendix E, F and G). If interested, GPs were required to fill out the referral form and
return this by email or post. Each consenting participant was assigned a participant number. Participants were contacted by a research team member and notified of the group education session dates, time and venues and given a choice to choose which session they could attend.

4.2.2 Eligibility criteria

Eligibility included an IBS diagnosis with diarrhoea or IBS with alternating diarrhoea and constipation, negative blood tests for coeliac disease and participants had to be aged over 18 years. Participants were excluded if they had co-existing coeliac disease, ulcerative colitis, Crohn’s disease, BMI of ≤18.5 kgm$^2$ or ≥ 35 kgm$^2$, unintentional weight loss, limited English comprehension, living in residential care or have had previous dietetic supervision on the low FODMAP diet, IBS with constipation only, Type 1 or Type 2 diabetes or bowel resection. Further details are found in the referral form (Appendix G).

4.2.3 Participant Contact

Consenting participants were contacted throughout the study by the research team using telephone calls, emails and text messaging for research purposes. An outline of participant contact throughout the study is shown in Table 5. Such purposes included reminders to return consent forms and questionnaires as well notifying participants of session dates. Participants who did not attend the first session were not contacted further. Participants who did not respond after multiple sources of contacts were utilised were also not contacted further. Participants that did not improve on the diet were notified that their IBS was most likely unrelated to FODMAPs and their GP was sent a letter confirming this.
4.3 Study design

The study was designed as a prospective observational pilot study in which 25 participants were recruited to attend one and/or two low FODMAP education sessions nine-weeks apart. Participants were divided into two different education groups based on their preference and each group included up to 13 participants. The first session was focused on the Elimination Phase and based on symptom improvement, the participants were invited to attend the second session which focused on the Reintroduction Phase. Assessment data were collected over three months; July 2018 to September 2018. Data collection included the questionnaires and semi structured telephone interviews which are outlined in Figure 2.

Table 5. Chronological outline of participant contact through the study

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Initial phone call to explain the study</td>
</tr>
<tr>
<td>2.</td>
<td>Information, consent forms and baseline questionnaires of SAGIS and HADs sent via mail to participants’ homes</td>
</tr>
<tr>
<td>3.</td>
<td>Reminder text for first session and completing and returning baseline questionnaires</td>
</tr>
<tr>
<td>4.</td>
<td>Phone call to determine if participants had found sufficient improvement on the low FODMAP diet and participants booked in to the second session</td>
</tr>
<tr>
<td>5.</td>
<td>Reminder text for second session and completing and returning follow up questionnaires</td>
</tr>
</tbody>
</table>

Figure 2. Data Collection during the course of the study.

Abbreviations: IBS; Irritable Bowel Syndrome, SAGIS; Structured Assessment Gastrointestinal Symptoms, HADS; Hospital Anxiety and Depression Scale.
4.3.1 Study intervention

Figure 3 shows the stages of the nine week study intervention, which is discussed in detail in the following sections.

4.3.2 Group education session

The study conducted two education sessions in community centres in two different suburbs in Christchurch; Cashmere and Halswell. The community centres provided a projector, projector screen, HDMI cord, desk and chairs. Participants signed their names in an attendance book before leaving the session.

The first group education sessions were held at the South Library, Cashmere and Halswell Centre, Halswell. A registered dietitian with experience in low FODMAP education delivered both group education sessions. The low FODMAP diet was taught primarily using a PowerPoint presentation (Appendix H). The first low FODMAP education sessions focused on the Elimination Phase and lasted approximately 90 minutes. The first session focused on what FODMAPs are and how they affect IBS symptoms. Then the dietitian explained what the low FODMAP diet is and how to eliminate FODMAPs from the diet. Discussion was given around common high FODMAP foods and how to replace them with low FODMAP alternatives and where to find these. She also talked about common difficulties people faced while being on the low FODMAP diet and how to address these. For example, using a garlic infused oil (low FODMAP) instead of using garlic. To engage the participants and make the sessions more practical, participants were asked to discuss a potential low FODMAP meal plan with each other and a label reading activity allowed the participants to examine the packaging of common foods to determine if they were low FODMAP or not. Participants were also encouraged to take photos of FODMAP friendly alternatives they might find useful. At the end of the session, participants were invited to trial some low FODMAP products that
Recruitment (early June to mid July 2018)
- Advertised low FODMAP group education sessions to GPs
- GP’s refer eligible and interested patients to study
- Participant is sent participant information sheet and consent form to complete.
- Participants are sent first set of questionnaires to complete and bring to the first group education session

Group Education Session 1 (23/24th July 2018)
- First set of questionnaires collected at session
- Low FODMAP diet education provided. First session focused on Elimination Phase: eliminating the different FODMAP containing foods from the diet.
- Low FODMAP diet resources provided for participants to take home
- Participants commences the low FODMAP diet and continues for six weeks

Participants follows the low FODMAP diet for six weeks (end of July to start of September)

After six weeks of low FODMAP diet (start to mid-September)
- Participants are assessed whether low FODMAP diet has provided sufficient IBS symptomatic improvement
- If IBS symptoms improved by ≥ 50%, participant required to attend Group Education Session 2
- If IBS symptoms improve by < 50%, GP notified and IBS management returns to GP
- Participants complete the second set of questionnaires and return to research offices by mail

Group Education Session 2 (17/20th September 2018)
- Reintroduction and challenging FODMAPs education provided
- Session focused on how to reintroduce and rechallenge FODMAPs safely and correctly
- Reintroduction resources provided for participants to take home

Participants commence the reintroduction phase

Participants continue with the reintroduction phase. End of study.

Figure 3. Study Intervention outline
were mentioned during the presentation. Participants were advised to follow the diet for six weeks and return to their normal diet after.

Participants were given a copy of the presentation slides to take home as well as a handout summarising the information taught at the session. The handouts had an extensive food list of foods to ‘Eat freely’, ‘Limit’ and ‘Avoid’. An example meal plan for breakfast, lunch and dinner was also provided. Some general healthy eating information was also given for participants to take home such as the 'Health eating, Active living’ booklet. Discussion was given around using evidence-based apps and websites to help with recipes and shopping such as the MONASH app, ‘A Little Bit Yummy ’website and ‘Healthy Food’ magazine/website. Participants were encouraged to go to the IBS Health Pathways or the MONASH website for further information on IBS and FODMAP.

After six weeks, participants were telephoned by a member of the research team to determine if the diet provided sufficient symptomatic improvement in their IBS symptoms. Questions such as ‘Do you think your symptoms have improved with the diet?’ and ‘If so, could you put on a percentage on, how much do you think you have improved by?’ were asked to determine if the low FODMAP diet had provided sufficient relief. If their symptoms had improved by ≥ 50%, they were invited to attend the second group education session. If the diet had not helped their IBS symptoms by ≥ 50%, then the participant’s IBS management was handed back to their general practitioner and a letter was sent to the participant and general practitioner notifying them of this. This cut off was used as it is used routinely in clinical practice by dietitians to determine whether patients have found sufficient improvement.

The second low FODMAP education sessions were booked approximately nine weeks later. The sessions were held at the same centers as the first sessions. These sessions were led by the same dietitian as the previous sessions and the same educational approach was utilised. The PowerPoint of the second education session can be found in Appendix I. The second low
FODMAP education session focused on reintroducing and challenging different FODMAPs and lasted approximately 60 minutes. In the second session, the session began by explaining the importance of rechallenging. Then the process of rechallenging FODMAPs was taught in a step-by-step process. Firstly, participants were advised to challenge foods during the evening to avoid any disturbances during the day. Secondly, the timing of rechallenging was explained using the handouts given. This allowed for a ‘Challenge day’ three times during the week and space in between the days to monitor symptoms. Thirdly, participants were taught what quantities to challenge with, starting with a small dose and increasing to a large dose. And lastly, how to interpret the results of the challenges regarding if the FODMAP is a major trigger, tolerated in small doses or tolerated well.

Participants were given copy of the presentation slides and a handout summarising the step-by-step process of rechallenging to take home. Participants were also given a rechallenging schedule to fill out.

### 4.3.3 Questionnaires

The Structured Assessment of Gastrointestinal Symptoms (SAGIS) questionnaire were used to measure effectiveness before and after the implementation of the low FODMAP diet (30). The Hospital Anxiety and Depression Scores (HADS) were used to assess psychological mood and distress of participants before and after the intervention as a secondary outcome (39). Participants were required to complete the SAGIS questionnaire (Appendix L) and the HADS questionnaire (Appendix N) prior to attending the first education sessions.

Participants were asked and reminded to bring the completed questionnaires to the first education session. Participants were given the second set of the same questionnaires at the first education session and asked to complete them after following the low FODMAP diet for a minimum of six weeks. After they had completed the second set of questionnaires, participants were required to return the completed questionnaires by mail to research offices.
Clear written instructions regarding how to complete the questionnaires were displayed at the front and average amount of time taken to complete both questionnaires was 15-20 minutes.

The SAGIS questionnaire uses a five-point rating scale (no problem=0, mild=1, moderate=2, severe=3 and very severe=4) (Appendix L) (30). The HADS questionnaire contains 14 items which is split into two domains; anxiety and depression and utilises a four-point rating scale (Appendix N) (39).

4.3.4 Semi-structured interview

At the end of the six week low FODMAP diet period, participants who attended the first group education session were contacted for a telephone interview conducted by the candidate. Before commencing the interviews, consent was obtained to digitally record the interview. The interviews aimed to assess the participant’s acceptability and attitudes towards the feasibility of following a low FODMAP diet. Participants were also asked to evaluate the group education sessions and resources provided. Table 6 provides an overview of the semi-structured interview protocol. On average, the interviews lasted approximately 10 minutes.

All interviews were transcribed verbatim by the candidate. A thematic inductive approach was used to identify broad themes across the data set (92). Following the ‘Phases to thematic analysis’ by Braun and Clarke, the candidate familiarised herself with the data set, coded aspects of the data deemed pertinent to the research aim and then the codes were collated into potential themes (92).
Table 6. Overview of the semi-structured interview protocol

<table>
<thead>
<tr>
<th>Overview – ease of diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>How did you find the low FODMAP diet?</td>
</tr>
<tr>
<td>What aspects did you find easy?</td>
</tr>
<tr>
<td>What aspects did you find hard?</td>
</tr>
<tr>
<td>Why did you think the low FODMAP diet didn’t work for you?</td>
</tr>
<tr>
<td>How come you didn’t implement the low FODMAP diet?</td>
</tr>
<tr>
<td>Did the positives of the diet outweigh the negatives?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Challenges of the low FODMAP diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>What were some of the challenges you experienced with the low FODMAP diet?</td>
</tr>
<tr>
<td>Could you tell me a bit more about the challenges?</td>
</tr>
<tr>
<td>How did you overcome these challenges?</td>
</tr>
<tr>
<td>Were your family supportive of you being on the low FODMAP diet? Did you face any challenges with the family dynamic? Did you end up having to cook separate meals for yourself and your family?</td>
</tr>
<tr>
<td>Did the low FODMAP diet cost you more than your usual diet? Or was it more or less the same? Which items were costing you more?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education sessions and resources provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>How did you find the session?</td>
</tr>
<tr>
<td>If we were to do it next year, what are some improvements you would like to see?</td>
</tr>
<tr>
<td>In terms of the challenges you faced, was there anything you would change in the class to help to address these challenges?</td>
</tr>
<tr>
<td>Did you use any of the resources provided by the session? If so which ones and how did you use it to help you?</td>
</tr>
<tr>
<td>Did you use any of the websites or apps mentioned at the session? If so which ones and how did you use it to help you?</td>
</tr>
<tr>
<td>If not, what other resources would you have liked to see?</td>
</tr>
</tbody>
</table>

4.3.5 Session evaluation forms

Participants were required to complete an evaluation form at the end of each session (Appendix M). This evaluation form is protocol for any CDHB programme or session.

Participants are asked to report back on what they thought of the session overall, time of day and parking amongst other factors. This study will look briefly into these results however their main purpose and analysis is conducted by the Canterbury Initiative.
4.4 Statistical analysis

Information from the SAGIS and HADS questionnaires was analysed using the statistical software programme; IBM SPSS Statistics 25 (1998, 2017, USA). Changes in SAGIS questionnaire scores were assessed using paired t-tests as a measure of effectiveness of the low FODMAP diet taught in a group setting. HADS scores were separated into their domains: anxiety and depression. Anxiety and depression scores were then analysed using a chi-squared test to determine statistical significance (p<0.05). Paired t-test of anxiety and depressions scores were also performed. However, as this is a feasibility study involving a small sample size it was not designed, or adequately powered to test clinical significance but only numerical significance and thus a cautionary approach has to be taken when drawing inferences from the data (93).
5

Results

5.1  Pilot study: What was planned versus what happened

5.1.1 Recruitment

The initial plan was to recruit participants from GP referrals from the surrounding areas of the venues. Approximately, ten referrals came from the general practices in the surrounding area of the venues; seven referrals came from Cashmere Health and three from Halswell Health. Due to low referral rates, Canterbury Initiative (CI) members attempted to recruit from Christchurch Hospital, from where a gastrointestinal dietitian referred three participants. However, these participants were excluded as they had constipation predominant IBS. A further 15 referrals were made through additional recruitment methods. The study was promoted on the home page of Community HealthPathways and HealthInfo Canterbury and also promoted by the Canterbury Initiative leadership team on their practice visits. The study was also advertised on Pegasus Health via an email newsletter (Figure 4).

Figure 4. Pegasus Health advertisement on e-newsletter

5.1.2 Venues

The second education sessions were scheduled to be at the same community centres and same times as the first education sessions. However, the room booked at Halswell Centre was undergoing renovations and could not be used. A room was then booked at South Library and therefore both second education sessions were booked at South Library. However, due to
numbers and participant availability, an evening session was offered and one of the sessions at South Library was cancelled. The evening session was held at Oxford Terrace and participants were notified of the time, date and parking availability by text and phone call. There was a CI member waiting at the entrance to let people in.

5.1.3 Questionnaires
Getting participants to complete and return the follow-up questionnaires via mail proved to be difficult and time consuming. Participants were telephoned and given text reminders, yet the time taken for questionnaires to be returned took two to three weeks longer than expected. Some participants had lost their questionnaires and these participants were sent electronic copies of the questionnaires to complete via email. Three participants completed electronic copies.

5.2 Main results
5.2.1 Recruited participants
A total of 25 referrals were made and approximately 40% (10) of referrals came from general practices in surrounding areas of the venues and 60% (15) of referrals came from other types of promotion. Recruitment began in late June and ended July with the last participant being recruited on the 21st of July 2018. Recruitment and attendance numbers throughout the study is shown in Figure 5.

5.2.2 Baseline characteristics of study participants
Baseline characteristics of study participants are shown in Table 7. Participants ranged in age from 19 to 57 years. Seventy-seven percent of participants were female and all participants identified as New Zealand European. The majority of participants were overweight or obese (68.4%). Most participants identified as having either diarrhoea predominant IBS (45.5%) or mixed constipation and diarrhoea predominant IBS (40.9%). Almost all participants were referred from a general practitioner (95.7%) with two referrals from a dietitian (8%).

46
Total number of participants recruited
n= 25

3 dropped out as they could not attend the session dates and times

Total number of participants booked to attend the first session
n= 22

5 DNAs

Total number of participants who attended the first session
n=17

Cashmere session
n= 10

Halswell session
n= 7

Total number of participants who did not follow the low FODMAP diet
n=2

Total number of participants who experienced ≥50% improvement in IBS symptoms
n= 13

Total number of participants who experienced < 50% improvement in IBS symptoms
n= 2

Total number of participants who attended the second session
n= 11

2 DNAs

Cashmere session
n=10

Oxford terrace session
n=1

Figure 5. Total number of participants from recruitment to final analysis stage.
Notes: n; number of participants, DNA; did not attend, FODMAP; Fermentable Oligosaccharide Disaccharide Monosaccharide and Polyols, IBS; irritable bowel syndrome.
Table 7. Baseline characteristics of the study participants.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number of Participants n=22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean in years</td>
<td>34.5</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>New Zealand European</td>
<td>22</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
<tr>
<td>Body Mass Index (BMI)</td>
<td></td>
</tr>
<tr>
<td>Normal (18.50–24.99 kgm$^2$)</td>
<td>7</td>
</tr>
<tr>
<td>Overweight (25.00–29.99kgm$^2$)</td>
<td>7</td>
</tr>
<tr>
<td>Obese Class I (30.0–34.99kgm$^2$)</td>
<td>5</td>
</tr>
<tr>
<td>Obese Class II (35.00–39.99kgm$^2$)</td>
<td>0</td>
</tr>
<tr>
<td>Obese Class III (≥ 40kgm$^2$)</td>
<td>1</td>
</tr>
<tr>
<td>IBS subtype $^b$</td>
<td></td>
</tr>
<tr>
<td>IBS with predominant diarrhoea</td>
<td>10</td>
</tr>
<tr>
<td>IBS with diarrhoea and constipation</td>
<td>9</td>
</tr>
<tr>
<td>Mental health $^c$</td>
<td></td>
</tr>
<tr>
<td>Headaches</td>
<td>15</td>
</tr>
<tr>
<td>Chronic fatigue</td>
<td>6</td>
</tr>
<tr>
<td>Back pain</td>
<td>9</td>
</tr>
<tr>
<td>Depression</td>
<td>10</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>9</td>
</tr>
<tr>
<td>Anxiety disorders</td>
<td>11</td>
</tr>
<tr>
<td>Referral</td>
<td></td>
</tr>
<tr>
<td>General practitioner</td>
<td>20</td>
</tr>
<tr>
<td>Other health professional</td>
<td>2</td>
</tr>
</tbody>
</table>

**Abbreviations:** n; number, BMI; body mass index (weight (kg) divided by height squared (m)$^2$)

$^a$ n=19. Two participants did not have heights recorded for BMI to be calculated

$^b$ n=19. Two participants were able to be contacted to determine IBS subtype

$^c$ n= 18. Based on the SAGIS questionnaires answers completed by participants who returned the first questionnaire.
5.1.3 Attendance at the first session

Attendance at each of the sessions is shown in Figure 5. A total of 25 participants were recruited into the study. Out of the 25 participants, three participants dropped out of the study as they could not attend the session dates. Seventeen participants attended the first education sessions while six participants did not attend (DNAs). At the first education session, 10 participants attended the Cashmere venue and seven participants attended the Halswell session, resulting in an attendance rate of 77.3% in the first education sessions (Elimination Phase), of those initially recruited.

Out of the five DNAs, three participants were contacted about their non-attendance. One participant reported that they had not received any information regarding the education sessions, one participant said they could not take time off work and another participant reported that they were called into work unexpectedly. The participants that did not attend shared similar characteristics, four of the participants being under the age of 25 and three of the participants had a BMI < 30kgm².

5.1.4 Symptomatic improvement

All participants that attended the first education were contacted by a member of the research team seven to eight weeks after the first education session. Overall, 76.5% of participants reported ≥ 50% improvement in their IBS symptoms. 11.7% of participants reported that their IBS symptoms had improved by 100%, 11.7% of participants reported their IBS symptoms had improved by 80% to 100%, 41.2% of participants reported their IBS symptoms had improved by 60% to 80% and 11.7% of participants reported their IBS symptoms had improved by 50% to 60%. In total, four participants (24%) reported no improvement. Out of the four that did not experience any improvement, two participants reported their IBS symptoms had not improved at all and two participants reported that they did not implement the diet at all.
5.1.5 Attendance at the second education session

Attendance at the second education session is demonstrated in Figure 5. Out of the 13 participants whose symptoms had improved, 11 (85%) participants attended the second education session (Reintroduction Phase). Originally, the second education sessions were to be held at the same venues as the previous education session. However, Halswell Centre was undergoing renovations and could not be used. Hence, another session was booked at South Library instead. However, due to the smaller numbers, the research team decided it was best to conduct only one education session at South Library, Cashmere which was held on the 17th of September from 10am to 11am. Three participants reported that they were unavailable during the day time and an evening session was offered. The evening session was conducted on Thursday 20th of September from 7.00pm to 8.00pm was at 32 Oxford Terrace, Christchurch Central. Overall, ten participants attended the second education session at South Library, Cashmere and one participant attended the Oxford Terrace session as two participants did not end up attending. Overall recruitment and attendance numbers is demonstrated in Figure 6.

5.3 Clinical effectiveness of group education

A total of 32 SAGIS questionnaires and 31 HADS questionnaires were collected throughout the study. Figure 6 summarises the data collection process from the beginning to final data analysis. Participants were excluded from final data analysis if they did not attend the first education session or if they did not implement the low FODMAP diet for a minimum of six weeks. Initially, a time period of two weeks was allocated for questionnaires to be completed and returned to the research team. However, only a small number of questionnaires had been received by the two-week period so the data collection period was extended for another two weeks. The total data collection period ended at approximately four weeks with the first sets of questionnaires received in early September and the last set of questionnaires received on the 5th of October.
The candidate utilised a variety of communication devices such as text messaging, emailing, voice messages and phone calls to remind participants to return their questionnaires. Those who had not returned their second set of questionnaires were offered electronic copies of the questionnaires to complete and return via email. Two participants filled out their questionnaires electronically and one participant scanned and emailed their completed questionnaires via email.

5.3.1 Results of SAGIS questionnaire

Table 8 summarises the mean scores of the 24 variables in the SAGIS questionnaire of the participants. Overall, all means scores for each of the variables decreased after implementation of the diet. Nineteen variables (79.2%) showed statistical significance (p<0.05) with the greatest change in bloating being 3.00 (0.894) at baseline and 1.09 (0.701) after intervention. Belching, dysphagia, early satiety, loss of appetite and vomiting showed no statistical significance. Figure 7 demonstrates SAGIS mean scores and the standard error of the mean scores.

5.3.2 Results of HADS questionnaire

At baseline, seven participants (64%) had anxiety and three participants (27%) had depression according to the HADS questionnaire. At follow-up, three participants (27%) had anxiety and one participant (9%) had depression according to the HADS questionnaire. Results from chi-square tests shows that there was no statistically significant differences for both anxiety (p=0.087) and depression (p= 0.269) cases at baseline and follow-up.

Table 9 and 10 summarises the mean scores HADS questionnaire in their separate domains: anxiety and depression. Most anxiety variables decreased from baseline to follow-up, however only two were shown to be statistically significant. These were ‘I get a sort of a
Total number of participants recruited
n= 25

Total number of participants booked to attend the session
n=22

Total number of questionnaires sent out to participants
n= 22 SAGIS n= 22 HADS

4 drop outs

‘Before implementing the low FODMAP diet’ questionnaires (#1) completed and received
n= 18 SAGIS n= 18 HADS

1 SAGIS and 1 HADS questionnaire excluded as patient did not attend the first session

Total number of participants who attended the first session (low FODMAP implementation education)
n= 17

2 SAGIS and 1 HADS questionnaire excluded as they did not implement the diet
2 SAGIS and 2 HADS questionnaires was never received

‘After implementing the low FODMAP diet’ questionnaires (#2) completed and received
n=14 SAGIS n=13 HADS

Final data analysis
n= 11 SAGIS n= 11 HADS

Figure 6. Total number of participants from that completed final data analysis.
Notes: n number, FODMAP Fermentable Oligosaccharide Disaccharide Monosaccharide and Polyols, HADS Hospital Anxiety and Depression scores, SAGIS Structured Assessment Gastrointestinal Symptoms Scale
frightened feeling like ‘butterflies’ in the stomach’ at baseline 1.82 (0.752) and after intervention 1.09 (0.701) and ‘I get sudden feelings of panic’ at baseline 1.64 (0.809) and after intervention 0.91 (0.701). The correlation and t-value for ‘I feel restless as if I have to be on the move’ was also unable to calculate for this variable as standard error was zero.

Similarly, depression variables decreased from baseline to follow-up, however only three were shown to be statistically significant (p<0.05). These were ‘I still enjoy the things I used to enjoy’ at baseline 1.00 (0.632) and at intervention 0.55 (0.522), ‘I feel as if I am slowed down’ at baseline 1.91 (0.944) and at intervention 1.18 (0.751) and ‘I can enjoy a good book or radio or TV programme’ at baseline 0.91(1.221) and at intervention 0.27 (0.674).

**Figure 8 and 9** demonstrate mean differences of the individual anxiety and depression variables and also the standard of error of the mean differences.
Table 8. Paired sample t-test results from SAGIS before and after questionnaires

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before low FODMAP diet Mean (SD)</th>
<th>After low FODMAP diet Mean (SD)</th>
<th>Δ</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belching</td>
<td>0.55 (0.688)</td>
<td>0.18 (0.405)</td>
<td>0.364</td>
<td>0.167</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>0.18 (0.122)</td>
<td>0.09 (0.091)</td>
<td>0.091</td>
<td>0.341</td>
</tr>
<tr>
<td>Fullness</td>
<td>1.64 (0.809)</td>
<td>0.73 (0.786)</td>
<td>0.909</td>
<td>0.010*</td>
</tr>
<tr>
<td>Early satiety</td>
<td>0.73 (0.195)</td>
<td>0.36 (0.505)</td>
<td>0.364</td>
<td>0.167</td>
</tr>
<tr>
<td>Postprandial pain</td>
<td>1.45 (0.934)</td>
<td>0.55 (0.688)</td>
<td>0.909</td>
<td>0.016*</td>
</tr>
<tr>
<td>Epigastric pain</td>
<td>1.55 (1.036)</td>
<td>0.36 (0.505)</td>
<td>1.182</td>
<td>0.007*</td>
</tr>
<tr>
<td>Retrosternal discomfort</td>
<td>0.91 (0.944)</td>
<td>0.27 (0.467)</td>
<td>0.636</td>
<td>0.046*</td>
</tr>
<tr>
<td>Pain before BM</td>
<td>2.45 (0.934)</td>
<td>0.91 (0.831)</td>
<td>1.545</td>
<td>0.001*</td>
</tr>
<tr>
<td>Pain after BM</td>
<td>2.30 (1.059)</td>
<td>0.80 (0.789)</td>
<td>1.500</td>
<td>0.005*</td>
</tr>
<tr>
<td>Difficulty to empty BM</td>
<td>1.91 (1.221)</td>
<td>1.00 (0.894)</td>
<td>0.909</td>
<td>0.043*</td>
</tr>
<tr>
<td>Constipation</td>
<td>1.73 (1.191)</td>
<td>0.64 (0.674)</td>
<td>1.091</td>
<td>0.006*</td>
</tr>
<tr>
<td>Hard BM</td>
<td>1.55 (1.214)</td>
<td>0.45 (0.522)</td>
<td>1.091</td>
<td>0.025*</td>
</tr>
<tr>
<td>Loose BM</td>
<td>2.73 (1.272)</td>
<td>1.09 (0.831)</td>
<td>1.636</td>
<td>0.003*</td>
</tr>
<tr>
<td>Incontinence</td>
<td>0.91 (0.944)</td>
<td>0.09 (0.302)</td>
<td>0.818</td>
<td>0.011*</td>
</tr>
<tr>
<td>Urgency to empty BM</td>
<td>2.82 (1.168)</td>
<td>1.27 (0.647)</td>
<td>1.545</td>
<td>0.001*</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>2.18 (1.401)</td>
<td>0.91 (0.539)</td>
<td>1.273</td>
<td>0.005*</td>
</tr>
<tr>
<td>Loss of appetite</td>
<td>0.73 (1.104)</td>
<td>0.27 (0.647)</td>
<td>0.455</td>
<td>0.138</td>
</tr>
<tr>
<td>Abdominal cramps</td>
<td>2.09 (1.136)</td>
<td>0.73 (0.786)</td>
<td>1.364</td>
<td>0.013*</td>
</tr>
<tr>
<td>Sickness</td>
<td>1.09 (1.044)</td>
<td>0.27 (0.467)</td>
<td>0.818</td>
<td>0.020*</td>
</tr>
<tr>
<td>Nausea</td>
<td>0.73 (0.905)</td>
<td>0.09 (0.302)</td>
<td>0.636</td>
<td>0.011*</td>
</tr>
<tr>
<td>Vomiting</td>
<td>0.27 (0.467)</td>
<td>0.00 (0.000)</td>
<td>0.273</td>
<td>0.082</td>
</tr>
<tr>
<td>Bloating</td>
<td>3.00 (0.894)</td>
<td>1.09 (0.701)</td>
<td>1.909</td>
<td>0.000*</td>
</tr>
<tr>
<td>Excessive gas</td>
<td>2.64 (1.027)</td>
<td>0.82 (0.982)</td>
<td>1.818</td>
<td>0.002*</td>
</tr>
<tr>
<td>Excessive belching</td>
<td>1.36 (1.120)</td>
<td>0.18 (0.405)</td>
<td>1.182</td>
<td>0.005*</td>
</tr>
</tbody>
</table>

*p-value of <0.05 is considered statistically significant
Table 9. Paired sample t-tests of results of HADS questionnaire: Anxiety

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before low FODMAP diet Mean (std dev)</th>
<th>After low FODMAP diet Mean (std dev)</th>
<th>Δ</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel tense or ‘wound up’</td>
<td>1.82 (0.874)</td>
<td>1.45 (0.688)</td>
<td>0.364</td>
<td>0.167</td>
</tr>
<tr>
<td>I get a sort of a frightened feelings like something awful is about to happen</td>
<td>1.64 (0.924)</td>
<td>1.36 (0.505)</td>
<td>0.273</td>
<td>0.341</td>
</tr>
<tr>
<td>Worrying thoughts go through my mind</td>
<td>2.00 (1.095)</td>
<td>1.45 (1.293)</td>
<td>0.545</td>
<td>0.111</td>
</tr>
<tr>
<td>I can sit at ease and feel relaxed</td>
<td>1.27 (0.647)</td>
<td>0.91 (0.539)</td>
<td>0.364</td>
<td>0.167</td>
</tr>
<tr>
<td>I get a sort of a frightened feeling like ‘butterflies’ in the stomach</td>
<td>1.82 (0.752)</td>
<td>1.09 (0.701)</td>
<td>0.727</td>
<td>0.038*</td>
</tr>
<tr>
<td>I feel restless as I have to be on the move</td>
<td>1.00 a</td>
<td>1.00 a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I get sudden feelings of panic</td>
<td>1.64 (0.809)</td>
<td>0.91 (0.701)</td>
<td>0.727</td>
<td>0.012*</td>
</tr>
</tbody>
</table>

*p-value of <0.05 is considered statistically significant.

Table 10. Paired sample t-tests of results of HADS questionnaire: Depression

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before low FODMAP diet Mean (std dev)</th>
<th>After low FODMAP diet Mean (std dev)</th>
<th>Δ</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I still enjoy the things I used to enjoy</td>
<td>1.00 (0.632)</td>
<td>0.55 (0.522)</td>
<td>0.455</td>
<td>0.016*</td>
</tr>
<tr>
<td>I can laugh and see the funny side of things</td>
<td>0.73 (0.786)</td>
<td>0.82 (0.751)</td>
<td>-0.091</td>
<td>0.676</td>
</tr>
<tr>
<td>I feel cheerful</td>
<td>0.82 (0.874)</td>
<td>1.00 (0.894)</td>
<td>-0.182</td>
<td>0.588</td>
</tr>
<tr>
<td>I feel as if I am slowed down</td>
<td>1.91 (0.944)</td>
<td>1.18 (0.751)</td>
<td>0.727</td>
<td>0.038*</td>
</tr>
<tr>
<td>I have lost interest in my appearance</td>
<td>1.55 (1.128)</td>
<td>1.09 (1.136)</td>
<td>0.455</td>
<td>0.053</td>
</tr>
<tr>
<td>I look forward with enjoyment to things</td>
<td>0.82 (0.751)</td>
<td>0.36 (0.674)</td>
<td>0.455</td>
<td>0.053</td>
</tr>
<tr>
<td>I can enjoy a good book or radio or TV programme</td>
<td>0.91 (1.221)</td>
<td>0.27 (0.674)</td>
<td>0.636</td>
<td>0.046*</td>
</tr>
</tbody>
</table>

*p-value of <0.05 is considered statistically significant.
Figure 7. Comparison of SAGIS mean (SEM) differences from baseline to follow-up
I feel tense of 'wound up'
I get a sort of frightened feeling as if something awful is about to happen
Worrying thoughts go through my mind
I can sit at ease and feel relaxed
I get a sort of frightened feeling like 'butterflies' in the stomach
I get sudden feelings of panic

Figure 8. Comparison of HADS anxiety mean (SEM) differences from baseline to follow-up
Figure 9. Comparison of HADS depression means (SEM) from baseline to follow-up
5.4 Acceptability of the low FODMAP diet (semi-structured interviews)

Results from the telephone interviews showed a range of benefits in group education and the general response from participants about the low FODMAP diet were positive. Most participants felt that the information provided at the session was sufficient for them to implement the low FODMAP diet for six weeks. Common words participants used to describe the sessions included ‘straightforward’, ‘really good’, ‘informative’, ‘well covered’ with one participant describing it as ‘short of someone cooking for me’. Table 11 shows a summary of the main and sub themes identified. The next sections explore the themes in greater detail in regards to facilitators, barriers and attitudes towards group education.

Table 11. Summary of themes derived from semi-structured interviews

<table>
<thead>
<tr>
<th>Main theme</th>
<th>Sub-themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A new way of eating</td>
<td>Meal planning&lt;br&gt;Time to prepare and plan meals&lt;br&gt;Regular meal pattern&lt;br&gt;Monitoring FODMAP intake&lt;br&gt;Cooking from scratch</td>
</tr>
<tr>
<td>Replacement of foods</td>
<td>Replacement of high FODMAP foods with low FODMAPS alternative&lt;br&gt;Using alternative flavourings instead of garlic and onion</td>
</tr>
<tr>
<td>Eating out</td>
<td>Maintaining social norms&lt;br&gt;Uncertainty of FODMAP content in meals eaten away from home</td>
</tr>
<tr>
<td>Social support</td>
<td>Understanding from family and friends&lt;br&gt;Reinforcement and encouragement from partners/spouse&lt;br&gt;Group education and other participants</td>
</tr>
<tr>
<td>Resources</td>
<td>Using a readily available app on the go (i.e. MONASH low FODMAP app)&lt;br&gt;Using websites (e.g. A Little Bit Yummy) for recipe ideas&lt;br&gt;Low FODMAP take home resources provided at the session</td>
</tr>
<tr>
<td>Label reading</td>
<td>Ease of reading and interpreting nutrition information&lt;br&gt;Aids to label reading – Monash low FODMAP diet app</td>
</tr>
</tbody>
</table>
5.4.1 Facilitators

Participants expressed a change in their relationship with food and eating; one expressed that they ‘definitely changed some of my thinking’ and another ‘I’m more aware what I’ve been eating but also how I’ve been eating’. More effort and research into shopping lists, meal planning and meal preparation was adapted by participants which aided them to successfully follow the low FODMAP diet for six weeks. Most of participants used the ‘A Little Bit Yummy’ website and the few that purchased the Monash app found its accessibility and convenience to be very helpful: ‘I downloaded the app, the FODMAP app, it sort of gave me enough products on there to give me an idea’. Another participant favoured its convenience saying that ‘MONASH one was the first port of call mainly because I had the app and I find it easy to find things on it’. However, the FODMAP app costs $11.99 (NZD) and the cost of this proved to be a barrier for one participant. ‘A Little Bit Yummy’ and the MONASH app were recommended by the presenting dietitian, however participants also sought other sites for further information. One participant found another website –‘The Wild Gut Project’ which catered to vegans with IBS. Another said ‘There were a few things I wasn’t sure about that I googled and I you know pick something that looks reputable to see’.

Replacing one product for a low FODMAP alternative was a common approach to reduce FODMAP intake. Most participants agreed that finding low FODMAP alternatives for foods that they often ate was really helpful. Though the low FODMAP alternatives for bread and lactose-free milk tended to be more expensive, the cost did not hinder many participants from purchasing them as many reported the increase in shopping costs to be minimal. Participants found these food swaps to have little disruption to their usual eating: ‘Only challenge was probably bread considering I had like sandwiches for lunch cause that was easy but then having that low carb one’. Another participant emphasised the need for finding alternatives: ‘I
might have chutney a few times a week which I couldn’t have but I found that I could use red pepper jelly instead, just finding alternatives really’.

Other main facilitators expressed were the use of the resources as well as having a supportive partner. The take home resources were used by most participants, a few read through the material once but most repeatedly visited it. Most participants found the extensive food lists in the handouts to be very useful because it helped them easily identify what foods to eat in accordance with a low FODMAP diet. Most participants found the extensive food list to be of great help, especially in the beginning when they were starting the diet: ‘When I left there was nothing to eat but then when I started looking through everything myself it was fine’. Having a supportive partner or family also helped participants to follow the diet, in some cases allowed for team work and collaboration. One participant expressed that he and his partner worked together to create a two-week cycle low FODMAP menu: ‘Got easier sort of maybe going through a bit of a 2 week cycle with meals and stuff at that at the moment we’ll just go sort of a two week plan that works and just change it up’.

5.4.2 Barriers

Behaviour change and dietary modifications proved to be the biggest challenge for almost all participants. One participant expressed that ‘It was harder at the beginning but towards the end it was quite simple now really’ which was a sentiment reflected throughout participants with another saying that ‘(it was) really just changing my habits’.

Another common challenge that participants faced included social gatherings and eating out. One participants said that she ‘kind (of) just wanted to fit in with other people’ and another participant found distraction at social gatherings to be problematic ‘It was being distracted more than anything, conversations happen and you get into some pretty intense discussions
and then you go hang out what was that’. ‘The garlic and onion scenario’ was a common challenge that participants came across both at home and eating out. Participants expressed that going out to eat or getting takeaways was difficult, due to the lack of garlic and onion free alternatives. However, some participants believed that the diet ending up costing them less as they were less inclined to eat out or buy takeaways for the same reason. Some participants expressed that cooking at home was also difficult, ‘It was just more realising how much garlic and onion were in things’. Common foods that participants struggled with included pasta sauce, hummus and soups. One participant expressed that ‘It was more a combination of ingredients that you had to good in with a fine tooth comb that was a real struggle’ which was expressed across most individuals.

Another challenge that participants encountered the graded amount of FODMAPs they could have at one given time, an example a participant gave was ‘Like sure I can have 10 almonds but when is the next time I can have ten almonds’. One participant said that she was unsure of the different portions of FODMAP containing foods in one serving-- ‘It might be a green light food but when you have it in a certain quantity or if you have it with another low FODMAP food and another low FODMAP food becomes an orange light’.

Those who did not complete or implement the diet at all, reported that personal issues were the main reason. One participant expressed that she had multiple food allergies and lacked confidence to implement the diet safely. Another participant identified his lack of motivation as his main barrier: ‘At this stage, I am not motivated enough to do the diet’ and when asked if he thought the sessions were helpful he replied ‘They were probably helpful it’s probably, more me understanding what I can and can’t eat’.

When participants were asked ‘If there were any improvements that could be made to the session’ most participants could not think of any suggestions. One participant wanted more
interaction with the rest of the group; ‘It’ll be cool to stay in touch with the other people in the group as well just touch base with how’s everyone else is going and (how) the other people might have gone’. Another participant suggested more complete food lists and more information about the hidden FODMAP ingredients in products because ‘If the information that you give us isn’t complete then it gets confusing and conflicting’. Furthermore, another wanted to see more information about alcohol in a low FODMAP diet.

5.4.3 Attitudes and perspectives around the programme

Overall, the group education sessions were well received by the participants. Participants who found that their symptoms have improved on the low FODMAP diet, when asked ‘Did the positives outweigh the negatives?’ all participants replied with ‘Yes’. After completing the diet, most participants were grateful to part of the group education experience and content with the overall results of the low FODMAP diet- ‘The rewards of actually doing it are very high’ and another expressing that ‘The (low FODMAP) diet has given me more control’. One participant said that ‘Following these sessions pretty sure I will go back to full time work next year. So I’m very grateful for that’ and another spoke highly on the group setting – ‘Other people that are doing it and more connection with other people that are doing it too’.

5.5 Acceptability around the programme (Eval Forms)

The session evaluation forms show that participants thought highly of education programme in general. Scores for ‘Time of day’, ‘Parking’, ‘Meeting room’, ‘Acoustics’, ‘Handouts’ and ‘Session overall’ were rated highly across all four education sessions conducted. On the scale of 1 being below average to 5 being excellent, the lowest rated variable was ‘Parking’ which was rated 4.17 out 5. The second lowest rated variable was for ‘Time of day’ which was rated 4.3 out of 5. These high scores support the overall positive experience of participants as suggested in the telephone interviews. As mentioned in the previous chapter, evaluation results will be formally reviewed by CI.
6 Discussion and Conclusion

6.1 Summary of key findings

This present study is one of the first to formally evaluate a dietitian-led low FODMAP group education programme for the dietary management of IBS. The results demonstrate that dietitian-led low FODMAP group education is feasible and effective in the management of IBS.

6.2 Clinical effectiveness

Our findings support previous results from randomised controlled trials that show that the low FODMAP diet provides relief in common gastrointestinal symptoms experienced by IBS patients (Table 2). Furthermore, the findings of the present study show that a group delivery of the low FODMAP diet can be effective in providing the desired symptomatic relief. The study found a statistically significant improvement in gastrointestinal symptoms in participants after following the low FODMAP diet. Significant improvements were seen in almost 80% of SAGIS variables (19/24). Such findings support those of Whigham et al, the first to formally evaluate group education for the delivery of the low FODMAP diet (20). In their study, 54% of participants were satisfied with their gut health at the end of intervention. Comparatively, in our study 87% (13/15) of participants were satisfied with their symptomatic improvement at the end of intervention. Most gastrointestinal symptoms such as bloating, abdominal pain and flatulence significantly improved apart from belching, which is similar to our current findings. Whigham et al also compared the clinical effectiveness of dietitian-led group education to traditional one-to-one pathway. They concluded that improvement in IBS symptoms is irrespective of the type of education delivery (group versus one to one). Though our study did not use a comparator group, the results of our study compared to those that utilised an individualised delivery model suggest similarities.
comparable to the findings from Whigham et al. Similar symptomatic improvement can be found in both types of delivery; bloating, loose bowel motions, stool consistency and flatulence before and after implementation of the low FODMAP appear to be consistently and significantly improved regardless of delivery model (15, 17, 18, 94). Early satiety, belching, dysphagia, vomiting and loss of appetite showed no significant difference at baseline and follow-up which is consistent with previous research as these symptoms are rarely associated with IBS.

A positive effect of the group low FODMAP education programme on psychometric and psychosocial measures is also shown in this study. Whigham et al failed to look at the psychological component in those living with IBS is a very important measure of health and wellness. As IBS has no structural or objective component, one must rely on patient reported illness experiences and their perceived feelings and emotions becomes a very important measure in assessing patient’s health status. The current literature has differing viewpoints on the impact of IBS group education on anxiety, depression and health-related quality of life (HRQoL). As shown in Chapter 2, Section 2.1.5, individualised dietary education and counselling improves patients’ understanding of IBS and their dietary management of IBS and hence their overall mood and HRQoL. However, others suggest that having group interactions allow patients to interact, relate and share salient ideas and experiences. Overall, there is limited and conflicting literature concerning IBS group dietary education and the impact it has on quality of mood and mental disorders, quality of life.

Like many other psychometric measurements, the HADS questionnaires utilises valid and methodological properties, the results of the questionnaire remain subjective within patients’ perceived feelings and self-reported illness (39). Additionally, 50% of participants reported having an anxiety and 45% reported to have depression prior to entering the study.
Anxiety and depression scores did not improve as remarkably as gastrointestinal symptom scores which are to be expected given the nature of the intervention and pre-existing psychological disorders. Positive changes in mood and mental factors often take a longer length of time to provide significant improvement (95). Furthermore, mental health requires long term behavioural therapy, medications and other strategies besides dietary management and a longer follow-up period may demonstrate more positive changes in mental health and hence HADS scores. Overall, HADS scores were only a secondary outcome in our study and it is more appropriate to evaluate the feasibility and effects of a group education programme in a multifactorial context through attitudes and shared experiences about the low FODMAP diet, GI symptom severity as well as psychosocial distress.

6.3 Patient acceptability of low FODMAP group education

Results from the telephone interviews showed that participants were generally positive and grateful for the overall experience of the low FODMAP diet. Additionally, participants found the group education programme to enhance their understanding and acceptability of the low FODMAP diet. Our results are in accordance with other IBS or non-IBS group dietary interventions, which also demonstrated that group settings increase patients’ acceptability of the treatment through sharing of experiences as well as comradery with other patients (20, 87-90, 96). Furthermore, suitable educational resources as well as references to websites and apps also increased adherence and acceptability of the low FODMAP diet which is consistent among emerging literature (16, 20, 85, 97). Websites and web apps such as ‘A Little Bit Yummy’ and the ‘Low FODMAP Diet App (MONASH)’ are increasing in popularity as they provide a fast and accessible platform for FODMAP friendly meals and products. However, the increase in web based education creates uncertainty and vulnerability for evidence based low FODMAP advice and individuals without the necessary expertise to do so. More research and protocol established should be warranted regarding the efficacy and safety of emerging web-based platforms.
Those who did not implement the diet after attending the initial session expressed that they had personal and individual reasons for not doing so. Suggesting it was not due to the delivery of intervention, but rather personal reasons. This also highlights the need to screen those suitable for one-to-one delivery rather than group delivery. Whigham et al employed a triage system using a telephone screening clinic to allocate participants’ suitability for group versus one-to-one education. They emphasised the importance of flexibility and being able to offer a one-to-one session to ensure effective patient care and maintain patient choice. Non-formally evaluated and unpublished results of a dietitian led low FODMAP group education programme at Christchurch Public Hospital also emphasised the need for a more vigorous screening process. Though our study employed a strict exclusion criterion, a telephone screening may be more useful to identify those participants who require a personalised dietary counselling such as those with complex mental health issues, lack of motivation, dietary restrictions and food allergies.

Participant acceptability regarding the overall logistics and organisation of the programme were also positive. To our knowledge, this study is one of the few that assessed accessibility to the programme as well as acceptability of the treatment. Whigham et al looked at attendance rate as their only measure of accessibility. However, in a feasibility study it is important to look at the wider picture in regards to how participants found the overall experience of the programme. Participants reported that the ‘timing of day’ to be an issue as most participants had to take time off work and some participants not being able to attend the sessions due to other commitments during the day. The low FODMAP group education programme should be flexible in terms of offering a one-to-one versus a group pathway as well as being flexible and accommodating to the lifestyle and availability of participants.
6.4 Strengths and weaknesses

This is the first study to examine the feasibility of low FODMAP group education for adults with IBS in a New Zealand population. The mixed methods design meant it was possible to assess gastrointestinal symptoms as well as psychological measures at baseline and at the end of intervention, as well as achieve a greater understanding of participant’s experiences and attitudes obtained through semi structured telephone interviews and evaluation forms. The candidate conducted the majority of data collection of the questionnaires and telephone interviews to remove inter-investigator variation.

There are a number of limitations. Our quantitative data needs to be viewed with caution and interpreted in context with the weaknesses of the study. As the study was small in size, it is not powered to demonstrate clinical significance. Yet, the results are promising and has potential to show clinical effectiveness given a larger sample size. Another limitation of the study is that we did not assess the cost of the group delivery model. Yet it can be assumed that the cost of a group delivery model is likely to cost significantly less than the cost of one-to-one session for each participant. Our study is based in Christchurch which means that the results are applicable to the context of Christchurch. In a more ethnically diverse city such as Auckland, language barriers, culture around food and different types of cuisines may need to be addressed. Furthermore, we only included IBS-D or IBS-M participants as IBS with constipation was deemed less appropriate for this study.

6.5 Future research

Our study focused primarily on the low FODMAP diet and the Elimination Phase as the main source of dietary treatment. However, the purpose of the low FODMAP diet is to allow patients to identify their food triggers through reintroduction and then modify their diet accordingly for long term symptom management. Future research should investigate the
feasibility of a low FODMAP group education in terms of reintroduction and diet modification. Our study excluded patients with IBS-C. Future research into low FODMAP group education for patients with IBS-C is warranted given the current findings are positive and promising. Future studies should also look at the importance of a vigorous triage system to screen suitable group education patients. They should assess the necessary questions and topics to discuss in order to appropriately screen participants. With New Zealand’s changing multicultural landscape, future studies should also look into the feasibility and acceptability of an ethnically diverse group of participants.

6.6 Conclusion

This six week, group-based low FODMAP education programme was feasible in improving adult IBS patients with diarrhoea or diarrhoea and constipation. Gastrointestinal symptoms as well as psychological states were improved from baseline to follow up. Participants were generally positive and satisfied with the education provided at the sessions. Participants also expressed that the timing of the day time sessions could be better improved. Main challenges faced when implementing the low FODMAP diet included eating out, combination of different FODMAPs in meals and eliminating onion and garlic from the diet. The main facilitators were: supportive peers, handouts given at the session and using websites or the Monash app for guidance and recipe ideas.
Irritable bowel syndrome is a chronic and debilitating condition that affects 10 - 20% of New Zealanders. Furthermore, the prevalence of IBS is increasing and hence the number of patients requiring low FODMAP dietary management is increasing. Yet, there is not capacity within the public health system to deliver one-to-one low FODMAP education in a safe and effective manner. The findings of the present study, demonstrate group low FODMAP education to be a feasible and effective delivery pathway as opposed to the traditional one-to-one pathway.

In dietetic practice, patients with a medical diagnosis of IBS are usually referred to a specialised gastroenterology dietitian for one-to-one low FODMAP education. Low FODMAP education is a specialised area of dietetics and requires additional training to educate and counsel patients on low FODMAP dietary management. However, referring a patient to the public pathway for the low FODMAP diet would require a prolonged waiting time unless the patient was perceived as an urgent or severe case. The other alternative would be to refer patients to a private dietitian who specialises in low FODMAPs. Yet, the latter is more costly for patients and many tend to reject this option for this reason. Our findings suggest that a dietitian led group based low FODMAP education programme could mean that patients that otherwise wouldn’t be seen in the public system, would be able to access low FODMAP education. Overall, more IBS patients will be reached in a group delivery model compared to the traditional pathway.

Yet, it is important to remember that all patients are unique and not all patients will be suitable for group education. Patients that lack motivation, have other dietary restrictions (in addition to FODMAPs) and other health issues should be screened beforehand to assess
suitability in one-to-one or low FODMAP education. In practice, there is limited time and resources to undergo a vigorous screening process. Instead a checklist of five questions could be utilised for further screening. Examples include: ‘Do you currently have any dietary restrictions?’, ‘Are you willing to make significant dietary changes for six weeks?’

Furthermore, dietitians should liaise with general practitioners and educate them the importance and utilisation of the screening process, in addition to the exclusion criteria.

This research experience has been one that was completely different to the candidate in her past five years as a university student. In terms of the candidate’s individual dietetic practice, having the privilege to be involved in a pilot study with Canterbury Initiative (CI) has enable a greater understanding into the processes and intricacies involved when developing a nutrition programme. By working with the staff at CI and the CDHB, the candidate was able to develop a greater understanding of the challenges, organisation, processes and team work involved to run a pilot group education session. This insight has helped the candidate to identify possible challenges and have the necessary skills for problem solving in all sorts of situations and settings. The candidate has also learnt to develop tailored communication skills to different stakeholders involved in the programme, including CI staff, CDHB staff as well as with participants. The candidate intends to continue to reflect on this learning and apply it to her own future dietetic practice.
References


75. Ong DK, Mitchell SB, Barrett JS, Shepherd SJ, Irving PM, Biesiekierski JR. Manipulation of dietary short chain carbohydrates alters the pattern of gas production


education-compared-to-routine-treatment-waiting-list-or-no-intervention-for-people-
with-type-2-diabetes-mellitus.
91. Odgers-Jewell K, Isenring EA, Thomas R, Reidlinger DP. Group participants' 
 experiences of a patient-directed group-based education program for the management 
93. Thabane L, Ma J, Chu R, Cheng J, Ismaila A, Rios LP. A tutorial on pilot studies: The 
monitoring in irritable bowel syndrome patients treated with low fermentable oligo-, 
Anxiety, depression, and anger in functional gastrointestinal disorders: A Cross-
97. Whelan K, Martin LD, Staudacher HM, Lomer MCE. The low FODMAP diet in the 
management of irritable bowel syndrome: an evidence-based review of FODMAP 
2018;31(2):239-55.
Appendices
Appendix A
Ethics approval

Professor R Geary
Department of Medicine (ChCh)
University of Otago, Christchurch
University of Otago Medical School

20 March 2018

Dear Professor Geary,

I am again writing to you concerning your proposal entitled “Investigating the impact of a nurse led diet and activity intervention for patients with irritable bowel syndrome (IBS)”, Ethics Committee reference number H18/002.

Thank you for your email of 14th March 2018 with response attached 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:
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

cc. Professor L Beckert  Head  Department of Medicine (ChCh)
Appendix B

Amendments

4 April 2018

Professor R Gearry
Department of Medicine (ChCh)
University of Otago, Christchurch
University of Otago Medical School

Dear Professor Gearry,

I am again writing to you concerning your proposal entitled “Investigating the impact of a nurse led diet and activity intervention for patients with irritable bowel syndrome (IBS)”, Ethics Committee reference number H18/002.

Thank you for the request for amendment notifying the Committee that Canterbury District Health Board funding has been obtained to have registered dietitians perform a group teaching session for people with Irritable Bowel Syndrome, instead of GP nurse education.

The Committee accepts and approves the amendment.

Your proposal continues to be fully approved by the Human Ethics Committee. If the nature, consent, location, procedures or personnel of your approved application change, please advise me in writing. I hope all goes well for you with your upcoming research.

Yours sincerely,

[Signature]

Mr Gary Witte
Manager, Academic Committees
Tel: 470 8258
Email: gary.witte@otago.ac.nz

cc: Professor L Beckert  Head  Department of Medicine (ChCh)
Professor R Geary
Department of Medicine (ChCh)
University of Otago, Christchurch
University of Otago Medical School

11 July 2018

Dear Professor Geary,

I am again writing to you concerning your proposal entitled “Investigating the impact of a nurse led diet and activity intervention for patients with irritable bowel syndrome (IBS)”, Ethics Committee reference number H18/002.

Thank you to Dorcas Chan for her email of 10th July 2016 requesting approval to interview participants following the education sessions. The Committee notes that the intention is to gain insights into participants experiences and challenges with following the low FODMAP diet.

The Committee accepts and approves the amendment and thanks you for providing the revised Information Sheet and Consent Form.

Your proposal continues to be fully approved by the Human Ethics Committee. If the nature, consent, location, procedures or personnel of your approved application change, please advise me in writing. I hope all goes well for you with your upcoming research.

Yours sincerely,

[Signature]

Mr Gary Witte
Manager, Academic Committees
Tel: 479 0258
Email: gary.witte@otago.ac.nz

cc. Professor R Geary  Head Department of Medicine (ChCh)
Appendix C

Participant Information Sheet

Participant Information Sheet

<table>
<thead>
<tr>
<th>Study title:</th>
<th>Investigating the impact of dietitian-led group education on the low FODMAP diet for adults with irritable bowel syndrome (IBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal investigator:</td>
<td>Professor Richard Geary Department of Medicine</td>
</tr>
<tr>
<td>Contact phone number:</td>
<td>(03) 3640640</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?
This project is being undertaken as part of the requirements for Dorcas Chan’s Master of Dietetics.

IBS is a common gastrointestinal disorder that affects 10-20% of New Zealanders. IBS can be a debilitating condition in which the symptoms range from changes in bowel habits to abdominal pain. The low FODMAP diet is an eating plan that helps improve symptoms in three out of four people with Irritable Bowel Syndrome (IBS). Group education delivered by a dietitian have been shown to be an effective way to teach the low FODMAP diet. The aim of this study is to evaluate two pilot group education sessions being held in the community. This will help us to determine if dietary advice for the low FODMAP diet can be provided in a group in the future.

Who is funding this project?
The University of Otago is funding this project.

Who are we seeking to participate in the project?
We are seeking approximately 30 males and females aged 18 and over who are currently attending general practice and have not already been provided with advice on the low FODMAP diet. To be eligible to participate you must:
- Be aged 18 or over
- Have a clinical diagnosis of IBS
- Understand English
- Have no other gastrointestinal disorder such as coeliac, inflammable bowel disease, or other uncontrolled medical condition as assessed by nurse.
If you participate, what will you be asked to do?
You will be asked to fill out two questionnaires before the education session and again after you have followed the low FODMAP diet for 6 weeks. One questionnaire will assess your IBS symptoms and the other questionnaire will assess quality of life factors. Each questionnaire will take approximately 5-10 minutes to fill out. After the education sessions, you will be asked to share your experience in implementing the low FODMAP diet by phone call. Participation is entirely voluntary and you may withdraw at any time.

Is there any risk of discomfort or harm from participation?
Our study is purely observational and the nature of the questionnaires relate to the foods you eat and the possible gastrointestinal symptoms you may experience. Our extensive experience using these questionnaires suggests that psychological harm is highly unlikely.

What specimens, data or information will be collected, and how will they be used?
No tissues, bloods or specimens will be collected. The only data collected will be from the two questionnaires about your IBS symptoms and quality of life.

Data will be stored for 10 years and your anonymity and confidentiality will be maintained. If this data is useful for future research around the management of IBS, you will have the opportunity to consent, or refuse consent for that to happen.
The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve your anonymity.

What about anonymity and confidentiality?
All data will be kept anonymous. You will be assigned a study number and this will identify all data. Data will be kept locked in a filing cabinet in the investigator’s office. All data entered on spreadsheet will be kept on password protected computers and only accessible by the research team members.

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, please feel free to contact either:

<table>
<thead>
<tr>
<th>Dr Paula Skidmore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researcher</td>
</tr>
<tr>
<td>Department of Human</td>
</tr>
<tr>
<td>Nutrition</td>
</tr>
</tbody>
</table>

Email address: paula.skidmore@otago.ac.nz

<table>
<thead>
<tr>
<th>Dorcas Chan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master of Dietetic students</td>
</tr>
<tr>
<td>Department of Human Nutrition</td>
</tr>
</tbody>
</table>

Email address: chado698@student.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
Appendix D

Consent form

Investigating the effectiveness of a dietitian led group class teaching the low FODMAP diet for patients with IBS

Principal Investigator: Professor Richard Geary. (richard.geary@cdhb.govt.nz (03) 364 0640)

CONSENT FORM FOR PARTICIPANTS
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 the questionnaires will explore the symptoms and quality of life with IBS 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.
7. I know that I will be asked to share my experiences with the low FODMAP diet and 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.
Appendix E

Information sheet for patients

Group education on the Low FODMAP Diet

Participant Information Sheet

You have been referred to a group education programme on the low FODMAP diet.

The low FODMAP diet is an eating plan that helps improve symptoms in three out of four people with Irritable Bowel Syndrome (IBS). Symptoms that may improve on a low FODMAP diet include:

- Pain or discomfort in your stomach
- Bloating or swelling in your stomach
- Diarrhoea
- Variable bowel habit alternating between diarrhoea and constipation
- Too much wind

What's involved?

- This is a pilot programme and you will be asked to participate in an evaluation.
- The group education session is 1½ hours long and will be delivered by a dietitian. You will learn how to follow a low FODMAP diet. You will receive written information about foods to include and avoid, a shopping guide, a meal plan and recipes.
- If your IBS symptoms go away or improve after 6 weeks on a low FODMAP diet you will be invited to attend a 1 hour follow-up group education session. This will also be delivered by a dietitian and will cover how to re-introduce FODMAP foods and follow a modified low FODMAP diet.
- If your IBS symptoms don’t go away or improve after six weeks you will be advised to return to eating normally and see your doctor for review.

What happens next?

We will contact you to enrol you in a group. The first education session will be held during the day in the 4th week of July. The session will be held in a community venue and there will be no more than 12 people in the group. You are welcome to bring a support person. The education sessions are funded by the Canterbury District Health Board so there is no cost for you to attend.

If you require further information please contact the Referral Coordinator:

03 364 4199

CIAadmin@cdhu.health.nz

Sally Watson
Dietitian Liaison, Canterbury Initiative
Appendix F

Information sheet for general practices

Group education on the Low FODMAP Diet

General Practice Information Sheet

The Canterbury Initiative is reviewing the feasibility and effectiveness of dietitian-led group education of the low FODMAP diet in adults diagnosed with irritable bowel syndrome (IBS).

Two free education programmes, with a maximum of 12 people per programme, will be held late July 2018.

To be eligible to attend group education patients must be aged 18 and over and have:

- IBS with diarrhoea, or IBS with alternating diarrhoea and constipation, and
- Negative blood tests for coeliac disease

Please refer to referral form for exclusions.

Details of education programme:

1. Eligible participants will be invited to attend a free 60 minute group education session about the low FODMAP diet. The session will be held during the day and will be delivered by a dietitian. Participants will receive written information about safe and eliminated foods, a shopping guide, a meal plan and recipes.
2. After six weeks on a low FODMAP diet, participants with significant improvement in their IBS symptoms will be invited to attend a free 60 minute follow-up group education session. This will be delivered by a dietitian and will cover how to re-introduce FODMAP groups and transition to a modified low FODMAP diet.
3. Participants who don’t have significant improvement after six weeks on a low FODMAP diet will be discharged back to their general practitioner for review.
4. This is a pilot programme and participants will be asked to participate in an evaluation.

Referral process:

1. Give your patient the attached Information Sheet.
2. Complete the attached referral form and send to the Canterbury Initiative.

If you require further information please contact the Referral Coordinator:

📞 03 364 4199
✉️ CAdmin@cdhb.health.nz

Sally Watson
Dietitian Liaison, Canterbury Initiative

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Appendix G

Referral form

Referral to Group Education on the Low FODMAP Diet

<table>
<thead>
<tr>
<th>Patient Details</th>
<th>Referral Date</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Surname:</td>
<td></td>
</tr>
<tr>
<td>Gender:</td>
<td></td>
</tr>
<tr>
<td>☐ Male</td>
<td>☐ Female</td>
</tr>
<tr>
<td>DOB</td>
<td></td>
</tr>
<tr>
<td>Ethnicity:</td>
<td>Email:</td>
</tr>
<tr>
<td>Address:</td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Mobile:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Referrer Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Referrer:</td>
</tr>
<tr>
<td>☐ Practico Nurse</td>
</tr>
<tr>
<td>Office name:</td>
</tr>
<tr>
<td>Contact Ph:</td>
</tr>
<tr>
<td>Email:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg):</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

To be eligible to attend the group education programme participants must be aged 18 and over and have one of the following. Please tick

- IBS with diarrhoea and negative blood tests for coeliac disease
- IBS with alternating diarrhoea and constipation and negative blood tests for coeliac disease

Exclusions

- IBS with diarrhoea or IBS with alternating diarrhoea and constipation and one or more of the following:
  - Co-existing coeliac disease, ulcerative colitis, Crohn’s disease or any other co-morbidity as assessed by the investigator conducting the review
  - BMI ≤ 16.5 or ≥ 35
  - Unintentional weight loss (loss of ≥ 10% (or ≥ 5% with a BMI ≤ 20), in past 3 to 6 months)
  - Limited English language comprehension
  - Living in residential care, supporting living or university halls of residence
  - Previous dietary supervision on the Low FODMAP diet
- IBS with constipation only
- Type 1 or 2 diabetes
- Bowel resection

Signed:...........................................................................
Appendix H

PowerPoint slides – First education session

(Not to be used without expressed permission, intellectual property of CDHB)
Study outline

- Background
- Two stages
  - Elimination
    - Questionnaire completed and returned
  - Challenge/reintroduction

What is Irritable Bowel Syndrome?

- Common disorder that affects the normal function of your bowel
- Symptoms include:
  - Lower abdominal pain
  - Bloating/distention
  - Excessive wind
  - Altered bowel habits (diarrhoea and/or constipation)
- IBS treatments include:
  - Diet (low FODMAP) and lifestyle changes
  - Medication
FODMAPs

- Fermentable — broken down by bacteria in the large bowel
- Oligosaccharides — fructans and galactans
- Disaccharides — lactose
- Monosaccharides — fructose
- And
- Polyols — sugar alcohols sorbitol, mannitol and xylitol

Following a low FODMAP diet has been shown to help 75% of people with IBS by managing their symptoms.

The low FODMAP diet

- Avoid foods that are high in FODMAPs to see if symptoms improve
- The short term diet is implemented in three stages —
  - Elimination
  - Challenges
  - Long term modification

GOAL
Identify which FODMAP groups cause IBS symptoms and use this information to create a personalised eating plan.

Eliminating FODMAPs from the diet

- First phase of the low FODMAP diet
  - Determines if eliminating FODMAPs from the diet makes a difference in symptoms
  - Need to be able to restrict diet for 6 weeks
  - Access to accurate resources — FODMAP Friendly or Monash smart phone app, food lists (provided)
Gluten-free V low FODMAP diet
- Gluten is a protein found in wheat, rye, oats and barley
- FODMAPs are carbohydrates found in a variety of foods
- People with IBS notice an improvement in symptoms on a gluten-free diet
- BUT research shows this is due to the reduction in FODMAPs since gluten and FODMAPs co-exist in grain and cereal foods

<table>
<thead>
<tr>
<th>GLUTEN</th>
<th>FRUCTANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>Wheat</td>
</tr>
<tr>
<td>Barley</td>
<td>Barley</td>
</tr>
<tr>
<td>Rye</td>
<td>Rye</td>
</tr>
<tr>
<td>Spelt</td>
<td>Spelt</td>
</tr>
<tr>
<td>Oats</td>
<td></td>
</tr>
</tbody>
</table>

Dairy-free V Lactose-free
- Lactose intolerance is often confused with milk allergy
- People with lactose intolerance can tolerate small amounts BUT with a milk allergy small amounts cause symptoms
- Low FODMAP diet – it’s ok to have lactose-free cows milk and cheese

Food allergy V food intolerance
- True food allergy involves the immune system and symptoms range from mild to life threatening
- It only takes a tiny bit of food to trigger an allergic reaction
- Food intolerance involves the digestive system, not your immune system
- You may still be able to eat small amounts with an intolerance
- Symptoms of intolerance take longer to show up than an allergy making it hard to identify the trigger food

Timing of symptoms
- It takes approximately 6-24 hours for food that is eaten to arrive in the large bowel (intestine)
- FODMAPs cause symptoms in the large bowel when they are fermented by bacteria
- When considering if a food is an issue, pay attention to delayed symptoms
Meal plan - Breakfast
- Porridge and lactose-free milk
- Gluten-free cereal (cornflakes, rice bubbles, GF Weet-bix)
- Gluten-free toast with suitable spread (vegemite, strawberry jam or peanut butter)
- Poached, boiled or scrambled egg with gluten-free toast
- Smoothie made with lactose-free milk and suitable fruit

Meal plan - Lunch
- Gluten-free sandwich made with ham, chicken, fish, egg or cheese AND salad vegetables (lettuce, carrot, cucumber, tomato)
- Rice or corn crackers topped with suitable toppings such as hard cheese, meat, salad vegetables, Vegemite, peanut butter
- Soup (using low FODMAP vegetables) with gluten-free bread
- Baked potato with meat/cheese AND low FODMAP salad
- Frittata and low FODMAP salad
- Gluten-free pizza with low FODMAP vegetable toppings
- 1 serve of suitable fruit

Meal plan - Dinner
- Meat, fish, chicken, tofu or eggs with rice, potato or gluten-free pasta AND suitable vegetables or a low FODMAP salad
- Dessert if required -
  - Rice pudding or custard (made with lactose-free milk)
  - Sorbet (made from suitable fruit)
  - 1 serve of suitable fruit

Meal plan - Snacks
- 1 serve of suitable fruit
- Small handful of suitable nuts or seeds
- Almond yoghurt
- Plain popcorn or pretzels
- Gluten-free baking
- Crispbreads with low FODMAP spread or cheese
- Hard boiled egg
Drinks
- Water
- Lactose-free milk
- Tea
- Coffee
- Hot chocolate

Activity
In a small group, discuss what you think you might have for breakfast, lunch, and dinner.

Adding flavour without the FODMAPs
- Asafoetida powder (or hing)
- Chives
- Chilli
- Green part of spring onions or leek
- Garlic infused oil
- Low FODMAP spice – all spice, cinnamon, cumin, curry powder, chilli powder, paprika
- Low FODMAP herbs – basil, coriander, parsley, rosemary, tarragon, thyme, curry leaves, lemongrass
- Lemon and lime juice
- Pure maple syrup

Eating out options
- Look at the menu online
- Know your worst triggers so you can exclude them
- Gluten-free meals can work if they exclude your worst triggers
- Sauce dishes often contain garlic and onion so avoid these
- Soups and risottos often contain garlic and onion
- Choose a meal that has fish, meat, chicken with suitable vegetables/salad and potato or rice on the side
Label reading for FODMAPs
- Ingredients are listed in order of weight, from high to low, so if a FODMAP appears near the start of the list, avoid that food.
- Gluten-free products are often low in FODMAPs, but not always. Check for onion/garlic, honey, dried fruit, and fruit juice.

Activity 2: Label reading – let’s have a go

Low FODMAP products available

Bread options
- Gluten-free bread
- 100% spelt bread
- Corn/coat and rice bread
- Sourdough bread (wheat) is a great option:
  - Tanner Street Bakery
  - Vic’s
  - Copenhagen Bakery
Resources available

- MONASH or FODMAP Friendly smart phone app
- A Little Bit Yummy website

Eat your way back to great health

Dietitian approved low FODMAP recipes and resources.

Other important factors

- Following the low FODMAP diet is only part of the puzzle
- What we do, how we eat and the amount we eat can also help

Healthy eating and lifestyle advice

- How you eat (not just what you eat) can help improve symptoms
- Eat regular meals
- Always sit down to eat
- Eat slowly
- Watch portion sizes
- Eat a variety of healthy foods
- Drink plenty of fluid
- Be active
- Manage stress level
Push play on being active
- Sit less, move more!
- Do at least 2 1/2 hours of moderate or 1 1/4 hours of vigorous physical activity spread throughout the week
- For extra health benefits, aim for 5 hours of moderate or 2 1/2 hours of vigorous physical activity spread throughout the week
- Do muscle strengthening activities on at least 2 days each week
- Doing some physical activity is better than doing none

Healthy eating guidelines
- Enjoy a variety of nutritious foods including:
  - Plenty of vegetables and fruit
  - Grain foods
  - Some milk and milk products
  - Some legumes, nuts, seeds, fish, seafood, eggs, chicken or red meat

The Healthy Plate
Appendix I

PowerPoint slides- Second education session

(Not to be used without expressed permission, intellectual property of CDHB)
FODMAPs Reintroduction

Well done on surviving the elimination phase of the low FODMAP diet!

The end goal

- Low FODMAP diet
- Challenge phase
- Modified low FODMAP diet for long-term self-management of IBS symptoms

Food challenge and modification

- Why challenge?
- How to challenge – the plan and challenge foods
- Symptoms
- Managing symptoms
- Moving to a modified low FODMAP diet
- Life after food challenges
**Why challenge?**

- **Social reasons** – over restrictive diets can affect your mental health and it can be difficult to follow when eating out
- **Balanced diet** – improving food variety ensures nutritional adequacy in the long term
- **Gut health** – FODMAPs have a prebiotic effect which means they promote the growth of good bacteria in the gut, which can have a positive effect on gut health and mood

---

**How to challenge**

- Continue on the low FODMAP diet
- Test one FODMAP group per week
- Keep a record
- **8 challenges in total** – lactose, sorbitol, mannitol, fructose, fructans (x3), and galactans
- Remember you are testing the FODMAP not the food

---

**What a challenge looks like**

<table>
<thead>
<tr>
<th>DAY</th>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
<th>SATURDAY</th>
<th>SUNDAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge Day</td>
<td>Low FODMAP diet</td>
<td>Monitor symptoms</td>
<td>Medium challenge FODMAP dose</td>
<td>Monitor symptoms</td>
<td>Low FODMAP diet</td>
<td>Challenge day</td>
<td>Low FODMAP diet</td>
</tr>
</tbody>
</table>

- Start with a small dose and increase to a large dose
- If no or mild symptoms continue
- If severe symptoms stop
- Eat the challenge dose in one go, preferably early evening at home
- Limit alcohol and caffeine

---

**The FODMAP challenge foods**

<table>
<thead>
<tr>
<th>Food Group</th>
<th>FODMAP Challenge</th>
<th>Recommended Alternatives for PSC patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Veggies</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Grains</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Beans</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Legumes</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Pulses</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Nuts</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Seaweed</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Mushrooms</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Almonds</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Sunflower</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Sesame</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Flax</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Chia</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Hemp</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Quinoa</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Amaranth</td>
<td>Low FODMAP level</td>
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</tr>
<tr>
<td>Soba</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Brown Rice</td>
<td>Low FODMAP level</td>
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<tr>
<td>Rice</td>
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<tr>
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</tr>
<tr>
<td>Flax Seeds</td>
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<td></td>
</tr>
<tr>
<td>Chia Seeds</td>
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<td></td>
</tr>
<tr>
<td>Hemp Seeds</td>
<td>Low FODMAP level</td>
<td></td>
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<tr>
<td>Quinoa Seeds</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Amaranth Seeds</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Soba Seeds</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Brown Rice Seeds</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Rice Seeds</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
<tr>
<td>Oats Seeds</td>
<td>Low FODMAP level</td>
<td></td>
</tr>
</tbody>
</table>
Timing of symptoms

- It takes approximately 6-24 hours for food that is eaten to arrive in the large bowel (intestine).
- FODMAPs cause symptoms in the large bowel when they are fermented by bacteria.
- When testing each FODMAP, pay attention to delayed symptoms.

Writing it all down

<table>
<thead>
<tr>
<th>FODMAP</th>
<th>Challenge food</th>
<th>Amount</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Interpreting your challenges

- If you get severe symptoms during a food challenge, **STOP**.
- **Don’t panic** – it’s a positive thing that you’ve found a trigger food, it means you can actively manage it.
- Return to the low FODMAP diet and wait 3 days for symptoms to pass.
- Treat symptoms –
  - Relaxation techniques – mindfulness, hot bath, yoga
  - Heat packs
  - Plenty of water
- If your symptoms are severe and ongoing see your doctor.

Symptoms to a small dose – This FODMAP is a major trigger

Symptoms to a medium dose – This FODMAP is tolerated in small doses occasionally

Symptoms to a large dose – This FODMAP is well tolerated in small/medium doses but large doses may push you over your limit.
Life after the food challenges

- After testing all the FODMAP groups, many people find they can eat normally, only restricting large amounts of a few high FODMAP foods.
- You will begin to know how often and what combination of foods are right for you – this is known as the modified FODMAP diet.
- Thresholds change over time so keep retesting/challenging.
- Stress affects symptoms.
Appendix J

First education session handouts (examples, not to be used without expressed permission)

Low FODMAP diet

So you’ve just got up to speed with everything there is to know about FODMAPs. But right about now you’re probably scratching your head wondering what there is left to eat? The answer is plenty of delicious and nutritious food!

We’ve put together this guide for you which will walk you through the elimination process and show you all the foods you can still enjoy for the next 6 weeks.

Eliminating FODMAPs

The most important thing to know is that a low FODMAP diet is not intended for life. The aim of the diet it to help you understand your food triggers and help you gain control of your symptoms. To kick things off, you first dramatically reduce your intake of high FODMAP foods and in turn you should reach your optimal level of symptom control. And after 6 weeks we’ll guide you to strategically bring in high FODMAP foods to learn what is your tolerance level - this part is covered in our second training session.

How to carry out the elimination phase

1. Grab a highlighter and go through the tables below and work out what you can eat. Focus on the foods that you already know you like. And why not select a few that you’d be willing to try too!
2. From the foods you’ve highlighted, jot down a few meals you could make with these. Remember there are loads of yummy recipes available online –
   - www.alittlebityummy.com
   - www.healthyfood.co.nz
   - www.monashfodmap.com/blog/monash-low-fodmap-recipe-index
3. Create a shopping list so you’ve got all the food you need to successfully follow a low FODMAP diet.
4. If you’re savvy with Apps, you could download either the MONASH app or FODMAP Friendly one. These apps are an easy guide to which foods are low and high in FODMAPs.

5. Make it habit to check the food labels. Look for all those sneaky high FODMAP ingredients such as sugar alcohols, inulin/chicory and onion and garlic in any form.

6. Don’t forget that it’s not just about what you eat, but how you eat! So don’t forget to—
   - Eat regular meals and a variety of healthy foods
   - Always sit down to eat
   - Eat slowly
   - Watch portions sizes (remember the plate model and hand guide we covered)
   - Drink plenty of fluid
   - Be active and manage those stress levels!

Good luck with the elimination phase! We’ll see you again soon (hopefully with an improvement in your symptoms) to cover reintroducing FODMAPs back into your life.
<table>
<thead>
<tr>
<th>FOOD</th>
<th>EAT FREELY</th>
<th>LIMIT</th>
<th>AVOID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread</td>
<td>Gluten-free bread, corn/oat/rice bread, 100% spelt bread, some sourdoughs</td>
<td>Cornflakes (1 cup), rice bubbles (1 cup), porridge (½ cup dry oats)</td>
<td>Wheat-based breads, flat bread, pita bread, rye bread</td>
</tr>
<tr>
<td>Breakfast cereals</td>
<td>Gluten-free cereals Check for unsuitable dried fruit and honey</td>
<td></td>
<td>Wheat-based cereals, gluten-free cereals that contain honey or dried fruit, wheat bran</td>
</tr>
<tr>
<td>Pasta</td>
<td>Gluten-free pasta, rice, millet or corn pasta</td>
<td></td>
<td>Wheat or spelt pasta</td>
</tr>
<tr>
<td>Noodles</td>
<td>Gluten-free pasta, rice noodles, buckwheat noodles</td>
<td>2-minute noodles, Udon noodles, egg noodles</td>
<td>Most cakes, muffins, crumpets, scones, croissants, puddings</td>
</tr>
<tr>
<td>Cakes and baked items</td>
<td>Gluten-free cakes, gluten-free biscuits, flourless cakes, cornflour sponge, friands</td>
<td></td>
<td>Most cakes, muffins, crumpets, scones, croissants, puddings</td>
</tr>
<tr>
<td>Crackers</td>
<td>Corn thins, rice cakes, rice crackers Check for onion &amp; garlic powder</td>
<td></td>
<td>Wheat based crackers, Ryvita</td>
</tr>
<tr>
<td>Pastry</td>
<td>Gluten-free pastry, or eat the filling only</td>
<td></td>
<td>Wheat based pies, pastry (flaky, short crust, puff, filo)</td>
</tr>
<tr>
<td>Grains</td>
<td>Rice, buckwheat, polenta (cornmeal), millet, quinoa, sago, sorghum, tapioca</td>
<td>Oats (¼ cup)</td>
<td>Amaranth, wheat, barley, bulghur, cous cous, rye, semolina, freekah</td>
</tr>
<tr>
<td>Flours</td>
<td>Buckwheat flour, cornflour, corn starch, maize flour, millet flour, oat bran, oat flour, polenta, potato flour, quinoa flour, rice</td>
<td>Chickpea flour, lentil flour, pea flour, soy flour (all in small amounts)</td>
<td>Almond meal, amaranth flour, barley flour, coconut flour, lupin flour, rye flour, spelt flour, wheat bran, wheat flour, wheat</td>
</tr>
<tr>
<td>FOOD</td>
<td>EAT FREELY</td>
<td>LIMIT</td>
<td>AVOID</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>bran, rice flour, sorghum flour, spelt flour, tapioca flour, teff flour, yam flour</td>
<td></td>
<td></td>
<td>germ</td>
</tr>
<tr>
<td>Meat, chicken, fish, eggs</td>
<td>All fine in unprocessed state</td>
<td>Sausages with onion/garlic, avoid stuffings, marinades with garlic or honey</td>
<td></td>
</tr>
<tr>
<td>Plain tofu</td>
<td>Canned chick peas (¼ cup), canned lentils (½ cup), boiled red/green lentils (¼ cup), edamame – young soy beans (1 cup), tempeh (100g)</td>
<td>Baked beans, kidney beans, soy beans, haricot beans, lentils, hummus, borlotti beans, butter beans, lima beans, split peas, black beans, silken tofu</td>
<td></td>
</tr>
<tr>
<td>Blueberries, raspberries, strawberries, lemon, lime, mandarin, orange, tangelo, grapes, kiwifruit, honeydew, passionfruit, pineapple, quince, rhubarb</td>
<td>Grapefruit (¾), banana (1/3), lychee (&lt;5)</td>
<td>Apples, apricots, blackberries, blackcurrants, boysenberries, cherries, feijoa, figs, mango, nectarines, pears, nashi pears, peaches, persimmon, plums, pomegranate, prunes, tamarillo, watermelon</td>
<td></td>
</tr>
<tr>
<td>Fruit – fresh or frozen</td>
<td>Limit to 1 serve of fruit per meal or snack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dried fruit</td>
<td>Banana chips (10)</td>
<td>Apples, apricots, cranberries, currants, dates, figs, mango, paw paw, pears, pineapple, prunes, raisins, sultanas</td>
<td></td>
</tr>
</tbody>
</table>
Appendix K

Second education session handouts (not to be used without expressed permission)

FODMAP challenge and reintroduction

Well done on getting through the elimination phase of the low FODMAP diet. If your IBS symptoms have calmed down, it’s now time for the most important challenge of all. The FODMAP food challenges! This part will help you identify your FODMAP friends and your trigger foods and how much of these foods are a problem.

Why challenge the FODMAPs?
We all know being on a restrictive diet is no fun – it’s socially isolating and makes dining out that extra bit trickier. Reintroducing some high FODMAP foods back into your meals means you’ll have a greater variety of food to choose from. This will help your food choices to remain nutritionally adequate in the long term. Win win!

Also, gut bacteria love FODMAPs! They use them as fuel which encourages good bacteria growth which in turn promotes good gut health.

How to carry out the FODMAP food challenges
Over the last 6 weeks you’ve successfully eliminated FODMAPs from your diet. So how do you go from eliminating them to reintroducing them? The answer is one by one and carefully. Here’s a step-by-step guide that will make the process less daunting for you.

Summary of the weekly food challenge

<table>
<thead>
<tr>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
<th>SATURDAY</th>
<th>SUNDAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low FODMAP diet PLUS</td>
<td>Low FODMAP diet</td>
<td>Low FODMAP diet PLUS</td>
<td>Low FODMAP diet</td>
<td>Low FODMAP diet PLUS</td>
<td>Low FODMAP diet</td>
<td>Low FODMAP diet</td>
</tr>
<tr>
<td>challenge food</td>
<td>diet</td>
<td>challenge food</td>
<td>diet</td>
<td>challenge food</td>
<td>diet</td>
<td>diet</td>
</tr>
<tr>
<td>Small FODMAP dose</td>
<td>Monitor symptoms</td>
<td>Medium FODMAP dose</td>
<td>Monitor symptoms</td>
<td>Large FODMAP dose</td>
<td>Monitor symptoms</td>
<td>Monitor symptoms</td>
</tr>
</tbody>
</table>
Food challenge step-by-step guide

1. Read all the information in this leaflet before you start a challenge.
2. Continue on the low FODMAP diet and test just one FODMAP group per week (there are 8 group challenges to complete). You need to be symptom free for at least three days before you start testing the next FODMAP group.
3. Use the Challenge Foods List on page 4. These foods have been chosen as they contain only one type of FODMAP. You can do the challenges in any order.
4. Use the template provided to record the challenge food, amount you ate and any symptoms.
5. Every second day you increase the amount of the FODMAP you’re eating from just a small amount to a large amount. The large amount is designed to push you to your limit so you might find you can tolerate a small amount but not a large amount.
6. If you have no or mild symptoms, continue with the challenge but if you have severe symptoms, stop. You’ll need to avoid food high in the FODMAP you tested and wait at least three days with no symptoms before you carry on with the other FODMAP challenges.
7. Make sure you eat all of the challenge food in one sitting, preferably in the early evening when you’re at home.
8. Don’t drink too much alcohol and caffeine during the challenge phase as this could cause gut symptoms.
9. Once you have finished testing a food, do not add it back into your diet until you have finished testing all the FODMAP groups.

A note about symptoms

- If you have no symptoms you can reintroduce these foods once you finish testing all the FODMAPs.
- If you have mild symptoms you can carry on with the challenges in the doses stated.
- If you have severe symptoms then these foods will remain out of your diet to keep you symptoms under control in the long run.
- Your tolerance levels can change over time so if you react to a particular FODMAP group, challenge again in 6-12 months’ time.
## Challenge foods and amounts

<table>
<thead>
<tr>
<th>FODMAP challenge</th>
<th>Recommended challenge food (select one)</th>
</tr>
</thead>
</table>
| Fructose         | • 1 teaspoon honey increasing to 2 tablespoons of honey  
|                  | • ¼ medium sized mango (fresh or canned in syrup) increasing to 1 medium sized mango  
| Lactose          | • ½ cup of milk increasing to 1 ½ cups  
|                  | • ½ cup of yoghurt* increasing to 1 cup  
|                  | *Watch for FODMAP ingredients such as honey or fruit in the yoghurt  
| Sorbitol         | • ¼ avocado increasing to a whole avocado  
|                  | • 1 fresh apricot – use the same serving size for each test day as apricots also contain fructans in larger serves  
|                  | • 3 sugar free mints (that contain sorbitol) increasing to 9 mints  
| Mannitol         | • ½ Portobello mushroom increasing to 1 large mushroom  
|                  | • ¾ cup kumara increasing to 1 ¾ cup serve  
|                  | • ¼ cup cooked cauliflower increasing to ¼ cup serve  
| Fructans - wheat | • 1 slice wheat bread increasing to 3 slices wheat bread  
|                  | • ½ cup wheat pasta (cooked) increasing to 1 ½ cups wheat pasta  
| Fructans – garlic and leek | • ¼ clove of garlic increasing to 1 clove of garlic  
|                  | • ¼ medium leek increasing to ½ whole leek (white and green section)  
| Fructans – onion | • 1 tablespoon onion increasing to ½ medium onion  
| Galactans        | • ¼ cup canned chickpeas, kidney beans or black beans increasing to ¾ cup  
|                  | • 15 almonds increasing to 25 nuts  

*Written by Project Dietitian Canterbury Initiative  
Canterbury District Health Board, June 2018*
### Example of FODMAP challenging template

#### FODMAP: Fructose

**Challenge food:**

<table>
<thead>
<tr>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
<th>SATURDAY</th>
<th>SUNDAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge day</td>
<td>Low FODMAP diet</td>
<td>Challenge day</td>
<td>Low FODMAP diet</td>
<td>Challenge day</td>
<td>Low FODMAP diet</td>
<td>Low FODMAP diet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount consumed</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Symptoms</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

#### FODMAP: Lactose

**Challenge food:**

<table>
<thead>
<tr>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
<th>SATURDAY</th>
<th>SUNDAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge day</td>
<td>Low FODMAP diet</td>
<td>Challenge day</td>
<td>Low FODMAP diet</td>
<td>Challenge day</td>
<td>Low FODMAP diet</td>
<td>Low FODMAP diet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount consumed</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Symptoms</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
Appendix L

SAGIS questionnaire

Structured Assessment of Gastrointestinal Symptoms

DATE / / 

Thank you for completing the following questionnaire, which is designed to determine the presence and severity of a range of gastrointestinal symptoms over the past week.

Please mark the appropriate response with a tick ✔. Please choose one box only.

The questionnaire should take you no more than 10 minutes to complete.

If you have any questions regarding the questionnaire, please email Dorcas Chan: chado698@student.otago.ac.nz

Please bring your completed questionnaires to the group education session.

<table>
<thead>
<tr>
<th>Questions will be assessed using a five point scale - choose one response per question.</th>
<th>0 = No problem</th>
<th>No problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = Mild problem</td>
<td>Can be ignored when you do not think about it</td>
<td></td>
</tr>
<tr>
<td>2 = Moderate problem</td>
<td>Cannot be ignored, but does not influence daily activities</td>
<td></td>
</tr>
<tr>
<td>3 = Severe problem</td>
<td>Influences your concentration on daily activities</td>
<td></td>
</tr>
<tr>
<td>4 = Very severe problem</td>
<td>Markedly influences your daily activities and/or requires rest</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No Problem</td>
<td>Mild</td>
</tr>
<tr>
<td>---</td>
<td>------------</td>
<td>------</td>
</tr>
<tr>
<td>1</td>
<td>Belching with acid taste / heartburn / burning sensation in the oesophagus (tube joining mouth and stomach)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Dysphagia (difficulty swallowing)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fullness (feeling of congestion of food without relation to prior food intake) even long after you have stopped eating</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Early satiety (stomach is overfilled soon after starting to eat, disproportional to the quantity of food taken, so that food cannot be finished)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Postprandial pain or discomfort (upper abdominal symptoms start or get worse after meals)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Epigastric pain / upper abdominal pain (pain between the belly button and chest / pain in the upper abdomen)</td>
<td></td>
</tr>
<tr>
<td>No Problem</td>
<td>Mild</td>
<td>Moderate</td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>7 Retrosternal discomfort (unpleasant feeling behind the middle of the chest)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8 Pain or discomfort prior to bowel movement</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9 Pain or discomfort that is relieved by a bowel movement</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9 Difficulty with emptying the bowel</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10 Constipation</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11 Hard bowel movements</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11 Loose bowel movements</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>12 Incontinence</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>13 Urgency to empty the bowel</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>14 Diarrhoea</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>15 Loss of appetite</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>16 Abdominal cramps (stomach pain without specified localisation)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No Problem</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>------------</td>
</tr>
<tr>
<td>17</td>
<td>Sickness (discomfort combined with the impression for the need to vomit)</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Nausea (urgent feeling of the need to vomit)</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Vomiting (vomiting of mucus and gastric contents, or strong unproductive retching)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Bloating (feeling of distension and excessive gas in the abdomen)</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Excessive gas and passing of wind</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Excessive belching</td>
<td></td>
</tr>
</tbody>
</table>

23. In your own words, what is your most important health concern or problem?

24. In your own words, what is your second most important health concern or problem?
<table>
<thead>
<tr>
<th>25</th>
<th>Do you suffer from?</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Headaches</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>B</td>
<td>Chronic Fatigue</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>C</td>
<td>Back pain</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>D</td>
<td>Depression</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>E</td>
<td>Sleep Disturbances</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>F</td>
<td>Anxiety Disorders</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Thank you for taking the time to complete this questionnaire. Your support is greatly appreciated.

Please bring your completed questionnaire to the group education session.
### Anxiety N

#### HADS questionnaire

**Hospital Anxiety and Depression Scale (HADS)**

| Surname: ______________________________ | Date: ______________________________ |

---

**Doctors are asked that emotions play an important part in most illnesses. If your doctor knows about these feelings he or she will be able to help you more.**

**This questionnaire is designed to help your doctor to know how you feel. Read each item below and underline the reply which comes closest to how you have been feeling in the past 7 days. Ignore the numbers printed at the edge of the questionnaire.**

**Don’t take too long over your replies, your immediate reaction to each item will probably be more accurate than a long, thought-out response.**

<table>
<thead>
<tr>
<th>A</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel tense or &quot;wound up&quot;</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

| I still enjoy the things I used to enjoy | |
| 0    |    |
| 1    |    |
| 2    |    |
| 3    |    |

| I get a frightened feeling as if something awful is about to happen | |
| 3    |    |
| 2    |    |
| 1    |    |
| 0    |    |

| As much as I always could | |
| 0    |    |
| 2    |    |
| 3    |    |

| Worrying thoughts go through my mind | |
| 2    |    |
| 1    |    |
| 0    |    |

| I feel cheerful | |
| 3    |    |
| 2    |    |
| 1    |    |
| 0    |    |

| I can sit at ease and feel relaxed | |
| 3    |    |
| 2    |    |
| 1    |    |
| 0    |    |

---

Now check that you have answered all the questions

**TOTAL**

---


Record from items originally published in Acta Psychiatrica Scandinavica, 63: 661-70.

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---

**HADS - New Zealand/English - Version of 30 Jan 17.**

**Last updated: 2017.**

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**116**
Appendix M
Eval forms

Group Education on the Low FODMAP Diet

Thank you for attending today’s session facilitated by Leigh O’Brien, dietitian.

We would really appreciate your feedback about the session. This will help us to ensure future sessions are useful for people with Irritable Bowel Syndrome (IBS).

Please read the statements below and circle the appropriate number.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The content was pitched at the right level</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2. The session was well paced within the allotted time</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3. Session length was just right</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4. Leigh was a good communicator</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5. The material was presented in an organized manner</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6. I feel confident about following a low FODMAP diet</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7. I would recommend this group education to other people with IBS.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8. Please rate the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Time of day</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>b. Parking</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>c. Meeting room</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>d. Acoustics</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>e. Slides</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>f. Hand-outs</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>g. The session overall</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>9. What did you most enjoy about the session?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. How could the session be improved?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>