Suffering and the Dimensionality of Medical Knowledge

A Critique of Evidence Based Medicine

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For the Love of Persons
And the Richness of Its Spirit
Abstract

Evidence Based Medicine (EBM) is a recent philosophy that is highly influential in medicine. EBM is centred on the notion that medical practice should be supported by rigorous clinical research. This thesis explores a “dimensional” framework of knowledge and argues EBM results in the exclusion of certain non-scientific knowledge forms. Since these knowledge forms are essential to the realisation of medicine’s goals, EBM is holding medicine back.

I frame the primary goal of medicine as to attend to suffering. There is a tendency to view the goal of medicine as the treatment of disease, but this fails to account for much of what occurs in practice. Suffering incorporates disease and also other humanistic aspects of medicine that may not be investigable in a scientific manner. Medical knowledge determines medical practice, so medicine must have knowledge of what suffering is to effectively attend to suffering. I propose a dimensional theory of knowledge that includes explicit, tacit, general and particular forms of knowledge. Explicated general knowledge includes the knowledge of science. Tacit knowledge is more readily enacted than articulated. Particular knowledge is knowledge that is applicable to specific circumstances and individuals. The existence of tacit and particular knowledge moderates the possibility and need for scientific justification and also means knowledge exists within the knower and not exclusively in abstracted forms.

EBM’s philosophical framework excludes tacit and particular knowledge in its selective recognition of explicit-generalised “evidence”. This means that EBM’s conception of knowledge is incomplete and is philosophically inadequate. Though EBM makes useful contributions to clinical research appraisal, its normative assertions of “what counts as knowing” in medicine obscures human suffering and so might harm practice. This thesis presents the foundations for an alternative philosophy to EBM that would see “EBM” reframed as “clinical epidemiology” as a remedy for EBM’s normative restriction of medical knowledge.
Acknowledgements

“And then the redneck doctor proclaimed, ‘Where is the evidence!?!’”

This has without doubt been the most mind expanding undertaking of my life so far and has given me the intellectual freedom to explore in a way that is often constrained by the demands of medical school.

I began this project with a vague unease that something was not quite right with EBM. Over the year an argument fell into place. My thoughts have been influenced by Cassell, who provided me with the rock, upon which Polanyi orchestrated what has been a paradigm shift in what it means for me to know. I am continually surprised by how his knowledge shows forth, and I am sure will continue to show forth in ways I have not at this point conceived.

I acknowledge my supervisors, Grant Gillett and Simon Walker, without whom the project would not have made it to this point. Grant’s wisdom has been invaluable, particularly in the formulation of an argument that would stand on its feet, and Simon’s well-placed criticism has helped to reign in a thesis that would have otherwise galloped into the sunset.

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I am indebted to my parents, for fostering my curiosity and encouraging critical thought. My father’s perspectives on health have inspired me to challenge the status quo - EBM has been rather apt in that regard.

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Chapter 1: Introduction

This thesis is about medical philosophy, conceptions of medical knowledge and their relevance to the goals of medicine. Medicine uses knowledge to achieve its goals. I will put forward a model for understanding medical knowledge and the various forms of knowledge that exist in practice. I will then use this model to critique Evidence Based Medicine (EBM), an influential philosophy in medical practice. EBM advocates the use of research evidence to guide medical practice. Although research evidence is a necessary form of medical knowledge, EBM’s claims rest on conceptualisations of knowledge that exclude certain other forms of knowledge that are also necessary to medical practice, which may be described as “subjective”. The model of knowledge I put forward is an attempt to unify what have been called “subjective” and “objective” knowledge under a single framework that can account for the importance of both. From this perspective, it becomes clear that the philosophy of EBM is not suitable for medicine.

Philosophy is sometimes regarded as being irrelevant to practical medicine, which is about knowing what works and getting the job done. I maintain that a sound philosophical understanding of the nature and purpose of medicine is just as necessary to success in medicine as technology. This is because fundamental to the achievement of medicine’s practical goals is knowing the job at hand and what determines if it is being done well. In chapter two I argue that the fundamental goal of medical practice is to relieve the suffering caused by sickness. Though medicine is highly diverse (compare, for example the different roles of a general practitioner, a surgeon, a public health specialist and so on), these apparently dissimilar professions are in united by the desire to relieve suffering. All of medicine can be reduced to this fundamental aim. That which is not concerned with human suffering is not medicine. Technological development may have caused a shift in focus from suffering to disease, and though the treatment of disease often results in the amelioration of suffering, disease and suffering are distinct.

1 Although I refer here to “subjective” and “objective” knowledge, the model of knowledge I will advocate rejects the possibility of objective knowledge (in the mind independent sense). This will be explained in chapter three.
Having established that the goal of medicine is to relieve suffering, it follows that to achieve its goal, medicine requires knowledge of suffering, i.e. how it is caused and how it can be relieved. Chapter three explores the nature of knowledge, and proposes two polar dimensions of knowledge. The first dimension draws from Polanyi’s description of *Personal Knowledge*, and his distinction between “explicit” and “tacit” knowledge. The second dimension is between “generalised” and “particular” knowledge. The resulting framework of knowledge unifies “objective” aspects of medical knowledge (e.g. that from clinical research) with aspects that are considered “subjective”, such as the wishes of individual patients, and shows how each have a role in determining medical decisions. The nature of scientific knowledge as something that is highly explicit and generalised is then explored along with examples of the kinds of knowledge important in medical practice and suffering.

An implication of the framework just outlined is that knowledge is “personal” and cannot exist independently of the knower, who must possess knowledge before they can use it. This feature of knowledge highlights the importance of the people who practice and *know* medicine. In chapter four I discuss how medical practice can be viewed as a discourse of knowledge, based on the ideas discussed in chapters two and three. This discourse includes four participants: the patient, the physician, clinical authorities and biomedical science.

Chapters five and six will specifically discuss EBM. The Evidence Based Medicine Working Group (EBMWG) introduced EBM in the 1992 paper, *Evidence Based Medicine – A New Approach to Teaching the Practice of Medicine*, where they outlined their philosophy, claiming it would usher in a “NEW paradigm for medical practice”. Since its inception, EBM has cemented itself within almost all aspects of medicine. Its influence is undeniable, and many at this time would find it hard to imagine any kind of *legitimate* medicine that is not “evidence-based”.

EBM highly values objective ideals of knowledge and emphasises the use of clinical research in guiding medical decisions. Chapter five will explore EBM as a philosophy with an inherent theory of knowledge. This theory will be elucidated and compared to the theory proposed in chapter three with the conclusion that EBM’s excludes both tacit

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and particular knowledge. Alongside EBM other philosophies have emerged that emphasise “subjective” factors in medicine, such as Patient Centred Medicine and Narrative Medicine. In response to these philosophies and criticisms, changes have been announced to EBM that appear to address original weaknesses. In my view, these changes are superficial and indicate that EBM is in crisis. In light of this, I argue “Evidence Based Medicine” is an inadequate model of clinical practice.

This argument for a shift away from Evidence Based Medicine is fully set out in chapter six, where I investigate how EBM plays out in practice through the practical framework in chapter four. EBM affects all those who participate in medical practice, particularly with respect to the kinds of knowledge that are considered legitimate. Specific consequences will be explored related to the primacy of “evidence” and the exclusion of tacit and particular knowledge forms. These suggest EBM is not aligned with medicine’s goal of ameliorating suffering and its discourse should be discontinued in the clinic, journals, policy rooms and the lecture theatre. Medical practice would be improved by the adoption of a framework of knowledge that is able to account for its tacit and particular nature and those aspects that are explicit and generalised, such as the one in this thesis. “EBM” as “clinical epidemiology” would resolve many issues EBM causes in practice, allowing it to make useful contributions related to clinical research appraisal without normative connotations of the nature of knowledge in medicine. In chapter seven I conclude by briefly recounting the overall discussion and indicating areas where it might be extended or developed through further inquiry.

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4 Stewart et al. (2003).
Chapter 2: Medicine as the Amelioration of Suffering

This chapter addresses philosophical aspects of medicine as a practical activity with its own ends. Medicine is about the care and good of the sick person, whatever that may involve. This in mind, medical practices can be evaluated as “good” or “bad” in terms of this end. Two ways of viewing the sick person will be discussed: (i) through the lens of disease and (ii) through the lens of suffering. Disease is a primarily scientific concept, explicitly defined and generalised in nature, but perhaps not an appropriate concept to frame a medical morality, as it excludes “subjective” elements of the patient’s predicament and their experience of care. Suffering is experiential and incorporates factors relevant to disease but also those concerned with “the good of the patient” that are excluded by a disease framework. This thesis holds that “good” practices in medicine are those that lead to the amelioration of patient suffering.6

The therapeutic and technological success of modern biomedical science may have caused a shift in the focus of medicine from the suffering of the individual sick person to the treatment of disease, which may be seen as separate to the person. This shift distances medicine from its true goals. EBM is based on the perceived superiority of “objective” forms of knowledge and contributes to this shift.

2.1 The Primacy of Praxis

Philosophy may be seen as something of little value to medicine. It is often perceived as predominantly metaphysical, using formal logic to deduce a priori truths. Medicine is different from philosophy (seen in this way) as it is inherently practical, and so philosophy may be dismissed as a flight of fancy. Medicine has its own system of knowledge, but its value comes not from having this knowledge but from its ability to restore health in real-world people.

A theoretical explanation legitimately strengthens our confidence in a given clinical procedure, but there is always more to timely, well-judged clinical practice than scientific theory can explain. What directly demonstrates its value is not its scientific foundation, but the record of its clinical performance. We may understand why it works in theory, but what matters is that it works in practice.7

6 Other possible ends exist that could be used to frame medicine’s goals. The point is that suffering incorporates the personal and experiential aspects that are excluded by a disease framework.

Toulmin investigates the role of postmodernism in medical philosophy by discussing a central theme in the early twentieth century, consisting of a series of critiques of Cartesian rationalism. Simplified, Cartesian rationalism attempts to establish comprehensive systems of knowledge based on permanent, universal systems of overarching principles. Part of this was the de-emphasis of “human” factors. A central project was the establishment of “necessary truths” by looking closely at the terms within propositions and their meanings. To reveal universal truths there must be universal meanings, so it was thought that propositions must be defined clearly in a way not open to interpretation (or “objectively”). Various methodologies were employed to do this, focussing on the logical structure of language.

In each case the unit of philosophical analysis – the unit of meaning – was not a local and timebound utterance, made at one place and time or another, in one situation or another, but a “proposition”: an abstract, timeless entity expressing in eternal terms the intellectual content of a statement or utterance. The outcome was as theoretical view of philosophy as one could want, whose validity was independent of all historical times and places.

Since the turn of the 20th century, there has been increasing awareness of the relevance of historical, political and social factors to philosophy. This represents a fundamental shift whereby philosophy was previously concerned with “de-situated” propositions but is now firmly “situated”, focussing on utterances made by people at certain times and places. As a result, the contexts of these utterances are inseparable from their meaning and become of interest to philosophy. Toulmin argues the philosophical programme initiated by Descartes saw philosophers seek out theoretical problems at the expense of practical wisdom. Postmodernism reverses this emphasis.

In the *Nichomachean Ethics*, Aristotle compares theoretical rationality, *episteme*, concerned with things that are universal and unchanging, with practical rationality, *phronesis*, which is concerned with the particularities of an individual circumstance. This contrast is similar to theory versus practice, medicine being one of the examples Aristotle and others have used to demonstrate *phronesis*.

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8 Ibid.
9 Ibid.
10 Ibid.
Medicine is primarily practical but is informed by the theories of biomedical science. Central to science is its dis-interest in human factors (e.g. value), the idea being that this allows science to be “objective”. Toulmin notes that in biomedical science, issues are framed by contrasting function and malfunction and that “however “factual” and “objective” the methods that physiologists employ, the core questions from which their research throws light have to do – evaluatively – with “good” or “bad” bodily functioning.”[13] This feature helps to guide biomedical science to ensure it is useful for medicine, where these concerns are central. He also highlights that although physiological discoveries may be “objective” and “scientific”, their bearing on the clinical condition of any individual patient is a matter of judgement with reference to the particular set of circumstances present in the case and what is wrong with the patient.

Toulmin rejects Cartesian foundationalist ideals, and calls for a medical philosophy grounded in practice where “what is done” in medicine is what matters philosophically (not “why it is done”). He deemphasises the relevance of any theory of practice, as this would signal a return to the primacy of theory that predominated under the Cartesian paradigm. I agree that medical philosophy should focus on practice, however I also stipulate that a theoretical understanding of medicine’s fundamental goals is required to know whether practice is “good” or “bad”.

### 2.2 Importance of Telos

Pellegrino agrees with Toulmin[14] that medical philosophy needs to focus on practice. However, he disagrees that medical philosophy should completely reject foundationalism and believes the practice-theory dichotomy is not clear-cut:[15]

> “Praxis without theory usually ends up conceptually impoverished and verges on empiricism; theory without practice has no anchor in reality and verges on flights of fancy.”[16]

Pellegrino advocates a medical philosophy grounded in praxis that is also informed by fundamental principles. Not Cartesian foundationalism where all knowledge can be derived axiomatically, but a “soft” foundationalism where some principles underpin

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14 Ibid.
15 Pellegrino, E. Ibid.
16 Ibid.
praxis (e.g. the sanctity of life). Pellegrino notes that praxis justified solely in practice risks becoming distorted, citing that genocide may be justified on the basis of utilitarianism if no foundational rules exist. Like Toulmin, Pellegrino draws on Aristotelian concepts:

As Plato, and Aristotle after him, repeatedly asserted, medicine is a techne. It is knowledge only realised when put into practice. It is a practice based not just on experience (the realm of the empiricist), but on understanding of the real nature of its object. A techne needs general rules and fixed knowledge. It differs from theory in always being linked to concrete practices. To the extent that there are generalisable rules for a techne, it has a theory, but not a theory in the sense of episteme or first philosophy.¹⁷

Pellegrino stresses theory in that the generalisable rules of the techne provide the framework for a theory of medicine where the rules define what is “good” and that medicine cannot be “good” without these rules. He advocates a philosophy grounded in telos – the statement of ends and goals – and that a philosophy of medicine can be derived a posteriori from the realities of the clinical encounter, the treatment of sick people. Telos is the desired endpoint of praxis, forming a reference from which praxis may be viewed outside of itself. This endpoint defines what is “good” thereby creating the alternative that is “bad”.¹⁸ In this manner telos shapes the foundational rules governing medicine’s practice. Wartofsky also emphasises telos in medicine.¹⁹

Medicine is a practice and while it may not be practically useful, or even possible, to completely define medicine - in the same way a theory of bicycles is not needed to ride one. It remains that medicine is not aimless and clinicians have at least some idea of what it means to be a “good” doctor. Because it has a purpose, “good” medicine can be framed in terms of whether its practice is aligned with its goals. This in mind, an understanding of what medicine sets out to achieve is crucial. The observation that something works is what matters (as opposed to why something works),²⁰ but to know whether something works, we must first know what working is. This is telos and a lucid understanding of medicine’s aspirations is fundamental to any investigation of practice.

Medicine’s goals exist at a number of levels of generalisation and takes different forms depending on that level. Superficially, medicine aims to achieve specific goals, as is

¹⁹ Wartofsky, M. Ibid.
²⁰ Toulmin, S. Ibid.
reflected in medicine’s diverse range of specialities. For example a goal of a surgeon is to perform operations that remove cancer. An analysis using such specific aspirations is not appropriate for this project’s attempt to examine the nature of knowledge within all of medicine. I am seeking a broad telos that ties medicine’s diversity under a single concept, allowing the evaluation of specific aspects against medicine’s overarching goal. The sections below will arrive at this broad principle that determines the goodness of medical practice.

2.3 Medicine as the Treatment of Disease?

Much of medicine is concerned with disease and its diagnosis, prognosis and treatment. Therefore disease is a potential conceptual foundation for medicine’s telos and attending to disease could be medicine’s primary goal.

2.3.1 The Nature of Disease

There are many ways of understanding disease, with each adding insights. A physician will likely frame it by the practically relevant features for its identification in patients (e.g. symptoms), however a public health specialist might think of social determinants of health in populations. Because of this, disease is a conceptual framework that proves very difficult to define completely.21

In medical practice, disease is primarily a scientific conceptualisation. For biomedical science, diseases are abstracted, generalised entities with specific features (e.g. prognosis) and causes (e.g. infection), with the result that diseases have specific therapies (e.g. drugs). Diseases are present in patients who are sick and they are the cause of sickness. This idea provides medicine with a taxonomy for classifying different kinds of sickness, allowing physicians to identify and treat specific diseases in patients and also for biomedical science, allowing its systematic investigation.

2.3.2 Why a Disease Framework Fails

If addressing disease is the fundamental goal of medical practice then all (good) aspects of medicine should be somehow related to this activity. Although much of medicine is about addressing disease, paradoxically there are circumstances where this may cause

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patient harm, for example the aggressive treatment of terminal cancer. Palliative care recognises that sometimes it is best to leave disease untreated (in the continuation of non-therapeutic measures to maximise comfort). Additionally, bioethics tells medicine that patients have the right to be autonomous and refuse treatment if they wish. How could this be possibly “right” if attending to disease is fundamentally what defines good medicine (as it would if medicine’s telos was about disease)?

There are things in medicine that the goal of attending to disease does not address. Subsequently, disease is not appropriate as a conceptual foundation for the medical telos. Understood as a purely scientific entity, diseases are value free (because science claims disinterest in value). The above examples demonstrate that it does not always follow that for a patient with disease, the “right thing to do” is to treat that disease. The morality of medicine (i.e. its goodness/badness) is not determined by disease alone and there is another more fundamental concept that grounds the medical telos. Medicine’s aim of attending to disease fails when it causes patients to experience harm. Framed in this way, an alternative view is that the aim of medicine is fundamentally to address patient’s suffering.

2.4 Suffering: Medicine’s Real Goal

In *The Nature of Suffering and the Goals of Medicine*, Cassell explores suffering and develops his conceptualisation of what it means to suffer given his conviction that:

“The test of a system of medicine should be its adequacy in the face of suffering”

This is the medical telos in this thesis. Practices in medicine can be evaluated in terms of their utility in suffering and “good” medicine is conducive to the prevention, alleviation and palliation of suffering. Consequently that which does not address suffering, or is sub-optimal in this regard, is “bad” medicine. Attending to suffering is

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23 Another weakness is that sometimes medicine attends to patients who suffer from sickness where no disease can be found. Under a disease framework this may be subjugated by attaching a disease title to the patient in the absence of any concrete disease entity (e.g. psychosomatic pain). However is this measure for the “good” of the patient, who may be abandoned within a disease framework if disease remains elusive in the presence of suffering?
24 Or that if there is no disease, then nothing should be done.
the overarching principle sought in section 2.2 and grounds the specific goals of medicine routinely pursued in practice.

2.4.1 The Nature of Suffering

Suffering is very complex. It is *experienced* by people, and just as every person is unique, so is every case of suffering. Suffering often follows disease however it is not confined to the physical symptoms of disease (e.g. pain). Suffering transcends physical aspects that bear on experience. It is not confined to ourselves but also encompasses apprehensions regarding others (e.g. the burden of disability to a family), and it is not always possible to predict what will cause us to suffer – or even know what we are suffering from when we do. Why we suffer can be elusive, yet we *know* when we are suffering, just as we know when we are not. Cassell uses the following story to illustrate the various things that cause suffering in sickness:

A thirty-five-year-old sculptor with cancer of the breast that had spread widely was treated by competent physicians employing advanced knowledge and technology and acting out of kindness and true concern. At every stage, the treatment as well as the disease was a source of suffering to her. She was frightened and uncertain about her future but could get little information from her physicians, and what she was told was not always the truth. She was unaware, for example, that the radiation therapy to the breast (in lieu of mastectomy) might be so disfiguring. After her ovaries were removed and a regimen of medications that were masculinising, she became obese, grew facial and body hair of a male type, and her libido disappeared. When tumor invaded the nerves near her shoulder, she lost strength in the hand she used in sculpting and became profoundly depressed. She felt isolated because she was not like the other people and could not do what other people did. She feared that her friends would stop visiting her. She was sure she would die.

Cassell argues that although disease may be adequately addressed, medicine fails its patients in terms of their suffering. He makes three points:

1. Suffering is experienced by *persons*.
2. Suffering occurs when an impending destruction of the *person* is perceived and continues until the threat of disintegration has passed or the integrity of the person is restored in some other manner.
3. Suffering can occur in relation to any aspect of the person.

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26 This is illustrated by the suffering of a tetraplegic, who may be incapable of feeling physical pain.
29 Ibid. p. 32
Cassell develops the idea of *person*, claiming that *person* represents a holistic conceptualisation of the individual with a rejection of Cartesian mind-body dualism. *Person* therefore consists of all aspects of an individual: mind, body, spirit, past, future, relationships, career, culture, appearance, duties, activities, capacity for independence and so on. The mind-body duality pervasive in medicine is unhelpful because suffering in sickness is related to the dynamic and inseparable relationship that exists between physical events in the body and the meanings associated to these events by the mind. Meaning here is used in two senses; the first is to do with “signification” in that an event might be taken to signal a certain consequence; the second is to do with the importance associated to that consequence.\(^{30}\) In the story presented above, the suffering caused by tumour growth leading to muscle weakness (bodily process) meant the woman could no longer sculpt (an association of consequence that is of value to her). The *person* is dynamic and changes over time as experience (who the *person* once was) shapes an individual in terms of who they are (activities, values, beliefs, relationships etc.) and who they intend to become (their aspirations). Unlike objects of science, the *person* cannot be reduced to its parts in order to understand them. The *person* is absolutely unique and will ascribe different value to different parts of itself.

People suffer when they perceive the impending destruction of their *person*. Suffering has a lot to do with meanings and like fear, it is related to perceptions of the future.

People in pain frequently report suffering from pain when they feel out of control, when the pain is overwhelming, when the source of pain is unknown, when the meaning of pain is dire, or when the pain is apparently without end.\(^{31}\)

The suffering caused by a crushing pain in the chest will be greater than the suffering due to the same pain in the thigh – because it could be a heart attack. Suffering stops once the threat has gone, for example after realising the pain was caused by indigestion. If the threat continues suffering may also be ameliorated if the *person* is able to restore him or herself in some other way. It is not possible to predict what will cause someone to suffer, any aspect of the *person* can cause suffering and unique persons value these aspects differently. An example of the effect of meaning would be the comparative suffering caused by a broken leg for a top athlete, days before an event, and the

\(^{30}\) Ibid. p. 35-36
\(^{31}\) Ibid. p. 35
suffering caused by the same injury to a person who enjoys movies and could do with some downtime.  

2.4.2 Suffering is Distinct to Disease

It is true that disease frequently results in suffering, and quite often, eradicating disease ameliorates suffering, however suffering is distinct from disease. Disease can sit dormantly and it may only be when it and its meanings are illuminated that suffering occurs (e.g. a pain in the side seen as a minor annoyance until it is found to arise from liver metastases). Disease excludes humanistic aspects of suffering and the ontological reality of disease is in question. Unlike disease, suffering is not confined to the conceptual realm of science but implicates the variety of consequences in the life of a unique individual who is sick. Suffering is primarily experiential in nature and people will suffer regardless of any conceptual framework for it. This is not true for disease, as although people would continue to be sick in the absence of disease theory, they would not have disease *per se*, because disease is defined by the presence of its *conceptual indicators* (i.e. symptoms, physical signs etc.). In contrast to disease, suffering cannot be physically isolated and is not totally reducible into scientifically measurable features. For this reason and others outlined in the following chapters, science is not suitable for the investigation of suffering (at least the kind of science advocated by EBM). Disease can be illuminated by science because it can be isolated to certain parts of people in independence of the whole *person* (e.g. cancer in the lung) and behaves in ways that are somewhat predictable. The suffering caused by disease is equivalent to disease plus the *meanings* of disease to the *person*, so addressing aspects of the patient’s disease (even if done optimally) does not necessarily equate to addressing their suffering - especially since addressing disease can cause suffering. Following this, with the good of the patient in mind, disease is not an adequate foundational concept to evaluate aspects of medical practice.

32 This example is simplistic to illustrate the point.
34 Cassell, E. J. (2004). p. 41
35 Ibid. p. 29
36 An argument for the irreducibility of suffering into disease is provided in the appendix.
2.5  Technological Success: The Suffering as Disease Illusion

Cassell and others\(^{37,38}\) have observed that medicine in its zealous pursuit of scientific rigour and technology, may have lost sight of its more fundamental aspiration – the care of the sick person. Cassell believes that because of its technical success, medicine highly values scientific knowledge and “objective” aspects of the patient’s disease at the expense of the consideration of the person, who is “subjective” and cannot be understood scientifically.\(^{39}\)

This section will discuss how the medical telos has been shaped over time. The sick person\(^{40}\) and the amelioration of their suffering has historically been the focus of medicine. Over recent history there has been a shift in focus away from the person and their suffering towards the use of technology and the treatment of disease.\(^{41}\) In doing this, medicine assumes that treating a patient’s disease also relieves suffering. But if suffering is not equivalent to disease, then medicine may have wrongly placed “objective” knowledge as superior to “subjective” knowledge forms.

2.5.1  Early Medicine: Emphasis of the Sick Person and Their Suffering

Modern medicine has its roots in ancient Greece. Hippocrates rejected sickness as a mystical punishment, instead advocating the naturalism of ill health. In Hippocrates’ era, humorism, the notion that diseases are caused by imbalances in fundamental elements predominated. Modern conceptualisations of disease (dictated by principles of pathology, physiology etc.) did not exist and there was no systematic programme of medical science. At this time the sick person’s story and complaints were front-centre as physicians did not have access to modern investigative technologies and had to rely solely on the patient’s own account to piece together what was going on (with a limited number of clinical signs).

Over time, by listening to patients’ histories and symptoms, physicians began to note patterns. They learnt that by doing certain things when a certain “type” of sickness presented itself, the physician could slow or even halt its course. In continuing with

\(^{38}\) Stewart, et al. (2003).
\(^{39}\) Cassell, E. J. (2004). p. 41
\(^{40}\) Not person in the sense of Cassell’s conceptualisation however there are parallels.
\(^{41}\) Cassell, E. J. (2004). p. 41
notions of naturalism, the idea of sickness being caused by some-thing was established; along with the consequence that sickness may be affected if the cause of sickness is affected. Although the conceptual basis of medicine was expanding, physicians had to be highly attuned to the “subjective” story of their patients to generate their diagnoses. Their focus was firmly on the patient as a person, rather than a set of disease data gleaned by “objective” methods.

2.5.2 The Suffering as Disease Illusion

The scientific revolution (16\textsuperscript{th} century, to the early 19\textsuperscript{th} century) saw dramatic changes in the way the world was seen.\textsuperscript{42} Near the end of this period (in France early 1800s) modern conceptualisations of disease were developed.\textsuperscript{43} The idea emerged that sickness and the suffering associated with it is the result of diseases with specific features, allowing systematic investigation.\textsuperscript{44}

Infective disease caused a huge burden on society before the discovery of microbes gave medicine an understanding of the processes involved. This heralded development in technologies like immunisation and antibiotics, two of medicine’s greatest achievements.\textsuperscript{45} Since the 1800s science and its derivative technologies have exploded, leading to great improvements in medicine’s ability to combat disease. There is no question as to the unprecedented \textit{therapeutic} success of modern medicine arising from biomedical science. This success has been so great that medicine (and society) not only demands a treatment, but a “cure”, for the afflictions that prey on peoples’ wellbeing.\textsuperscript{46} Disease was (and still is) something that could – in theory – be eradicated given sufficient volumes of research funding.\textsuperscript{47}

Biomedical science’s therapeutic success has led medicine to believe that disease is \textit{the} cause of suffering. It follows, that medicine will achieve its fundamental goal of attending to suffering primarily by emphasising the scientific approach and having a

\textsuperscript{42} Hall, A. R. (1962). p. xii
\textsuperscript{43} Cassell, E. J. (2004). p. 6
\textsuperscript{44} See section 2.3.
\textsuperscript{45} Godlee, F. (2007).
\textsuperscript{46} Antibiotics and vaccination delivered cures for some infective diseases and chemotherapy offered a glimpse of hope for a “cure” for cancer.
\textsuperscript{47} This possibility is eroded with the rise of chronic disease and the realisation that the causes of disease are extremely complex (e.g. the accumulation of “lifestyle factors”), which cannot be eliminated by “magic bullets” as can occur when causes are simple and strong (e.g. antibiotics for bacterial infections).
highly technological focus. Before the scientific revolution, physicians relied on non-technological measures to lessen the burden of sickness in patients (e.g. their compassion). These measures were targeted primarily at the patients suffering - science and new technology are directed at disease.

2.5.3 Disease, Not the Person as the Object of Medicine’s Gaze

Separately from therapeutic developments, investigative technologies have appeared that allow physicians to “see” disease in a way never before possible. Physicians no longer rely solely the patient’s history and a few clinical signs. Technology has allowed doctors to “rule in or out” instances of disease accurately and medicine can now quite readily “know what is wrong” with the patient with respect to their disease (e.g. by MRI).

Medicine, being influenced by scientific principles relishes the “objective”, shunning “subjectivity” as something that obscures the “truth” it strives towards. The reliability of investigative technologies means that medicine no longer relies on the patient’s account to make a diagnosis, so much that when the patient’s account is at odds with the “hard data”, the physician will side with technology. Continuing with this trend, physicians themselves are also “subjective”, so humanistic aspects of their practice (e.g. clinical experience) cannot be trusted over the “objectivity” of science. Technology has become what illuminates disease, and because disease has been equated to suffering, these technologies are what medicine uses to “see” suffering in patients. This is in contrast to paying careful attention to the patient’s account of their sickness, as was done in antiquity.

The above account of the teleological history of biomedicine illuminates its implicit argument: (i) disease is the cause of suffering in sick people and (ii) disease will eventually be cured by scientific and technological knowledge therefore (iii) medicine’s telos of attending to the suffering of its patients is best achieved by having a highly scientific and technological focus. It was discussed in section 2.4.2 that disease and suffering are not equivalent and that scientific methods are not adequate for illuminating suffering. The idea that suffering can be adequately addressed by focussing on disease

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48 This account is presented to make a point and is not intended to denote that all those who practice medicine hold this view.
alone is false and this misperception is likely to result in harm to patients (at the level of suffering). Science has taught medicine that subjectivity hinders the “method” by which it finds the “truth”. This viewpoint results in a framework of medical knowledge that prioritises “objectivity” as superior to “subjective” sources of knowledge, a framework of medical knowledge that is represented by EBM.

2.6 Conclusions

This chapter has explored considerations of the praxis and telos of clinical medicine in order to find an overarching concept to evaluate it. Disease was a potential candidate, however medicine is not just about disease. Suffering is at a more fundamental level, medicine is also about attending to suffering, and treating disease does not necessarily lead to this. As a result, practices in medicine can be evaluated in terms of whether they lead to this goal. 49

Over time, biomedical science’s therapeutic success may have resulted in the false assumption that suffering is best addressed through disease. Because disease can be investigated by science, medicine has come to believe the best kind of knowledge is “objective”. EBM provides a framework of medical knowledge that highly values objectivity.

The next step is to explore the kind of knowledge that is relevant to suffering. Scientific knowledge has been a successful template for technological development, however suffering cannot be studied by science in the same way as disease.50 If not exclusively scientific, what is the nature of medical knowledge? On superficial examination there are many kinds of knowledge that are practically important in medicine that are not scientific, such as physicians’ knowledge of surgical procedures, or the patient’s knowledge of their wishes. The telos of medicine is to attend to the suffering of patients

49 Using suffering (as opposed to disease) as medicine’s endpoint has an additional benefit in that if the purpose of medicine is to attend to suffering, there is the implication that medicine has an inherent morality (which is compatible with the Hippocratic ethos). Disease, as a scientific entity, is supposedly objective and value free. Medicine founded in disease is also (without external intervention) amoral in that the goal of attending to disease has nothing to say as to whether this is a “good” thing to do for the patient. A system of medicine founded in suffering ameliorates the patient-physician conflict that can arise when a patient refuses medical treatment. Under a disease framework, physicians view their role primarily as one that attends to disease and they are being asked not to. There is no such conflict if the physician’s role is to attend to suffering (so long as the physician can see how treatment may result in more, not less, suffering). This results in a medical practice that is more aligned with ethical principles (such as autonomy) than a disease framework that has nothing to say about these issues.

50 See section 2.4.2. and Appendix
and medical knowledge is that which helps medicine achieve this goal. The next chapter describes a theory of knowledge that accounts for the importance of knowledge other than scientific knowledge in medicine. This account will be used to critique aspects of EBM.
Chapter 3: The Dimensionality of Medical Knowledge

This chapter will outline the theory of knowledge guiding this thesis and indicate two features central in medical knowledge, viz: its explicit-tacitness and its general-particularity. These characteristics of knowledge are not recognised by EBM, the kinds of knowledge EBM recognises will be discussed in chapter five.

One popular view of knowledge is as a “justified, true belief”\(^5^1\). In science, where quantifiable evidence is required for the justification of scientific knowledge this may be apt, but it falls short in other areas of knowledge where justification may not be possible (tacit knowledge) or necessary (particular knowledge). It may also privilege scientific knowledge over other kinds of knowledge. This will be a broader characterisation of knowledge where scientific knowledge exists, alongside other inherently different kinds, a view that draws on Michael Polanyi’s *Personal Knowledge, Towards a Post-Critical Philosophy*.\(^5^2\) The two non-quantifiable aspects of knowledge concern (i) whether it is predominantly generalised or particular; and (ii) whether it is predominantly explicit or tacit. Knowledge therefore lies on a plane where the axes represent the variability of knowledge in terms of its general-particularity and explicit-tacitness.\(^5^4\)

![Figure 1: The Dimensions of Knowledge](image)

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54 Though this representation might suggest it, *Personal knowledge* is non-quantifiable as assigning numerical values is a form of explication and this cannot be accurately and completely done with tacit knowledge. These aspects are not absolute or fixed and explicit-tacit and general-particular features may become more or less apparent depending on how knowledge is enacted or used.
All knowledge has explicit, tacit, general and particular aspects, however the importance of each dimension varies and can do so according to its use. Even mathematical knowledge, a very explicit form of knowledge, has tacit components that are vital for its understanding (e.g. knowing how to differentiate). Recognising these complexities is central to understanding the role of science and knowledge in medical practice.

Knowledge and the knower are inseparable because a text is meaningless until the reader interprets it, and recorded knowledge is of little practical use until it is understood and enacted by people. Polanyi noted the explicit-tacit dimension to which I have added the particular-general dimension. The sections that follow will present these two dimensions and use them to discuss knowledge in biomedical science, medicine and suffering.

3.1 Personal Knowledge and Objectivity

The definition of knowledge as “justified, true belief” enables a distinction between something that is both reasonable to believe and true, and something that is believed but either not true or not reasonable to believe. This definition entitles a subject to claim knowledge only if that claim can be justified.

3.1.1 Rejection of Objectivity

“Objective is subjective – but in a red dress”

Objectivity is a fundamental aspiration of science in its quest to accumulate knowledge. This is tied to the view that the scientific method leads to the illumination of “objective truths” that are present in nature and awaiting discovery. Science strives for disinterest

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55 E.g. a formally stated mathematical axiom means nothing to a mathematical ignoramus.
57 I am not aware of descriptions of this dimension of knowledge, however it may have been described elsewhere.
58 Objectivity in this thesis is used in the mind-independent sense as strived for by “modern” scientific methodologies and espoused by Cartesian rationalism. The author is aware of post-“modern” accounts of objectivity (e.g. Personal Knowledge) that might not fall victim to the presented arguments. This is a criticism of scientific objectivity and not more sophisticated philosophical accounts that recognise the necessary personal aspects of knowledge.
60 BJ Brooker (2014) – on the idea that nothing can be completely objective, we may try to objectify things (through criteria, procedures etc.), however everything of human significance must at some point involve the judgment of persons, which are necessarily “subjective”.
61 This view is aligned with Cartesian ideals (see section 2.1) and is a hallmark of the “modern” era.
and employs methodologies designed to remove human factors due to the conviction that human “subjectivity” can lead to false belief, and it justifies blinding subjects and observers in randomised controlled trials (RCTs). A further example of the importance of objectivity in science is the Copernican revolution, where it was proposed that the Sun was the centre of our solar system,62 rather than the Earth (and man) being at the centre, as in the Ptolemaic model, a false belief system linked to the human subject’s position in the cosmos.63

Polanyi challenges the possibility of objectivity of the kind aspired to by science noting that, although the Ptolemaic model appealed to human self-importance, the Copernican model spoke to a different human need, the desire for greater intellectual satisfaction.64 In his rejection of “modern” objectivity, Polanyi argues that science depends on “subjective” factors intrinsic to being human and exercising intelligence so that intelligent judgement is necessary for knowledge. This does not undermine the truth because what is thought true will be further investigated and validated in ways that have not been conceived at a given point. For example, centuries after Copernicus, astronauts observed the solar system outside of Earth and were able to “see the truth” in a way not previously possible. Polanyi argues that humans have a capacity to self-appraise their beliefs and also that there is a deep seated human dedication to reason (or intellectual beauty) that helps to ensure scientific integrity and truth, although science has and will continue to be wrong at times. The human commitment to rationality therefore bridges the supposed gap between subjectivity and objectivity.65

### 3.1.2 The Probabilistic Nature of Science

The conceptualisation of knowledge as a “justified, true belief” is not clear with respect to what can count as justification, and how much of it is required to justify something. This section and those that follow will argue that human judgement is necessary for these appraisals.

Karl Popper asserted that to be scientific, a theory must be falsifiable. This results from the fact that no number of positive observations can prove a generalised statement but a

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63 This observation, and the appearance of the Earth as stationary.
64 Polanyi, M. (1958), p. 3-6
65 Ibid. p. 63-65
single negative one may disprove it.\textsuperscript{66} In the exact sciences (e.g. astrophysics) it is conceivable that a theory could be absolutely falsified by an incongruent observation. This could be if a theory predicted an event (e.g. solar eclipse) that did not occur (with the assumption of no measurement errors or external factors not accounted for by the theory). In practice the necessity of measurement and associated errors make absolute falsification impossible – it is done probabilistically. In the inexact sciences, such as biomedical science, falsification is even less feasible because these sciences allow for a degree of freedom between observation and theory, and also because justification is done on the basis of probabilistic statements like the null hypothesis,\textsuperscript{67} rather than by strict contradiction.\textsuperscript{68} Because of the statistical nature of justification in science and the resultant impossibility of \textit{absolute} falsification, Polanyi argues that scientific knowledge is knowledge that is known “with a very high likelihood” to be true.\textsuperscript{69}

\textbf{3.1.3 The Necessity of Judgement}

In life, the degree we demand a statement to be justified is inversely proportional to how likely we believe it to be true. In our routine judgements we naturally gauge the evidence of something against our appraisal of how likely it is.\textsuperscript{70} For example, when I hear a loud bang in my North Dunedin flat, I think of a car backfiring and not a gunshot, which may be different if I were in Syria.

Appraisals related to probability are essential to our day-to-day interpretation of things and help us to make sense of the world. In science the scientist drawing conclusions appraises experimental evidence for a theory against how likely she thinks that theory is to be true, in effect judging whether or not a piece of data counts as knowledge or not. There must always be a judgement when using statistical methods because there is no universal cut-off point representing certainty.\textsuperscript{71} An example presenting extremes would be the relative justification required to support the conclusion that “people can change matter with their mind” (something believed to be untrue) compared to “paracetamol

\textsuperscript{66} Popper, K. R. (1972).
\textsuperscript{67} Fisher, R. A. S. (1935).
\textsuperscript{68} Polanyi, M. (1958). p. 20-24
\textsuperscript{69} That observation is laden with theory and different observers can justifiably interpret the same data differently is an alternative argument against the possibility of objectivity - Hanson, N. R. (1958).
\textsuperscript{70} Polanyi, M. (1958). p. 24-48
\textsuperscript{71} The null hypothesis is a method to aid the appraisal of whether a result occurred by chance (or if the data shows a true relationship). A low “p-value” suggests a true relationship and a high value suggests a result caused by chance. The degree of justification (in terms of p-value) required to qualify a result as knowledge is not an “objective” truth, but is assigned conventionally (p<0.05 in most circles).
reduces intracranial pressure” (a theory aligned with the current paradigm). Science cannot be considered truly objective because the appraisal of the scientist is required to qualify something as knowledge. This depends on the characteristics and personal knowledge of that person, which is “subjective” and is supposedly removed in “objective” knowledge. A rejection of scientific objectivity is not a rejection of truth, because inter-subjectivity and triangulation occurs. 72 “Subjective” individuals communicate and agree on things and although agreement might rationally lead you to believe they are true, this does not lead to “objectivity” (in the mind-independent sense). Inter-subjective agreement is conditional on each individual judgement and is therefore more reliable, but not “objective”. It is the human ability to make accurate judgements along with our commitment to rationality that help to ensure truth.

At (all) these points the act of knowing includes an appraisal; and this personal co-efficient, which shapes all factual knowledge, bridges in doing so the disjunction between subjectivity and objectivity. It implies the claim that man can transcend his own subjectivity by striving passionately to fulfil his personal obligations to universal standards. 73

Science as the detached application of “the method” that provides a machinery for the creation of “objective” knowledge is a myth. Scientific knowledge depends on the scientist asking fruitful questions and interpreting the data accurately. This does not undermine claims to “truth” or the existence of a reality, because scientists have a personal commitment to rationality and the personal satisfaction that comes with enlightenment (so that mathematical solutions can be beautiful). Attempts to separate knowledge from the humans that create and use it are not helpful and rational passion plays a vital role. 74 This passion is exemplified in individuals such as Einstein, who dedicate themselves to knowledge and are not satisfied by incomplete answers. Because judgement and assertion is required to qualify anything as knowledge, knowledge is personal in that it exists within people and not independent to the mind in abstract forms. It is true that much of knowledge can be written down and apparently de-humanised, 75 but recorded knowledge does not reside independently in texts but in their meaning, and meaning is created as a reader who knows how to read interprets them.

73 Polanyi, M. (1958), p. 17
74 Ibid. p. 63-65
75 This is explicit knowledge, tacit knowledge cannot be articulated.
3.2 The Explicit-Tacit Dimension of Knowledge

This section discusses the explicit-tacit dimension of knowledge. Explicit knowledge is knowledge that is readily explicated - i.e. spoken or written down in detail succinctly. Tacit knowledge cannot be made explicit completely, succinctly or in abstract terms. Factual knowledge, such as knowing the day of the week or the atomic number of platinum is explicit, but even the most abstracted and explicit forms of knowledge, like mathematics, have a degree of tacitness. This poses problems for knowledge as a “justified, true belief” as the existence of tacit knowledge – which cannot be defined – means that there are situations where it is possible to truthfully know without there being any explicit justification of this knowledge outside of the personal “hands on experience” of the knower. The focus here will be on tacit knowledge as it is less recognised, however this is not intended to imply any superiority over explicit knowledge.

3.2.1 Skilful Knowledge

Polanyi explores skills and connoisseurship, noting that they are superficially different to explicit knowledge but are used by people as a kind of knowledge. People “know” skills like how to swim or play guitar, just as some people do not “know” how to do these things. Skilful knowledge is acquired, just like scientific or factual knowledge, however the manner in which it done is not the same. Polanyi draws from Gestalt psychology noting that the execution of skilful knowledge (e.g. playing guitar) is done holistically (and by practice not formal intellect). When you skilfully play guitar you are doing just that, “playing guitar”, not focussing on where your hands are on the neck, the angle of your finger joints or the pressure required to sound a note. Using the example of the pianist, Polanyi observes that when the pianist thinks about the individual things that make up her performance (e.g. finger movements), it breaks down and fails. Just as if you try to focus on what happens with your legs when you walk.76

The use of tools is similar. When using a tool, like a scalpel, we are generally focally aware of only the act itself. There is a vast amount of sensory input essential to using a scalpel, such as seeing a 3D map of where we want to cut, along with the fine changes in pressure in the fingertips that guide cutting. When using a scalpel we are not focally

aware of these things (i.e. not thinking about them), but to say we don’t know these things is false as they are essential to the task. Polanyi argues that when executing skilful knowledge we are subsidiarily aware\textsuperscript{77} of the “parts that make up the whole” and when using a tool we effectively assimilate the tool as an extension of our body. Because shifting awareness away from the whole to any of the parts results in the deterioration of the performance of a skill (as with the piano), it makes it impossible for the skilful knower to explicitly know the entirety of these parts that make up the skill.\textsuperscript{78,79}

### 3.2.2 Communication of Skilful Knowledge

Because the skilful knower might not (and possibly cannot) be aware of the parts making up a skill, explicating (e.g. writing down) skilful knowledge is troublesome. The communication of skilful knowledge is different to factual knowledge, which can be more completely explicated in things like textbooks. It is possible to partially explicate skilful knowledge in, say, a manual for a helicopter. But the act of reading this manual does not translate into knowing how to fly a helicopter. Skills are learnt by doing and by observing. In this respect tacit knowledge is unlike explicit knowledge, which can be readily written down and transferred explicitly.\textsuperscript{80}

### 3.2.3 The Role of Articulation and Language

Polanyi expands tacit knowledge by exploring the role of language in the articulation of knowledge. Language includes words and also other things that convey meaning, like maps and diagrams. Polanyi discusses inarticulate intelligence (i.e. tacit knowledge), citing the intelligent behaviour of pre-linguistic humans and experiments with animals that demonstrate their ability to learn tricks, read signs and execute higher tasks.\textsuperscript{81,82}

Inarticulate faculties of intelligence exist, and it follows that in some circumstances,

\textsuperscript{77} Subsidiary awareness refers to things we perceive (or know) that contribute to awareness but are not manifest (or articulable) at the focal level.
\textsuperscript{78} Polanyi, M. (1958). p. 49-63
\textsuperscript{79} Connoisseurship is like a skill, but the taster is subsidiarily aware of the qualities against which a decision of taste is being made – and cannot be totally aware of them. Judgement also is like this. Ibid. p. 53-55
\textsuperscript{80} So long as there are readers who can (tacitly) understand the language.
\textsuperscript{81} An experiment involving a baby chimpanzee that was reared with a human baby demonstrated that the chimpanzee kept up with the human baby in many aspects of intelligence up until the age of about 15-18 months (when the mental development of the chimpanzee is nearing completion and the human’s is about to accelerate) - White, L. A. (1935).
\textsuperscript{82} Polanyi, M. (1958). p. 71-77
knowledge is used that is not founded in language – the knower has no words to speak of their knowledge. This feature of knowledge can be observed in suffering in medical settings and occurs when patients know that they are suffering, but not perhaps why.\textsuperscript{83}

Comparing the intellectual abilities of humans and animals, Polanyi claims the principle cause of our superior intellectual abilities is our ability to use language to create formal frameworks of knowledge. Language allows us to clarify our thoughts, to condense information into manageable units (like in a map), and to communicate and record knowledge (a precursor to cultural evolution).\textsuperscript{84} Language greatly enhances our ability to know and communicate aspects of experience, however there are functional features of language that means there is a necessary gap between what may be spoken of and experience.\textsuperscript{85}

\subsection{3.2.4 The Limits of Articulation}

Experience never repeats itself in totality. A language containing words to denote every possible circumstance would be absurd as languages must be finite to be easily learnt and used. For this reason words are not highly specific. Within the meanings of words are generalisations about “things” that are considered constant for any instance of that “thing”. For example a car is a vehicle with four wheels, but there is no word for a “red car turning left” because this is too specific. Polanyi uses the example of a map, where its scale is analogous to the size of a vocabulary. Having a map the same size of the territory you navigate might be unhelpful because the map would be just as difficult to navigate as the region itself. Language must be sufficiently large to speak of the many things that exist, but sufficiently small to have any practical utility. Because of the necessary gap with experience this creates, there are things that cannot be spoken about, or at least not easily and succinctly.\textsuperscript{86}

\subsection{3.2.5 The Tacit Nature of Language}

At an operational level using language is similar to using skilful knowledge, where the explicit part of language falls into subsidiary awareness, contributing to our focal and

\textsuperscript{83} Hamilton, M. and G. Gillett (2012).

\textsuperscript{84} Polanyi, M. (1958), p. 77-87

\textsuperscript{85} This is also a feature of abstraction (which depends on language). Abstraction is the ability to isolate critical features from experience and make them the focus of attention – this is a requirement for scientific investigation. So science is also limited by language.

\textsuperscript{86} Polanyi, M. (1958), p. 77-87
holistic awareness of meaning. For example when reading this, you are aware of the meaning of the words and not the individual letters in the text (which your eyes see). I can write and I “know” how to manipulate words into sentences, however I cannot tell you how I am able to do this – I just can. When I write I am subsidiarily aware of my entire vocabulary, yet only the words that convey my intended meaning come into my focal awareness and are written. Even the meaning of a word is not concrete; meaning comes from our subsidiary awareness of the context of the situations we know a word has been used. Babies have no reference when learning to understand and speak words. Over time they learn the meaning and operational principles of language by contextualising the similarities and differences of the utterances of those who speak around them. This is like in medicine where medical terminology is alienating for outsiders, yet is learnt and becomes an essential tool for physicians.

Tacit features are also inherent in mathematics, possibly the most explicit form of knowledge. Mathematical knowledge is generally considered to consist of explicit theorems (e.g. Pythagoras’ theorem: \( a^2 + b^2 = c^2 \)). These equations contribute to mathematical knowledge, yet they are meaningless and practically useless without a tacit understanding of mathematics. Mathematics relies on symbols and operational rules that determine how they may be manipulated to “do maths”. The mathematician is aware of the meaning of the symbols and the manipulations available to them, and good mathematicians choose the right operations for the situation to solve the problem. This decision is not explicit, by a systematic review of all possible operations; it is done tacitly in a manner the mathematician may not be aware of. Tacit knowledge in mathematics is evident in the differences in human mathematical ability. Possible mathematical operations enter subsidiary awareness via the practice of mathematics. Many people cannot solve problems requiring partial differentiation, whereas those familiar with this operation may see the solution easily.

If mathematics were completely explicit it would follow that anyone could grasp even the most difficult mathematical theories, which is clearly not the case. The arguments

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87 Ibid. p. 104-117
88 A parallel to judgement can be drawn here – judgement is a faculty that cannot be explicitly taught but one may learn to exercise it. In terms of the necessity of judgement in science (discussed in section 3.1.3), scientific judgement is a (partially) tacit capacity of the scientist. The tacit nature of this judgement illuminates the possibility that some judges are better than others, and judgement is something that is not necessarily an a priori explicit process. Judgements may be explicated and justified a posteriori, i.e. after the fact, however this may not reflect the actual cognitive process involved.
presented above apply specifically to mathematics, but similar arguments apply for all aspects of intelligence, ranging from science to the arts, to things in between – like medicine. Because aspects of medical knowledge are inarticulate, the requirement of explicit justification for knowledge that is primarily tacit may be counter productive. An example might be the use of detailed explicit and “objective” criteria for the assessment of interpersonal skills in medical education (e.g. an OSCE), where the assessor is likely to have a tacit impression of whether a candidate excelled well before they tally the score on the mark sheet.

3.2.6 The Persistence of Tacit Knowledge

Polanyi investigates the role of logic in discovery noting that:

The irreversible character of discovery suggests that no solution of a problem can be accredited as a discovery if it is achieved by a procedure following definite rules. For such a procedure would be reversible in the sense that it could be traced back stepwise to its beginning and repeated at will any number of times, like any arithmetical computation. Accordingly, any strictly formalised procedure would also be excluded as a means of achieving discovery.

Because there is no explicit logical pathway from problem to solution in novel discovery, discovery is not purely logical and there is a “logical gap” that must be bridged by the discoverer. Polanyi believes discovery can be attributed to heuristic tension and resolution whereby the discoverer is “illuminated” and the solution becomes clear. He recognises the creativity inherent to any discovery, and the logical gap reflects aspects that are not conducive to formalisation and are therefore more aptly considered tacit. The genius is able to traverse this logical gap allowing them to find solutions that are not available to the “non-genius”, who is less creative and has more difficulty negotiating this impasse.

Even in the most explicit realms, there are tacit elements required for knowledge to have any meaning or practical usage. It is not possible to have purely explicit knowledge, which could be considered “objective”, because knowledge requires our ability to make meanings, which is above explicit language and the ways we perceive it.

89 The role of tacit knowledge in medicine will be explored following a description of the general-particular dimension.
91 The same could be said of clinical judgment.
While it might be possible to partially explicate the tacit, for example using a novel to describe aspects of being in love (if you are skilled at explication you may do it better), it is not possible to translate the myriad of experiential possibilities into words because we are not aware of everything we know (definitely not at any one time) and language is limited. As a result, any theory of knowledge that does not recognise knowledge forms that cannot be spoken of is incomplete. In medicine, frameworks may overlook the possibility of tacit knowledge, resulting in them placing undue emphasis on explicit justification (e.g. EBM).

3.3 The General-Particular Dimension of Knowledge

The general-particular dimension of knowledge recognises that knowledge varies in its generality, referring to all (or many) things of a certain kind, or to individuals or groups within a particular kind. Much of science is about forming general knowledge by investigating particular instances and making generalisations about them. Particular knowledge is closely related to day-to-day human experience in that a lot of our knowledge is highly specific to us. For example I know where I live, what foods I enjoy, and the names of my friends.

Like the explicit-tacit dimension, the general-particular dimension is variable, with the generalised theories of science (or normative ethics) at one end, and more specific knowledge at the other. Not all generalised knowledge is scientific; for example that murder is (to my knowledge) illegal all over the world. That “murder is illegal in New Zealand” is a slightly less generalised version of the previous statement. The degree knowledge is generalised is related to how much that knowledge relies on assumptions made, and what the knowledge claim is intended to encapsulate. For example the effects of a drug can be determined based on observations of a small sample, and many of the methodological constraints and statistical analyses have to do with making generalisations from this particular sample. Knowledge from observations would be

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93 The presumption that the same mechanism exists in every particular case is inherent in Popperian falsifiability. If something can be demonstrated in a random selection of cases, it is possible to make generalisations from the limited number of “particulars” investigated.

94 But whether a killing is a murder falls into a jurisprudential gap that will inevitably consider particular and possibly tacit aspects of the killing (e.g. malicious intent, which is likely to be appraised tacitly by a jury).
particular knowledge of that sample, but when the scientist makes a generalisation to encapsulate all humans, the knowledge becomes more general.

### 3.3.1 On the Need for Justification

In terms of knowledge as a “justified, true belief” the general-particular dimension poses a problem, as the extent to which knowledge must be justified is related to the degree of generalisation inherent in it. Where there is a high degree of generalisation like in science, justification is very important and maxims exist that stipulate standards of rigour and evidence. Particular knowledge is different in that one may stake a claim to particular knowledge on the basis of very little justification, which can be a single observation of a particular event. For example, because I saw ice on the path on my walk to the library this morning, I am entitled to say I know the (water) temperature on that particular occasion was below zero degrees Celsius.

Generalisation in science requires an abstraction where characteristics of interest are isolated to establish relationships independently of other characteristics. In an RCT, the abstraction is framed by a small number of measured variables (e.g. blood pressure, age, etc.). There will be other variables (e.g. name, eye colour, favourite food etc.) that are excluded and attempts will be made to minimise confounding caused by them (e.g. the process of randomisation). Abstraction means generalised knowledge has a low level of detail, but is applicable to more instances of the thing(s) it refers to. This is in contrast to particular knowledge, which has a lot of detail because non-abstracted characteristics are not excluded, but it is not broadly applicable.

A problem related to the requirement of justification (in terms of “justified, true belief”) is this view can falsely lead to the impression that more justification is equivalent to better knowledge. Because of the general-particular dimension there is a differential in the need for justification. For example, alternative approaches (general vs. particular) of getting to know someone’s name would be to: refer to a survey and choose the most common name (a generalised approach); or you could ask their name, going about it in

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95 To the extent of the accuracy of measurement and the extent that abstractions represent the “real” situation.
96 This deductive reasoning, where I have prior (general) knowledge of thermodynamic principles and the freezing point of water, which is applied to the particular situation.
97 Those variables that are excluded from the abstraction are implicitly considered as less important than the abstraction defining variables.
a particular manner. Often, the justification required to “know” does not involve systematic surveys and rigorous methodologies, however frameworks may relegate particular knowledge where rigorous justification is prioritised.\footnote{Another situation where justification to the extent expected of science is not as necessary is where relationships are strong and direct (e.g. an extradural hematoma causing raised ICP and death).}

### 3.4 Personal Knowledge and the Centrality of Expertise

That knowledge is \textit{personal} and cannot exist independently of the knower has a consequence for the role of expertise. Some systems of knowledge that value “objectivity” (e.g. EBM) dismiss expert knowledge as unreliable because it is “subjective”.\footnote{EBMWG (1992).} This thesis claims experts are the knowers of their field and should be valued as such. Experts are experts because they possess the relevant explicit knowledge from “objective” scientific studies, textbooks and what have you. They also have the tacit knowledge required of their discipline, which cannot readily be recorded or transferred explicitly. Because experts have tacit knowledge, they are able to \textit{know} much more than can be recorded in abstract forms. What is more, experts are able to know things (tacitly) without any explicit justification for doing so. This is seen regularly in medicine where physicians make the right decisions in difficult circumstances based on their “gut feeling” or “intuition”. Since experts are potentially more knowledgeable than purely explicit knowledge forms, there is a central role for expert knowledge in medicine, the legitimation of which will be discussed in chapter six.

### 3.5 Knowledge in Biomedical Science

Fundamental to science is the importance of having a clear and explicit understanding of the subject matter. This is a requirement for the abstractions needed to make generalisations. The degree to which an entity (or phenomenon) may be investigated scientifically is directly related to how well that thing can be described in the language of science. Things that do not yield succinct, explicit characterisation (e.g. beauty) are less suited to scientific investigation than things that are inherently standardised (e.g. hydrogen atoms). As a result, scientific knowledge is inherently and completely explicit.
knowledge. Tacit knowledge does not yield to scientific investigation because it is less readily articulated and abstracted.

In terms of the general-particular dimension, science is predominantly generalised. In biomedical science, knowledge is restricted to the general largely as a result of the available investigative technologies – RCTs are not capable of detecting variations between individual subjects. Developments such as N of 1 studies and genomic investigations offer the possibility of developing and expanding particular knowledge in biomedical science, i.e. knowledge that is applicable to the individual patient.

Qualitative studies provide a possible avenue to broaden the scope of scientific knowledge to include explicable, but non-quantifiable factors. This is unlike quantitative science, as qualitative investigation does not rely on the explicit measurement of variables to provide results. The implementation of qualitative studies is limited however, by perceptions of the need for epistemic rigor (which generally involves numerical calculation).

3.6 Knowledge in Medicine

Tacit knowledge in medicine has been discussed elsewhere, but often without the added consideration of particular knowledge. The role of tacit and particular knowledge in medicine is seen in medical education. The preceding section discussed that scientific knowledge is generalised and explicit so that, if medicine were about scientific knowledge only, it would follow that medical education would be purely theoretical. If this were the case, once students had passed their written exams only, they would be fully knowledgeable and competent physicians. This is not the reality of medical education. In New Zealand medical students undergo three initial years of dominantly theoretical studies (mainly explicit knowledge) before commencing a three-year apprenticeship of primarily practical studies geared at acquiring the required tacit medical knowledge. Medical exams consist of written components and also practical

100 This is science as it is communicated (e.g. in textbooks). Scientists possess and rely heavily on their own tacit scientific knowledge.
103 This will be discussed later in the thesis.
examinations whereby the student’s tacit knowledge is put to the test, and a doctor is competent only once they have adequate medical knowledge in all dimensions.

Tacit medical knowledge ranges from the skilful knowledge of the surgeon, to the judgement of the diagnostician, or the empathetic knowledge of a caring physician. An example of tacit medical knowledge used by Polanyi is the attainment of anatomical knowledge, which he believes is an ineffable process.

The medical student first learns a list of bones, arteries, nerves and viscera which constitutes systematic anatomy. This is hard on the memory, but mostly presents no difficulty to the understanding, for the characteristic parts of the body can usually be clearly identified by diagrams. The major difficulty in the understanding, and hence in the teaching of anatomy, arises in respect to the intricate three-dimensional network of organs closely packed inside the body, of which no diagram can give an adequate representation. Even dissection, which lays bare a region and its organs by removing the parts overlaying it, does not demonstrate more than one aspect of that region. It is left to the imagination to reconstruct from such experience the three-dimensional picture of the exposed area as it existed on the unopened body, and to explore mentally its connections with adjoining unexposed areas around it and below it. The kind of knowledge which an experienced surgeon possesses of the regions on which he operates is therefore ineffable knowledge.\(^\text{105}\)

The ability to construct a mental, three-dimensional image of the body is but one of many such examples of tacit knowledge in medicine. In fact, due to the spectral nature of knowledge, all medical knowledge has at least some tacit component – just as tacit knowledge can be partially explicated.

The role of particular knowledge in medicine is also dominant in that, in practice, medicine is primarily about the application of its knowledge to the individual patient’s suffering. Chapter four will provide examples of functions of explicit, tacit, general and particular knowledge forms in medicine.

### 3.7 Knowledge in Suffering

Knowledge in suffering is very important in this thesis given that knowledge determines a rational practice (like medicine) and the amelioration of suffering is medicine’s primary goal. Suffering cannot be completely understood by science because scientific knowledge largely excludes tacit and particular knowledge and these knowledge forms (as well as explicit and general knowledge) are of utmost importance in the experience

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and therefore amelioration of suffering in persons.\textsuperscript{106} This means the knowledge that is important in medicine is broader than just scientific knowledge. Tacit knowledge in suffering has been implicitly referred to by Cassell in his characterisation of suffering as something that is holistic and often unknown,\textsuperscript{107} and also by Gillett when he discusses suffering where there are “no words to speak” of it.\textsuperscript{108}

I know about myself and this knowledge may be explicated into language or require a tacit understanding, whether particular to me or shared by others. What causes me to suffer is my awareness of things, both focally and subsidiarily, that I perceive to threaten my personhood (i.e. my personal knowledge) and could include that “I have terminal cancer” (rather explicit) or that “I am sad, but don’t know why” (tacit). This knowledge may be generalised, for example death is widely considered to be bad for the person. It will also have particular aspects, such as cultural or personal beliefs of death. In this light, the holistic experience of suffering is a kind of knowledge in itself – the sufferer knows she suffers and may be aware of some salient and even inexpressible aspects of that.

The knowledge of those attending to suffering also varies. I need a physician with a thorough grasp of explicit-general medical knowledge of the bodily causes of suffering (i.e. disease), but also someone who can relate to me as a unique person at a level above the explicit content of our interactions (particular-tacit knowledge). Because the experience and amelioration of suffering depends on all the dimensions of knowledge it follows that to properly serve its goals, medicine must recognise and use all forms of knowledge. Medicine is not serving its ends by emphasising one kind of knowledge at the expense of others because a balance is required for effective practice. Through the lens of the medical telos, philosophies that encourage exclusion of knowledge about suffering can be rightly considered unhelpful for medicine.

\textsuperscript{106} This was alluded to in section 2.4.
\textsuperscript{107} Cassell, E. J. (2004). p. 29-45
3.8 Conclusions

The theory presented in this chapter presents two dimensions of knowledge: the explicit-tacit and general-particular. Over time, medicine has come to highly value scientific knowledge, possibly at the expense of seeing the patient as a unique person.\textsuperscript{109} This has created a tension in that some thinkers have advocated the importance of “subjective aspects”\textsuperscript{110} of medical practice,\textsuperscript{111} but have had difficulty advocating their views due to the perception that medicine must maximise its use of knowledge and the best kind of knowledge is “objective” (and so explicit and general). This perception is largely the result of a “modernistic” hangover within a philosophically lay medical community where the paradigm is knowledge as an explicitly “justified, true belief”. The theory in this chapter unifies explicit and generalised knowledge forms with tacit and particular knowledge and therefore undermines the gap between “objective” (explicit-general) and “subjective” (tacit and particular) knowledge. This conception of medical knowledge is a step forward for medical practice, as it recognises the dual importance of “objective” clinical research as well as “subjective” factors pertaining to persons.

I propose that medicine, as a rational activity, maximise its ability to realise its telos by maximising its knowledge of this telos. That is, medicine will be optimally poised to attend to suffering when it recognises and uses all its knowledge of suffering (and not just “objective” forms). Before appraising whether EBM (a specific philosophy in medicine), aids us in achieving this goal, I will outline a framework of medical practice centred on the medical telos and the theory of knowledge outlined in this chapter.

\textsuperscript{109} See section 2.5.
\textsuperscript{110} I reject concepts of “objectivity” and “subjectivity”. I would instead frame “subjective aspects” as knowledge that has tacit and/or particular components.
Chapter 4: The Discourse of Medical Knowledge

Chapter four will apply ideas developed in previous chapters to develop a conceptual framework for clinical medicine. Medicine is diverse, and consists of activities that are quite apparently medical, such as general practice, as well as things that might not involve a physician-patient interaction, such as public health or community based activities.

4.1 Philosophies of Practice

Medicine is primarily practical however it remains important to have an understanding of the nature of its goals (i.e. its telos). Within medicine, there are distinct philosophies of practice that aim to inform this telos and also how medicine is carried out (e.g. Patient Centred Medicine). These philosophies are grounded in sets of “fundamental notions” related to diverse understandings of medicine’s goals and how they may be realised. For example, Patient Centred Medicine (PCM) is loosely based on the idea that the patient (as a person) is paramount in medicine. These “fundamental notions” are central to a philosophy of practice and underpin its specific assertions. They may be explicit, or implied by a philosophy’s assertions.

The foundations of a philosophy define it – a philosophy where physicians were the paramount participants in medicine could not be “patient centred”. In a philosophy of practice the fundamental notions can be so rigid that any changes to them results in a novel philosophy based on a “new idea”. Changes to a philosophy are permitted given they do not violate its fundamental assertions, for example if the consultation model for PCM changed slightly but clearly remained “patient centred”. Any changes that do violate a philosophy’s fundamental notions are implicit signals that it has altered its internal framework and is consequently an entirely new philosophy and should be recognised as such.

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112 Stewart et al. (2003).
113 Alternatively: “foundational theory”, “fundamental assertions” or “basic ideas”.
114 “Philosophies of practice” are similar to “paradigms” in Kuhn’s - The Structure of Scientific Revolutions. Paradigms also have rigid sets of “fundamental notions”. Although parallels exist, Kuhn’s “paradigms” will be avoided (for now) to avoid connotations of incommensurability and the irrationality of science.
This chapter articulates a model for a philosophy of practice based on a critical discussion of medicine’s goals and the nature of medical knowledge. The fundamental assertions of this philosophy are: (i) medicine is about attending to patient suffering; (ii) medical knowledge is personal and varies in its explicit-tacitness and general-particularity; and (iii) medicine has a discourse of knowledge created by those who participate in it. The framework developed here will be used to critique EBM, another philosophy of practice, following an elucidation of the foundations of EBM.

4.2 Medical Practice and Knowledge of Suffering

Because medicine is about addressing the suffering of individual patients, all medical knowledge is related to suffering in some way. Links between medical knowledge and suffering may be direct, or knowledge may affect suffering via an indefinite number of proxies (e.g. disease). When seen in terms of medicine’s goal, it is clear the value of knowledge is in its ability to assist medicine address the suffering of sick people. Something like the knowledge of effective medical record systems affects suffering in that this knowledge allows institutions to run efficiently, assisting those who practice within them to tend to patient suffering.

Medicine is rational and should strive to maximise its use of knowledge to guide practice and govern what is appropriate in the medical context. In an idealised system, knowledge would dictate the legitimacy of practices and could be seen as analogous to a currency of medical authority. Practices can be judged as “good” if they agree with current medical knowledge, but only if that knowledge is concerned with suffering and is not exclusively scientific. As a result of this, medical knowledge of suffering is the landscape within which those who practice medicine should navigate.

4.3 Knowers in Medicine

Clinical medicine is guided by medical knowledge that, because it is personal, is held by the people involved in medicine’s varied activities. In a model of practice framed by medical knowledge, the importance of those players who possess knowledge of suffering and its alleviation is therefore paramount. The people who practise medicine

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115 See chapter two.
116 This is like for EBM however EBM exclusively recognises clinical research and excludes other forms of knowledge recognised by this thesis (tacit and particular knowledge).
117 See chapter three.
are the experts who know medicine and should be recognised as such. In this study, the
groups who participate in clinical medicine are patients, physicians, clinical authorities
and biomedical science. Other players will not be discussed (e.g. medical educators)
even though they “know” medical practice and its goals, and possess their own unique
knowledge that reflects their role in practice. Commercial entities will be considered in
chapter six but they are outside this framework because they are motivated by profit, not
suffering.

4.3.1 Patients

The individual patient suffers so is the subject most acquainted with the reality central
to medicine’s goal. Patients’ knowledge of their suffering is direct, to the point their
knowledge of suffering is equivalent to their suffering - we know when we suffer but
not always why. Patient’s knowledge of suffering tends to be particular but also
includes general aspects that result from inter-subjectivity (e.g. cultural knowledge). It
is also both explicit and tacit.

The patient gives an explicit account of their suffering when communicating their
symptoms, social, medical and family histories to the physician. These accounts also
convey tacit knowledge implicit in concerns, ideas and beliefs. The explication of tacit
knowledge can present difficulties and may only be illuminated in the subtle
interpretation of things like body language, highlighting the need for sensitivity and
empathy from the physician. In suffering, the patient’s values and perspectives are
important, just as explicit facts like smoking status are important considerations for the
physician in terms of disease. The results of examinations and investigations are a
kind of particular knowledge of the patient illuminated by the medical process.

The family and friends of a sick person are invariably involved with their care, so this
framework also includes them, to the extent they are involved in patients’ suffering (and
alleviation of it).

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118 See section 3.7.
120 Tacit aspects are important in disease too, such as the physician’s appreciation of the patient’s overall
state from their appearance.
4.3.2 Physicians

Physicians are those who care for patients, and primarily includes those who are medically trained, but there are others involved with patient care and form a part of the physician player in this framework (e.g. nurses, medical students, clinic receptionists). These people are relevant but for the purposes of brevity will not be explicitly discussed.

Physicians possess medical knowledge of all kinds including: general-explicit knowledge from science but also many other things. In the physician’s synthesis of the case the particulars are paramount, and accumulated general knowledge is used to gain particular knowledge of the patient. General-tacit knowledge of the physician includes clinical judgement, examination and procedural skills, and moral and interpersonal knowledge (e.g. empathy).

The physician’s particular knowledge of the individual patient includes explicit features (e.g. age, sex, occupation or previous diagnoses), and also tacit features like the patient’s overall state of health and how they are coping. The physician accumulates this knowledge by talking with the patient, by observing, and from the results of biomedical investigations.

4.3.3 Clinical Authorities\textsuperscript{121}

Clinical authorities dictate what is appropriate in the medical context and exist at all levels of medicine. The World Health Organisation and health ministries in central government are clinical authorities at the general level. More particular levels include individual District Health Boards or governance within hospitals.

Clinical authorities make decisions about health policy and affect what is done at the patient-physician level. This may be by mandating or prohibiting certain practices (e.g. euthanasia is not allowed in New Zealand), or by manipulating the means to carry out practices through funding (e.g. drug subsidisation). Clinical authorities assimilate medical knowledge from different sources to make these decisions.

\textsuperscript{121} Note the distinction here between the group “clinical authorities” and the attribute of having “clinical authority”. This distinction will hold throughout this thesis.
Medical knowledge for clinical authorities varies in all dimensions and includes the general-explicit knowledge of both biomedical science and the economic costs inherent to providing care. The knowledge of population health needs exists globally and also at particular local levels. Decisions by clinical authorities have partially tacit ethical considerations, either generalised or related to local particularities (e.g. cultural beliefs). And any judgements at the local level made on the basis of generalised knowledge will necessarily consider particular local knowledge to be effective. Clinical authorities have social, economic and political agendas that run alongside their scientific aspirations.

Clinical authorities must recognise and utilise all knowledge as “legitimate knowledge” to accurately judge the legitimacy of aspects of medicine. Different kinds of knowledge are inherently related to different things, so an exclusion of some knowledge will lead to unbalanced representations and decisions that reflect this. Because knowledge is personal and tacit aspects cannot be explicitly communicated, expertise is central to clinical authorities. In this framework clinical authorities recognise all knowledge and make judgements accordingly. The affects of EBM on clinical authorities will be explored in chapter six.

### 4.3.4 Biomedical Science

Biomedical science is the group of scientific disciplines concerned with health. This includes the basic sciences of medicine (e.g. physiology, genetics etc.) and also clinical research on patients. The knowledge that biomedical scientists possess includes tacit knowledge of the practice of science; however the knowledge they transfer to other players in medicine is exclusively explicit. This is a characteristic of scientific knowledge. It is also generalised due to characteristics of popular investigational techniques.  

### 4.4 The Discourse of Knowledge

In this framework players partake in medicine by communicating and acting on medical knowledge. Patient’s see physicians and recount the story of their illness and the physician gleans clinical knowledge from this interaction. This relies on knowledge from biomedical science and actions are governed by the regulations communicated by

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122 See section 3.5
clinical authorities. The practice of medicine can be seen as a discourse of knowledge occurring within the players of medicine, resulting in the execution of that knowledge and outcomes. A two-way flow of medical knowledge can be visualised between each player.

![Figure 2: The Discourse of Knowledge](image)

**4.4.1 Biomedical Science <-> Patient**

The patient is a source of knowledge for biomedical science so it can learn about sickness and how it may be treated. In clinical research, biomedical science takes information (knowledge) from individual patients to make generalisations about health (explicit-general knowledge).

Patients also receive generalised knowledge from biomedical science. With the development of information technologies, patients are becoming more informed (and misinformed) about scientific aspects of their illnesses.
4.4.2 Clinical Authorities <-> Patient

Knowledge from patients informs clinical authorities in terms of the interventions that receive funding as well as professional standards for physicians. Policy decisions are determined by the needs of the patients at global levels but also by particular aspects of localised populations. Patients speak explicitly to clinical authorities when communities of patients with specific disease advocate their need for attention to their suffering (e.g. the cancer society campaigning for cancer research). They also communicate their need for an appreciation of tacit elements of their suffering, such as when patients advocate their autonomy or an appreciation of their cultural identity.

Clinical authorities communicate with patients through health policy. This information is explicit, however tacit elements are communicated via the meanings and values attached to policy. For example, the Code of Health and Disability Services Consumers' Rights\(^\text{123}\) is a message to patients that clinical authorities value their rights, explicitly spelling out which aspects of the patient experience are perceived to be important. Similarly, the treatments clinical authorities legitimise and subsidise is a tacit message of signification.

4.4.3 Physicians <-> Biomedical Science

The activities of physicians are hugely influenced by biomedical science. Biomedical science is central in medical education and its influence continues as discoveries enter practice. Physicians are encouraged to seek the newest and best clinical research to inform their decisions.

Physicians also influence biomedical science and may undertake their own medical research. The physician’s knowledge of the patient-physician interaction helps to guide research and informs biomedical science of areas where research is needed.

4.4.4 Biomedical Science <-> Clinical Authorities

Explicit-general knowledge from biomedical science influences the treatments that clinical authorities see as “good medicine” and legitimises in policy. It is also used to choose between alternative options in funding allocation. It is important to recognise the

\(^{123}\) HDC (1996).
political dimension that exists here, and that clinical authorities’ use of biomedical science might invoke motives other than alleviating suffering (e.g. restraining costs).

Clinical authorities influence the direction of biomedical science by selectively allocating research funding. What determines funding decisions will include knowledge from patients and physicians (e.g. via advocacy groups or social needs) as well as from science in terms of programmes that have been successful in the past. Prevailing views affect the allocation of funding (e.g. EBM advocating the superiority of RCTs over observational studies), and so do restrictions imposed by considerations in research ethics, which limit the questions biomedical science is able to ask and so answer.¹²⁴

4.4.5 Clinical Authorities <-> Physician

Clinical authorities impart knowledge to physicians in policy, which is reflective of clinical authorities’ interpretations of medical knowledge in all dimensions, often received from other players in practice. The knowledge communicated to physicians in this way is explicit (but reflective of tacit elements). A tacit transfer of knowledge comes in the form of normative expectations, largely related to professional standards of behaviour.

Physicians and their knowledge of the clinic play a key role in clinical authorities, which may be made up of people who are also physicians. An example is the need to balance false positives and false negatives in diagnosis and treatment and the costs associated with this balance – both economic and human.

4.4.6 Patient <-> Physician

The discourse occurring between the physician and patient has been touched on. Simplified, the clinical consultation consists of the patient presenting with suffering and the physician attempts to learn about it. This involves discussing the patient’s history, examinations and biomedical investigations. The patient shares medical knowledge of themselves and the physician receives this critically to guide further investigation. The physician develops a differential diagnosis in the consultation and this is a dynamic process in that responses to questioning will affect the differential, and the differential

¹²⁴ This is one factor that limits scientific knowledge and so should be considered in its application in practice, especially if there is an imperative for scientific justification.
will affect the questions asked. In partnership with the patient, the physician makes connections using their tacit and explicit knowledge to make knowledgeable judgements.

The patient receives medical knowledge from the physician consisting of information related to diagnosis, prognosis and treatment. During the interaction, the physician conveys what may help with the patient’s suffering. This could be a drug treatment, a surgical procedure or something not exclusively medical such as a lifestyle change.

The discourse occurring between the patient and physician is arguably the most significant in medicine and its goals. It follows that what is seen to be legitimate medical knowledge in this situation is also very important. Medical knowledge in the patient-physician discourse consists of much more than scientific knowledge. Non-scientific knowledge can be extremely important in the patient-physician interaction (e.g. empathy), and can be rightly considered a kind of medical knowledge important in alleviating patient suffering.

4.5 The Discourse in Practice

An analogy to a real clinical situation may help elucidate this framework and its application to medical practice:

A patient presents to her local general practice complaining of headaches. The consultation begins as the physician initiates a discourse whereby he interviews her to learn about what is going on. The doctor asks questions related to the headaches and aspects of the patient’s social, medical and family history that might be relevant (particular-explicit knowledge). During the interview, the patient expresses her distress and concern that she has a brain tumour (particular-tacit knowledge). During this time the physician makes acute observations of the patient’s state that he may be unaware of (particular-tacit knowledge). The physician undertakes a neurological examination (dependent on his general-tacit knowledge) and orders a CT scan as a further investigation (an explicit result relying on tacit interpretation).

On receiving the results the physician sees there is a mass lesion and calls the patient back in to discuss treatment options. The options he is able to offer depends on his explicit-general knowledge (from biomedical science), one of which involves a genetic test, which indicates whether an experimental immunological treatment might be effective for this patient (explicit-particular knowledge from biomedical science). Most of the treatment options are

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125 This knowledge is tacit as although the explicit consequences of cancer contribute to her suffering (e.g. that she might die), there will also be factors that the patient is unable to explicitly recognise or communicate.
publicly funded, however the immunological therapy is not and is very expensive (the availability of funding is determined by medical authorities and this knowledge is communicated to the physician).

When the patient arrives at the practice, the physician informs her empathetically that she has a potentially fatal brain tumour. In doing this, the physician utilises his tacit-general knowledge of how to deliver bad news but also tacit-particular elements as the physician relates with aspects of the person in front of him. On hearing the news the patient is upset (a kind of tacit-particular knowledge), but appreciates the concern for her wellbeing shown by the physician, paying attention as he communicates explicit aspects of her disease and treatment options. Due to her beliefs and experiences the patient is unwilling to undergo chemotherapy or surgery (tacit-particular knowledge), but is willing and fortunately able to pay for the immunological therapy. She takes the quick genetic verification test with a favourable result. At this time, the patient enters a discourse with the doctor about how this diagnosis and therapeutic regime is going to affect her life physically, but also emotionally and spiritually (noting tacit elements), and the physician refers the patient to further support systems.

The patient undergoes the experimental treatment as part of a large clinical trial. Fortunately the treatment is successful and she returns to good health. The success of her treatment informs the clinical trial (biomedical science) which is analysed by clinical authorities who choose to fund this treatment. This decision is made on the basis of scientific results and also the social need this type of cancer patient presents.

This story illustrates knowledge of all kinds in the clinic and how it influences decisions and outcomes. This knowledge is not limited to the physician and patient, but involves biomedical science and clinical authorities. If some aspects of knowledge in this situation were removed (or ignored) the resultant clinical outcome could be very different. More importantly, the non-recognition of particular and tacit knowledge could have a drastic effect on how this instance of disease was experienced by the patient as suffering. The consequences of this diagnosis on the person and their knowledge of the situation are very particular and tacit. Therefore, recognition of these aspects as “legitimate knowledge” is paramount in attending to this patient’s suffering, even if treatment and outcomes of disease are identical. Philosophies of practice may influence what are seen as legitimate ways of doing medicine and some, like EBM, are specifically concerned with medical knowledge.
4.6 Conclusions

In medicine there are distinct “philosophies of practice”, with their own fundamental notions related to medicine’s goals and how they should be achieved. These philosophies represent different ways of “doing” medicine, and because their fundamental notions define them, any change to these notions results in a novel philosophy that is distinct from the original. According to this philosophy of practice and framework of clinical medicine, medicine is set against a background of medical knowledge that is inherently related to the relief of suffering (medicine’s telos). Medical knowledge is explicit and generalised and also tacit and particular. Because knowledge is personal, it cannot exist independently of the players who practice medicine and medicine “happens” by a discourse of knowledge between its players who are: the patient, the physician, biomedical science and clinical authorities.

The next chapter discusses Evidence Based Medicine (EBM) as a philosophy of practice that is distinct from medicine’s use of scientific knowledge. EBM’s fundamental notions about knowledge amount to an implicit theory of medical knowledge. EBM de-emphasizes subjective knowledge, however alongside EBM, philosophies emphasizing subjective factors in medical care have become popular.\textsuperscript{126} I conclude that an alternative model to EBM that is concerned with knowledge should be sought, such as the philosophy presented in the last three chapters.\textsuperscript{127}

\textsuperscript{127} Due to the nature of this project the framework that has been presented has been described simplistically. It could be expanded upon given its basic assertions of medical knowledge, practice, and the importance of the players that participate in it to provide a more complete framework.
Chapter 5: Evidence Based Medicine and Knowledge

This chapter discusses EBM and its conception of medical knowledge. EBM is concerned with clinical decision-making, and how this should be based in certain kinds of knowledge. EBM influences how medicine is practiced and is a “philosophy of practice” of the kind described in section 4.1. Following from this, EBM has “fundamental notions”, and those that are concerned with knowledge amount to a theory of medical knowledge that underpins EBM’s specific assertions. This theory will be explicated by analysing the original characterisation of EBM and compared to the theory of knowledge in chapter three. EBM’s specific goals will be discussed before attention turns to announced changes to EBM. These changes are responses to weaknesses in EBM’s original philosophy and whether they reflect genuine modifications to EBM theory is unclear. I will conclude that although it is right that medicine utilises scientific knowledge, EBM as a method for doing so is flawed, because it is philosophically incoherent. Chapter six will assess EBM in terms of medicine’s fundamental goal of relieving suffering.

5.1 EBM: Distinct to the Use of Science in Medicine

It is important first to distinguish EBM from biomedical science, or the use of scientific knowledge in medical practice. Here I will briefly trace the historical relationships between: medicine, science, and EBM, and then discuss how EBM only recognises a certain kind of scientific knowledge. I will then explain why EBM is not a science in itself but a philosophy of practice concerned with using scientific knowledge in medicine.

5.1.1 The History of Biomedical Science in Medicine

EBM was first described in the early 1990s.\textsuperscript{128} Medicine, however, has been using scientific ideas and methods throughout its history. The Edwin Smith papyrus, for example, is a case-based text describing the diagnosis and treatment of trauma, considered one of the first scientific approaches to medicine dating back to 1600BC.\textsuperscript{129} Some of the first uses of modern quantitative techniques appeared in medicine at the

\textsuperscript{128} EBMWG (1992).
\textsuperscript{129} Moore, W. (2011).
end of the 17th century,130 and the first half of the 20th century saw the first modern randomised controlled trials.131 There were also developments that facilitated new investigative technologies, like the null hypothesis.132 Although such developments in investigational techniques may have precipitated the EBM movement, they existed independently of EBM.133 What this temporal separation shows is that medicine has and may continue to utilise scientific knowledge in the absence of EBM. EBM is not “the use of scientific knowledge medicine”, but rather, a specific “philosophy of practice” concerned with scientific knowledge in medicine.

5.1.2 EBM’s Emergence from Clinical Epidemiology

EBM is restrictive in the kinds of biomedical science it recognises. This is partially a result of EBM’s emergence from clinical epidemiology.134,135 Clinical epidemiology is a scientific discipline largely attributed to Alvan Feinstein’s work in the mid 20th century.136,137 He argued there was more to medicine than a sound understanding of disease mechanisms and developed the use of statistical techniques to inform clinical decision-making.138,139 Epidemiology is concerned with using statistical methods in health and at a population level. Clinical epidemiology is similar, but investigates health at the level of the patient in the clinical setting. It uses techniques like the RCT to study the efficacy of treatment, prognosis and other things investigable at the clinical level.

David Sackett, who published a book on clinical epidemiology,140 helped to establish EBM and was influenced by Feinstein’s ideas. He worked with Feinstein at McMaster University while Feinstein was there from 1971-1973,141 and was the first chair of the university’s clinical epidemiology department.142 Gordon Guyatt, who coined the term “Evidence Based Medicine”, also worked in clinical epidemiology at McMaster.143

130 JA, V. H. (1662).
133 A detailed account of the history leading up to EBM can be found in – Claridge, J. A. and T. C. Fabian (2005).
135 Charlton, B. G. (2009).
136 Ibid.
141 Spitzer, W. O. (2002).
142 McMaster. "Faculty - David Sackett."
143 McMaster. "Faculty - Gordon Guyatt."
EBM originated from clinical epidemiology and is similar in its appreciation of statistical investigations of health in clinical settings. As a specific discipline of biomedical science, the knowledge employed by clinical epidemiology does not include that from other disciplines, such as physiology (except in terms of study design and interpretation). As a scientific discipline, clinical epidemiology is not intrinsically concerned with how medicine is carried out (but medicine uses clinical epidemiology to inform practice). EBM is concerned with philosophical aspects of medical practice. The creators of EBM were very familiar with clinical epidemiology and the scientific knowledge EBM recognises comes strictly from clinical epidemiology – i.e. research involving patients in the clinical settings. EBM does not recognise knowledge from the other basic biomedical sciences.

Studies in the laboratory and preliminary investigations in humans form the foundation of our knowledge about clinical problems and provide the groundwork for most diagnostic procedures and clinical interventions. To determine whether these interventions and insights do more good than harm, however, systematic studies of their application in clinical settings are needed.

An example of the exclusion of the basic sciences by EBM would be that favourable results in studies on mice would not be sufficient “evidence” to justify prescribing a drug in pregnant human patients (I do not dispute this). The scientific knowledge used by EBM is limited to evaluative science – i.e. science involving patients evaluating interventions (or diagnostic techniques, prognostic markers etc.). Evaluative science’s counterpart is explorative science, excluded by EBM and comprised of the remainder of biomedical science (other than clinical epidemiology). Evaluative science is concerned with understanding processes of health and the development of new therapeutic technologies. The exclusion of explorative biomedical science as a valid guide to medical practice demonstrates the distinction between EBM and the use of science in medicine. This feature of EBM reflects its disapproval of reasoning by pathophysiological principles and will be discussed in section 5.4.3.

144 There is a view that EBM took clinical epidemiology and oversimplified it, possibly to facilitate its dissemination - Charlton, B. G. (2009).
5.1.3 EBM as a Philosophy of Medical Practice

“When I use a word,” Humpty Dumpty said, in a rather scornful tone, “it means just what I mean it to mean – neither more nor less.”

Elucidating the nature of EBM is difficult. It has been pointed out, that EBM is elusive because it has been defined ambiguously by its creators.\(^{(148,149)}\)

There is a tendency for some proponents of EBM to duck these questions [about EBM] and avoid this debate by defining "evidence-based medicine" such that it includes the best possible combination of basic science, clinical experience, and clinical trials. In so doing, the proponents of EBM come awfully close to simply defining EBM as the best way to practice medicine, whatever that may be.\(^{(150)}\)

The ambiguity of EBM means it is necessary to look beyond explicit definitions to reveal their underlying meanings. Difficulties are confounded by changes announced to EBM by its creators.\(^{(151)}\) The original version “de-emphasizes intuition, [and] unsystematic clinical experience”\(^{(152)}\) however, recent versions state there is “a central role for clinical expertise”.\(^{(153)}\) Much discussion of EBM is rhetorical, utilising colourful terminology such as EBM as a “zombie science”.\(^{(154)}\) This creates further difficulties in determining the nature of EBM, as arguments tend to be polarised and points exaggerated for persuasive appeal.

What can be said of EBM is that it was created with the intention of changing medical practice - “A NEW paradigm for medical practice is emerging”\(^{(155)}\) – and that it is concerned with the nature and evaluation of medical knowledge. The creators of EBM sought to introduce changes to practice that they claimed would result in “superior patient care”.\(^{(156)}\) In the absence of any “evidence” to support this claim,\(^{(157)}\) they must have had some reason (i.e. philosophy) to believe it. Presumably, these reasons would have included their (possibly incomplete) theories of the nature of medical knowledge, and how the application of these ideas would result in the achievement of specific goals.

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\(^{(147)}\) Carroll, L. (1871).
\(^{(149)}\) Loughlin, M. Ibid.
\(^{(152)}\) EBMWG (1992).
\(^{(154)}\) Charlton, B. G. (2009).
\(^{(156)}\) Ibid.
So, EBM as a *philosophy of practice*\textsuperscript{158} must have *fundamental notions*, which provide the *reasons* why the EBMWG stake claims regarding the use of knowledge in medicine. These notions are set out in the original characterisation of EBM\textsuperscript{159} because this paper reflects the original theoretical reasoning of the EBMWG and the “basic ideas” upon which EBM is grounded. However, according to the EBMWG, EBM has changed over time in response to limitations of early models.\textsuperscript{160} This allows proponents of EMB to argue that certain arguments directed at EBM are now invalid because of these changes.\textsuperscript{161} In my view, this defence fails because the announced changes to EBM are superficial and do not represent genuine changes to its underlying philosophy. This is because the *fundamental notions* of a philosophy define that philosophy and must remain constant for the original philosophy to exist. For this reason I will describe EMB in terms of its original characterisation.\textsuperscript{162} The possibility that EBM has genuinely changed will also be discussed.

### 5.2 EBM: A Theory of Medical Knowledge

EBM advocates argue that all medicine should be “evidence based”, and hence the theory of knowledge intrinsic to EBM is not only a theory for EBM, but is implied to be a theory of knowledge for all of medicine.\textsuperscript{163} This is in contrast with a theory of knowledge implicit in, say, clinical epidemiology, which does not assert itself as essential to all of practice. Clinical epidemiology’s theory of knowledge would be a theory of things like RCTs or meta-reviews, but not a theory of knowledge for all of medical practice because of the absence of a normative imperative.

\textsuperscript{158} EBM is also described by its creators as a “philosophy of medical practice” - EBMWG (1992).
\textsuperscript{159} Ibid.
\textsuperscript{160} Haynes, R. B. (2002).
\textsuperscript{161} Buetow, S. (2009).
\textsuperscript{162} Also announced changes have been low profile in comparison to the emergence of EBM so EBM in practise may reflect earlier versions.
\textsuperscript{163} EBM has been described as “a school of medical epistemology” – i.e. a theory of medical knowledge - Tonelli, M. R. (1998).
EBM is distinct from science but highly influenced by scientific principles. The creators of EBM aimed to improve medicine by making it more “scientific”. This is reflected in EBM’s foundational theory. According to science, knowledge is a “justified, true belief” - the first fundamental notion of EBM:

1. **For EBM, medical knowledge is a justified, true belief.**

One mustn’t look further than the name “Evidence Based Medicine” to see this. EBM advocates the use of clinical research evidence to justify medical practice, and for EBM, evidence is the justification of medical knowledge.¹⁶⁴ For EBM, “evidence” is specifically clinical research and knowledge resides in the journal articles presenting clinical studies and not within the humans who read and interpret these articles. In this respect, EBM construes knowledge as abstract. Hence, EBM is an objectivist philosophy because it views knowledge as something independent to the mind and external to the knower.

The second fundamental notion of EBM is that different kinds of knowledge are more or less reliable:

2. **For EBM, some medical knowledge is superior to other kinds.**

That EBM places different value on different kinds of knowledge is evident in the “hierarchy of evidence”, a tool used by EBM to grade the quality of evidence.¹⁶⁵ The hierarchy is graded based on how evidence is obtained. Randomised controlled trials and meta-reviews of these trials are typically at the top, followed by observational studies, with case studies and “expert opinion” at the bottom of the hierarchy. The hierarchy of evidence ranks methodologies according to their “epistemic strength”.¹⁶⁶ Following this is the third fundamental notion of EBM:

3. **For EBM, rigorously justified medical knowledge is superior.¹⁶⁷**

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¹⁶⁴ Knowledge as a justified, true belief was discussed in section 3.1.
¹⁶⁵ Guyatt et al. (1995).
For superior knowledge to exist, there must also be inferior knowledge. A logical consequence is that in practice, the use of superior knowledge should be encouraged and inferior knowledge should be de-emphasised.\textsuperscript{168}

4. \textit{For EBM, medicine will be improved by using superior over inferior knowledge.}

Maximising the use of “superior knowledge” is what the EBMWG advocated in their original EBM (i.e. that from clinical research). Two other kinds of reasoning were considered inferior: reasoning by pathophysiological principles, and reasoning by clinical experience - and were consequently de-emphasised.\textsuperscript{169} Later this assertion was revoked, either as a genuine change in EBM’s underlying philosophy, or as a superficial response to criticism. The four statements just presented represent how I understand EBM’s theory of medical knowledge. The next section will evaluate EBM’s theory of knowledge against the theory I set out in chapter three. Later I will explore specific goals of EBM’s theory in practice to reinforce the proposed theory of knowledge and also to highlight weaknesses of EBM that will be explored in chapter six.

5.3 EBM and the Four Dimensions of Knowledge

As discussed in chapter three, medical knowledge is dimensional and varies in its explicit-tacit(ness) and general-particular(ity). This conception of knowledge is incompatible with knowledge conceived simply as a “justified, true belief”. This is because tacit knowledge cannot be readily articulated (or abstracted) and so cannot be explicitly justified, and because particular knowledge does not need to be justified in the manner of general knowledge. The forms of epistemic justification required by EBM means tacit and particular knowledge are considered inferior and consequently their use is discouraged. The reasons tacit and particular knowledge are excluded by EBM are similar to the reasons they are excluded by biomedical science.\textsuperscript{170}

Medical knowledge for EBM is abstract and exists independently of the knower. This is at odds with discussion in section 3.1.3, which holds that knowledge resides exclusively within the knower. When seen through the framework of EBM the deeply personal nature of tacit knowledge is troublesome, as is particular knowledge, which includes all

\textsuperscript{169} EBMWG (1992).
\textsuperscript{170} See section 3.5.
the things I know about myself (regardless of whether I can say them). Thus, EBM’s medical knowledge only recognises the explicit and general dimensions of knowledge. However, even these dimensions are limited by EBM’s exclusion of exploratory biomedical science.¹⁷¹

Later versions of EBM emphasise the importance of clinical expertise, the patient’s preferences and actions, and the clinical state and circumstances.¹⁷² I consider these things as predominantly tacit and particular knowledge. According to this account of EBM’s theory of knowledge, tacit and particular aspects cannot be considered as “superior knowledge” and therefore their use in practice should not be encouraged. Consequences of this announced change to EBM (as a “philosophy of practice”) will be explored at the end of this chapter.

5.4 Goals of EBM

This section discusses EBM’s goals as set out in its original characterisation. This will reiterate EBM’s theory of knowledge and will allow me to address weaknesses in EBM’s philosophy that will be expanded on in chapter six. Three goals will be mentioned. The first was to improve medicine by increasing its rationality. The EBMWG aimed to do this by insisting medicine be based in a kind of knowledge that

¹⁷¹ See section 5.1.2.
they saw as superior. The second is to do with what the EBMWG saw as a misappropriation of clinical authority attributed to clinical experience. And the third goal was to make medicine safer by discouraging reasoning in pathophysiological principles. Other possible goals will not be discussed.

5.4.1 Superior Knowledge and Rationality

“All knowledge is equal, but some knowledge is more equal than others”173

EBM’s main goal was to improve medicine by increasing its rationality. Tied to this goal is the assumption that increasing rationality (i.e. the use of knowledge) results in better practice. I accept this claim but argue that “rational” knowledge is broader than EBM allows. EBM considers rigorously justified knowledge superior. A conclusion was that EBM could increase the rationality and therefore quality of medicine by encouraging the use of rigorously justified knowledge over knowledge that is not justified, or less so.

Evidence-based medicine de-emphasizes intuition, unsystematic clinical experience, and pathophysiologic rationale as sufficient grounds for clinical decision-making and stresses the examination of evidence from clinical research.174

Through the lens of EBM’s theory of knowledge, reasoning by clinical experience and pathophysiological principles are inferior to reasoning by rigorous clinical research, so medicine will be improved by a focus on the latter. EBM does not out of hand reject reasoning by clinical experience or pathophysiological principles, but accepts that both are relevant to medical practice. However, the context of these claims is an argument where clinical research evidence is the sufficient and preferred guide to practice, while other forms of reasoning are insufficient and undesirable. Goals related to clinical experience and pathophysiological principles will be addressed in the proceeding sections.

In terms of the theory in chapter three, emphasising research evidence at the expense of other forms of reasoning erodes medicine’s rationality. These kinds of knowledge are inherently different, and emphasising one kind of knowledge cannot make up for a deficiency in another. Clinical research evidence is strictly explicit and generalised.

173 Adapted from Orwell, G. (1945).
Clinical experience and pathophysiological principles contribute to tacit and particular components of a physician’s knowledge (and also explicit and general ones). EBM fails its goal of advocating for rationality in medicine, as it encourages a flat-world and exclusionary perspective of knowledge that impinges on medicine’s adequate use of it.  

5.4.2 Reasoning by Experience and Clinical Authority

A second aspiration of EBM was to democratise medical practice:  

“The new paradigm puts a much lower value on authority.”

EBM was concerned with the authority attributed to clinical experience and the resultant power possessed by those considered experts. The EBMWG thought placing authority in “expert opinion” was a misappropriation of power that resulted in the silencing of less experienced physicians with equal access to research evidence, the ideal guide to practice. There are two reasons EBM objected to the use of clinical experience. The first was that it is not rigorously justified and can be demonstrated as wrong by systematic research. So, the use of clinical experience was seen to diminish medicine’s rationality. The second reason was that it varies from person to person, meaning there could be unresolvable conflict if arguments were justified by opposing clinical experience. The de-emphasis of clinical experience, in favour of the use of clinical research, was seen as a way EBM could fix problems of authority in medicine.

Clinical experience may be regarded as primarily a tacit form of knowledge, with explicit elements. One problem with EBM’s (original) de-emphasis of clinical experience in favour of explicit research evidence is that it ignores important differences between these two dimensions of knowledge. Overemphasis of clinical research is not healthy because even infinite clinical research cannot replace the tacit knowledge of the physician, which is accumulated by experience only. The authority attached to experts makes sense when tacit knowledge is considered. Although junior

175 In my account, rationality calls for a holistic balance of all kinds of knowledge in medicine, including that from clinical research.
176 Hegemony in clinical authority was also an issue for Feinstein, the father of clinical epidemiology and an inspirational character for EBM. He was motivated by the dominance of laboratory medicine in clinical authority. New therapies and diagnostic techniques were emerging and Feinstein thought these were obscuring the truth, that clinical medicine was not adequately using science to provide evidence for the true purpose of medicine - addressing human illness and improving the treatment of sick people. He was, until his death, an avid critic of EBM for the same reasons - Jensen, U. J. (2007).
physicians have equal access to clinical research, they lack the tacit capacities of the “expert” doctor. The fact that clinical experience varies does not weaken its value. A breadth of experience is valuable in unpredictable and diverse settings like healthcare. Although disagreements occur, healthy argument can generate solutions and new ideas (so long as individuals are not dogmatic; yet if they are then the individual is at fault not “experience” per se).

The EBMWG thought denouncing clinical experience would resolve issues of authority in medicine because power would be shifted from the “subjective” hands of experienced physicians into the “objective” statistics of research evidence. For the EBMWG, research evidence was knowledge that existed independently of people, so authority was moved away from those who could manipulate it for their ends. This goal of “democratising” practice was noble, but failed because clinical authority has not left the hands of people (nor has it been objectified). Rather it has shifted and moved from physicians, who share medicine’s goals (and possess a deep tacit medical knowledge), to those who control the direction of research evidence (which is communicated strictly explicitly). Some of these people do not hold human suffering as a paramount concern and are motivated by other things (e.g. profit). The ways that EBM is corrupting medicine’s humanistic goals through its allocation of clinical authority will be explored in chapter six.

5.4.3 Reasoning by Pathophysiological Principles and Clinical Safety

A third concern of EBM is clinical safety. Many medical therapies come with risks. Requiring that interventions undergo testing in patient populations is a way to identify practices that cause more harm than good. Although EBM recognises the relevance of pathophysiology in medicine, it discourages reasoning by pathophysiological principles, instead advocating research evidence. This is because sometimes pathophysiological reasoning can justify practices that are harmful.

Thus, the observation that patients with ventricular ectopic beats following myocardial infarction were at high risk of sudden death, coupled with the demonstration that these extra beats could be suppressed by specific drugs, formed a sufficient rationale for the wide-spread prescription of these drugs to post-infarction patients with unstable cardiac rhythms. However, subsequent

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178 It is important to note here that tenure does not necessarily equate to expertise.
179 Unless you hold the perspective that “knowledge” refers exclusively to unshakable universal truths.
randomized controlled trials examined outcomes, not processes, and showed that several of these drugs increase, rather than decrease, the risk of death in such patients, and their routine use is now strongly discouraged.\(^{180}\)

Reasoning by pathophysiological principles is not “sufficient grounds for clinical decision-making” for EBM.\(^{181}\) The EBMWG does not outright denounce its importance, however when addressing concerns that EBM does not value pathophysiological knowledge, their response is:

> The dearth of adequate evidence demands that clinical problem solving must rely on an understanding of underlying pathophysiology. Moreover, a good understanding of pathophysiology is necessary for interpreting clinical observations and for appropriate interpretation of evidence (especially in deciding on its generalizability).\(^{182}\)

In other words, EBM values pathophysiological knowledge, but only where there is not research evidence, or when this knowledge is used to apply research evidence. This reflects the perceived superiority of knowledge from clinical research, but how does this fit in to EBM’s theory of knowledge, given that both pathophysiological and clinical research knowledge are rigorously justified? It has been mentioned that EBM requires research evidence on human patients, and that EMB recognises evaluative science but not explorative science.\(^{183}\) This means that EBM represents a strictly inductive approach to medical practice. The EBMWG recognises our lack of omniscience and that deductive approaches may go awry when important unknown factors are not considered (e.g. in the quoted example). Therefore, according to EBM, evaluative scientific knowledge that addresses outcomes, not processes, is what is required for the justification of medical practice.\(^{184}\)

Against this view, it should be noted firstly that pathophysiological knowledge contributes to the overall “knowledge base” essential for medical practice, particularly for tacit functions such as diagnosis. Pathophysiological theory allows physicians to draw the conceptual dots between symptoms and disease, aetiology and prognosis and the risks of therapy. EBM does not deny this, however it sees this kind of knowledge as

\(^{181}\) EBMWG (1992).
\(^{182}\) Ibid.
\(^{183}\) See section 5.1.2.
\(^{184}\) An example of a contradiction within EBM related to this is when it is claimed that basic sciences of medicine are in fact part of the knowledge recognized by EBM - “Clinically relevant research, often from the basic sciences of medicine…” - Sackett, D. L., W. M. Rosenberg, J. A. Gray, R. B. Haynes and W. S. Richardson (1996).
useful primarily in the absence of or as supplementary to research evidence. There are many medical situations where practice can be justified on the basis of reason alone (independently of clinical research). In emergency medicine, when a spinal fracture is stabilised to minimise damage to the spinal cord, or when oxygen is given to a hypoxic patient having a severe asthma attack, practice is justified in reason. When the physician informs the patient about a certain procedure, knowledge of outcome risks alone does not provide an adequate understanding. The processes involved are also important in these kinds of judgements. For example, I could not justify transfusion after informing a Jehovah’s Witness of the outcome (life vs. death), without him or her knowing the process (blood transfusion).

A further point concerns EBM’s requirement of clinical evidence to justify practices, stemming from the fact that some practices are harmful. In making this assertion EBM overlooks the possibility of rationalising risk and that some medical practices can be accurately judged as “riskier” than others--prior to evidential verification. In the example presented previously there were unexpected harms associated with the use of a drug in an acutely sick patient (based on deductive reasoning). This is unsurprising because drugs are typically risky. Because of our ability to make judgements of risk, there is a variation in the need for evidential justification that is related to the “riskiness” of the practice in question. For example surgery is riskier than physiotherapy (as a generalisation). Therefore to justify sending an arthritic patient to the surgeon, and not the physio, I would require a greater level of evidentiary support (if the patient’s problem was treatable by both). As a framework of medical decision-making, EBM overlooks the possibility of this kind of rationalisation. The consequences of this for medical practice will be discussed in chapter six. The next sections address changes to EBM that may or may not have occurred over its two-decade history.

5.5 The Devolution of EBM

The four foundational notions about knowledge described above define EBM as a philosophy of practice, so they must be stable for EBM to remain “EBM”. A substantial change to these ideas results in a new philosophy that is not EBM. Minor changes may be possible without violating EBM’s fundamental assertions. For example, if new investigative techniques were invented EBM could coherently adjust its hierarchy of evidence, so long as rigour of justification remained the ordering criteria. The
announced changes over EBM’s history are considerable enough however, to cast doubt on EBM’s current integrity. This section will evaluate the most recent characterisation of EBM against the original. There are two possibilities. The first is EBM’s original theory of knowledge remains intact. This would mean announced changes do not reflect modifications to EBM’s underlying philosophy, in which case arguments made against EBM’s original foundational construction are still relevant. The alternative is that EBM’s fundamental notions have changed. This would mean that EBM is no longer what it was when first announced, and that its name should change accordingly. The former possibility would suggest parallels between this thesis’s idea of “philosophies of practice” and Kuhn’s theory of “paradigms”. It will be argued that if EBM’s fundamental assertions have not changed, EBM is in “crisis” and is ripe for replacement. Both possibilities call for an end to “Evidence Based Medicine”.

5.5.1 Revised Versions of EBM

EBM has enjoyed a lot of attention from both critics and advocates, and definitions of EBM have changed over time. It has been suggested that there have been three distinct versions. In parallel to EBM, other philosophies of practice have risen in prominence, with many emphasising “subjective” factors in medicine. There have been increasing concerns in medicine about the patient’s right to be involved in his or her care, reflected by philosophies like Patient-Centred Medicine and Narrative Medicine, and the attention given to patient autonomy in bioethics. The original model of EBM did not account for patient factors. In addition, EBM has been criticised for restricting physician autonomy. In its original form, EBM had little to say about the role of judgement in the physician, which is often acute and very important. With its original foundational theory, EBM finds it difficult to account for the significance of these factors because they are not rigorously justified. Patient, clinician and circumstantial factors are undeniably important co-factors to the use of research evidence in medicine. Against a burgeoning body of criticism EBM was forced to respond. This section

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187 Even disease, possibly the peak of “objectivity” in medicine, is recognised to be affected heavily by “subjective” factors (e.g. a person’s desire to smoke) - Engel, G. L. (1977).
188 Stewart et al. (2003).
191 e.g. knowing the difference between a child who has a self-limiting viral illness and one who has a potentially fatal meningococcal infection.
describes the latest version of EBM\(^{192}\) as described in two papers from the EBMWG in 2002.\(^{193,194}\) This will set the scene for an evaluation of whether EBM has changed.\(^{195}\)

The concepts of evidence-based medicine are evolving as limitations of early models are addressed. In this editorial, we present a new model for evidence-based clinical decision making based on patients’ circumstances, patients’ preferences and actions, and best research evidence, with a central role for clinical expertise to integrate these components.\(^{196}\)

This version of EBM specifies four factors in medical decision-making (three clinical and one integrative). The clinical factors are: clinical state and circumstances, patients’ preferences and actions, and research evidence. They are considered as equally important and any one may take precedence in a particular case. The role of the fourth factor – clinical expertise – is to integrate the three clinical factors to guide clinical decisions.\(^{197}\)

![Figure 4: Revised Model of EBM – from (Haynes 2002)](image)

On first examination, this version appears to address many of EBM’s original weaknesses. The importance of patient factors is recognised, as has the variability in the patient’s clinical state and the central role of clinical expertise.\(^{198}\) However hierarchies

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\(^{195}\) Subsequent versions of EBM may be put forth by the EBMWG, however this does not affect the argument presented here as there have been sufficient changes to EBM’s presentation to make claims about its fundamental notions.


\(^{197}\) Ibid.

\(^{198}\) The fact that clinical expertise is the central integrating factor aligns EBM more closely with personal knowledge (as described in this thesis). It is not clear whether this change is recognition of the
of evidence are still employed by EBM, as this model maintains the notion of superior evidence, and superiority is still related to rigour:

Evidence-based medicine recognises that such evidence is not “created equal” and provides detailed guides for finding the most rigorous and pertinent evidence for a specific clinical decision.\(^{199}\)

There is an important junction here that depends on the distinction for EBM between “evidence” and “knowledge”. In the first model of EBM, it was proposed that medical decisions should be based in evidence and not other things. Rigorous evidence was equated to “superior knowledge” and “inferior knowledge” was de-emphasised. The revised model still holds that there is “superior evidence” (framed by rigor), but also emphasises non-rigorous factors in medical decisions. Whether the new model of EBM equates “evidence” to “knowledge” is unclear, and depends on whether it considers factors that are not rigorously justified as “knowledge”, or as “not-knowledge but nonetheless important in decisions”.\(^{200}\)

### 5.5.2 EBM as a Philosophy in Crisis

This section assumes EBM’s foundational ideas about knowledge have not changed following new definitions, and that clinical expertise, the clinical state and circumstances, and the patient’s preferences and actions are not considered medical “knowledge” by EBM. There are similarities between the idea of “philosophies of practice” in this thesis and the concept of “paradigms” presented by Kuhn.\(^{201}\) Kuhn believed that paradigms are defined by sets of rigid fundamental notions that determine acceptable and unacceptable ways of solving problems within the paradigm. The reason science is thought by Kuhn to progress via revolution is that if a problem cannot be explained by one set of foundational theory a change in theory is required. And because paradigms are defined by these “basic ideas”, this requires the establishment of a new paradigm, which happens by scientific revolution. Such change is difficult and is

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\(^{200}\) The theory of knowledge in this thesis considers all four of the factors described in the new model of EBM as kinds of medical knowledge.

\(^{201}\) Kuhn, T. S. (1996).
usually resisted by the established paradigm, which ceases to exist following revolution.\textsuperscript{202}

In referring to Kuhn’s theory, I am not adopting the idea that science is an irrational activity.\textsuperscript{203} It has been suggested that Polanyi heavily influenced Kuhn, and that Kuhn’s \textit{Structure of Scientific Revolutions} can be considered an argument for anti-realism in science. In contrast to Kuhn, Polanyi is a realist as he argues that the scientist’s commitment to “intellectual beauty” ensures her theories make contact with some external truth.

We accept it in the hope of making contact with reality; so that, being really true, our theory may yet show forth its truth through future centuries in ways undreamed of by its authors.\textsuperscript{204}

Polanyi would agree with Kuhn that science progresses by revolution but disagree that this is an argument for anti-realism.\textsuperscript{205} My claim is simply that EBM is a philosophy in “crisis”, and that it is possible to select an alternative philosophy if it more completely accounts for the reality of medical practice.\textsuperscript{206}

“A NEW paradigm for medical practice is emerging.” \textsuperscript{207, 208}

EBM was first introduced as a Kuhnian paradigm shift.\textsuperscript{209} Though this has been criticised,\textsuperscript{210, 211} there are good reasons to regard EBM as a paradigm.\textsuperscript{212} Moreover, Kuhn’s philosophy could shed light on EBM as a philosophy of practice somewhere on the cycle of “normal science – crisis – scientific revolution – normal science”.

\textsuperscript{202}Ibid. p.7
\textsuperscript{203}The notion of irrationality stems from the idea that “incommensurability” means the merits of alternative paradigms cannot be evaluated “objectively”.
\textsuperscript{204}Polanyi, M. (1958). p. 5
\textsuperscript{205}Kennedy, T. (2011).
\textsuperscript{206}It is possible to make this judgment but not by any objective criteria.
\textsuperscript{207}EBMWG (1992).
\textsuperscript{208}This was a very bold proclamation by the EBMWG, considering scientific revolutions can only be seen after they occur, not before. It also interesting the EBMWG chose Kuhn as a philosophical supporter of their “paradigm”, given it a philosophy based on “objective” ideals, and Kuhn was explicitly opposed to these ideals.
\textsuperscript{209}EBMWG (1992).
\textsuperscript{211}Tonelli, M. R. (1998).
\textsuperscript{212}Solomon, M. (2011).
According to Kuhn, a paradigm is essential to enquiry and consists of a community of researchers who practice according to a set of fundamental theories. For EBM these include the fundamental notions within the theory of knowledge presented in section 5.2, but also other “basic ideas”.

“Paradigms may be prior to, more binding, and more complete than any set of rules for research that could be unequivocally abstracted from them.”

After the introduction of a paradigm (e.g. EBM), there is a period of “normal science”. Kuhn describes this as a problem solving activity where researchers attempt to describe nature to fit within the conceptual constraints the fundamental theory provides. For EBM this would be the development of the “hierarchy of evidence” and establishment of journals to disseminate knowledge according to EBM principles, which are activities reflecting EBM’s theory that rigorously justified knowledge is superior. Because the fundamental theories of a paradigm restrict the acceptable solutions to a problem (they cannot be violated within the paradigm), there will be some problems that cannot be explained by the paradigm. These are anomalies through the lens of a paradigm’s theory. For EBM an anomaly would be observations that important clinical factors exist that are not rigorously justified (e.g. patient preferences). Kuhn stipulates that as “normal science” progresses, anomalous observations build up, leading to doubt within the paradigm as certain problems refuse to be accounted for by its fundamental notions. This is “crisis”. As anomalies accumulate researchers become aware of crisis and attempt to invent novel theory to account for them:

“Failure of existing rules is a preclude to a search for new ones.”

Observed discrepancies from theory and fact are the core of crisis. In response to crisis, scientists generally do not abandon the paradigm and ad hoc modifications to theory are made to align the paradigm with observed results. This is done by adding corollary theory that does not modify the “fundamental notions”. For EBM, announced modifications that are meant to align EBM more closely with observed clinical reality can be seen as a response to “crisis”. This crisis has come about partially due to observations from philosophies such as Patient Centred Medicine.

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213 Kuhn, T. S. (1996). p. 16-17
214 Ibid. p. 46
215 Ibid. p. 68
216 Ibid. p. 69
If EBM is a Kuhnian paradigm, modifications are ad hoc theory modification, leaving the fundamental notions of EBM unchanged. The recognition of factors that are not rigorously justified in medical decisions violates EBM’s fundamental notions if these factors are considered medical “knowledge”. However EBM skirts around this inconsistency by regarding these not as “knowledge”, but as corollary factors that influence the use of “knowledge” in exceptional circumstances. According to this view, research evidence would determine what is “objectively” true and clinical expertise and patient preferences determine decisions in particular instances. A reason to suspect this may be the case is how EBM views the “medical condition”. For this thesis the medical condition is the suffering of the sick person because this is what medicine attempts to alleviate (not just disease). What should be done in a medical situation is determined wholly by medical knowledge, which consists of research evidence and other factors that are tacit and particular (e.g. patients preferences). The consideration of all of this “knowledge” is what determines “what is best for the patient’s condition”. The following excerpt implies that, although clinical expertise and patient preferences are important and can override research evidence in exceptional circumstances, “what is best for the patient’s condition” is determined independently of the individual patient, who’s “condition” is governed by research evidence alone.

It is important to note that clinical expertise and patient preferences may override the other components of the model for a given decision. For example, clinical expertise must prevail if the clinician decides that the patient is too frail to have a surgical procedure that is otherwise best for his condition, and the patient's preference will dominate when she declines a treatment that clinical circumstances and research evidence indicate is best for her condition.

The above excerpt is from the 2nd version of EBM. If clinical expertise and patient preferences were considered as “medical knowledge” by EBM and therefore worthy of dictating “what is best for a patient’s condition”, the quoted passage would read:

…clinical expertise must prevail if the clinician decides that the patient is too frail to have a surgical procedure because this is best for his condition, and the patient's preference will dominate when she declines a treatment because this is best for her condition…

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217 Exceptional because these factors cause exceptions and change the outcome of decisions that would otherwise be governed as “right” or “wrong” according to medical knowledge – i.e. clinical research.
218 See chapter two.
221 Although not from the most recent version, the announced changed to EBM that are being discussed have occurred at this point.
The above passage suggests that for EBM the patient’s condition is defined by variations in biomedical variables (e.g. blood pressure). In my view, the patient’s “condition” is broader than this and includes biomedical variables and all those other factors excluded by a reductive disease framework (e.g. a patient’s desire to see their family). Non-recognition of these factors as “knowledge” is aligned with EBM as a paradigmatic philosophy of practice in crisis. As just discussed, in response to crisis one of three things can happen: normal science is able to account for the problems and crisis is resolved; the problem resists explanation and it is recognised but set aside for future researchers; or a new candidate for a paradigm emerges which will undergo an authority struggle with the existing paradigm.\textsuperscript{222} I hold that if EBM is a paradigm with the foundational theory of knowledge outlined in section 5.2, \textit{and} factors like clinical expertise and patient preferences \textit{are medical knowledge} (with tacit and particular elements) - EBM is in intractable crisis, because it is not possible to consider tacit and particular aspects of knowledge “superior” and so worthy of guiding practice, if rigorous justification defines superiority.

Paradigm shifts are a “reconstruction of the field from new fundamentals that changes some of the field’s most elementary theoretical generalisations”.\textsuperscript{223} Recognition of tacit and particular knowledge by EBM would require a paradigm shift because it would fundamentally change its views of the nature of medical knowledge. I suggest the “philosophy of practice” presented in this thesis as a superior start point for an alternative, as it’s fundamental assertions (e.g. the existence of explicit-tacit and general-particular dimensions, and the personal nature of knowledge) account for a broader range of knowledge phenomena that does not exclude knowledge that is observably important in medical practice.\textsuperscript{224} To suffice, this philosophy of practice needs development as it has been presented simplistically here.\textsuperscript{225} This may happen in future work and ideas can be built upon so long as the fundamental assertions of this philosophy remain intact. I have argued that tacit and particular aspects of knowledge are essential for medical practice and the alleviation of suffering.\textsuperscript{226} If EBM is in crisis

\textsuperscript{222} Kuhn, T. S. (1996). p. 75-85
\textsuperscript{223} Ibid. p. 85
\textsuperscript{224} The theory of knowledge in this thesis does not necessarily deny the value of epistemic considerations regarding rigor, but only when applied strictly to explicit-general knowledge.\textsuperscript{222} For example Polanyi’s account of tacit knowledge is much more complete than this account and he presents arguments for its verification - Polanyi, M. (1958).
\textsuperscript{225} See chapter three.
and does not recognise these things as “knowledge” then EBM is not adequate as a philosophy of medical practice and there are harms that could arise as a result of the application of this incomplete philosophy in practice (these will be discussed in chapter six).

5.5.3 EBM as a Misnomer

The previous section assumed EBM is a paradigm with rigid fundamental notions and as a result, EBM cannot coherently consider non-rigorously justified factors as (superior) “knowledge”. This section assumes EBM has changed following announcements, which would require substantial alterations to EBM’s fundamental notions (as outlined in section 5.2). Because “philosophies of practice” are defined by their fundamental notions and a change in these notions results in a novel philosophy, the announced modifications to EBM (which require such a change) means, EBM now is not the same thing as it was when originally presented. So it is not accurate to refer to “current EBM” as EBM and it needs a new name. If changes to EBM are genuine, and all factors are considered equal, it is not clear why this model’s title is based in “evidence” and not any of the other three mentioned bases. “Clinical-Expertise Based Medicine” may be more descriptive as “clinical expertise”, not research evidence, is supposedly the integrating and guiding factor in EBM’s revised model of practice. It makes little sense to single out “evidence” if this is just one part of the picture, and not the single most important one.

An argument that does not rely on the existence of “fundamental notions” is that the EBM debate is highly polarised and rhetorical. Each side makes arguments according to differing definitions; critics hold EBM is what it was when first introduced (with its weaknesses), and advocates point out that EBM has changed since then. A change in EBM’s name would realign this debate. Secondary to this, the ambiguous nature of EBM, and the fact that physicians (and other players) may not be up to date with EBM literature, means there is a disjunction between EBM as defined and as it is practiced. Although EBM currently stipulates medical decisions should be made by considering three equally important clinical factors (as integrated by clinical expertise), EBM has very little to say of these factors other than clinical research. This suggests EBM values clinical research as superior in spite of claims to the contrary. Surely a

227 For example there is a hierarchy of evidence but no equivalent hierarchy of patient preferences.
philosophy named “Evidence Based Medicine” distinguishes research evidence as superior in some way. It would be a good idea for EBM to adopt a different name as there are meanings associated with its title regarding the superiority of clinical research evidence that are no longer true of EBM (if it has changed). Surprisingly, this conclusion has already been arrived at by the EBMWG (although in over 10 years nothing has been done about it).

The term evidence based medicine was developed to encourage practitioners and patients to pay due respect—no more, no less—to current best evidence in making decisions. An alternative term that some may find more appealing is research enhanced health care. Evidence Based Medicine is a normative term suggesting that all medicine should be practiced in a certain way. Moreover, interpretations of EBM are not necessarily equivalent to recent characterisations that address its original downfalls. A simple, albeit highly recognised, renouncement of “EBM” with a shift to an alternative term such as “clinical epidemiology” could be a solution to these problems, resolving the tension EBM is causing in medical philosophy. EBM may well have principles that assist the critical appraisal of clinical research. However, some of these principles (e.g. the superiority of rigorous justification) lead to the exclusion of other important knowledge forms in medical practice (e.g. tacit knowledge). The main issue is that EBM claims to be (or will become) a comprehensive model of clinical practice. Others have recognised that EBM makes important contributions to medicine’s use of research evidence, but argue it fails as a philosophy of practice. EBM as “clinical epidemiology” would be reflective of EBM as something that knows some-things about medicine but does not claim to know about all of medical practice.

231 This change could also be beneficial to EBM, as it would be able to focus on what it is good at – clinical epidemiology. Leaving the task of deviseing models and theories of medical practice to philosophers – a group its creators do not belong to - Wyer, P. C. and S. A. Silva (2009).
5.6 Conclusions

This chapter explored philosophical aspects of EBM as a philosophy of practice distinct from the use of scientific knowledge in medicine. Four fundamental notions were proposed that equated to a theory of knowledge for the original version of EBM, with the exploration of specific goals. Whether or not these fundamental notions still hold is unclear, as EBM has changed significantly according to its creators. There are two ways of interpreting these announced changes. Either, they are superficial and EBM’s original foundational theory remains intact, and hence it is a philosophy in crisis. This means the situation is ripe for “revolution”, seeing the introduction of an alternative philosophy, and also that arguments made on the basis of the original EBM are relevant in spite of announced changes. Alternatively, EBM has changed with announcements, in which case EBM has changed its theoretical construction and is no longer EBM. There are also connotations of the superiority of research evidence implicit in the term “EBM”. If EBM has changed, it makes sense for EBM to change its name. Both of these possibilities require the removal of “Evidence Based Medicine” from medical terminology. The principle cause of EBM’s philosophical inadequacy is its failure to recognise tacit and particular forms of knowledge. This has practical consequences. The next chapter investigates EBM as it is enacted in practice through the framework of clinical medicine from chapter four. This will involve discussing EBM’s three goals of increasing medical rationality, “democratising” practice and increasing safety by empiricism, and bring together arguments presented in the first five chapters, so as to finally evaluate EBM in the light of medicine’s goal of attending to the suffering of its patients.
Chapter 6: Evidence Based Medicine in Practice

This chapter discusses how EBM is enacted in practice by a variety of mechanisms affecting the discourse of knowledge occurring between patients, physicians, biomedical science and clinical authorities in medicine. The effects on these four players will be covered individually to highlight EBM’s weaknesses. EBM is restricted by features of biomedical science that limit what it can tell us, which may lead to a distorted picture of medicine if they are not mitigated. Physicians are affected by EBM but are autonomous and able to bypass some of its failings. This is limited however, by restrictions imposed by clinical authorities, who are less able to account for circumstantial factors in policy. EBM’s affect on patients and their suffering is the final measure of its adequacy in practice. This chapter makes an evaluation of EBM in terms of medicine’s telos, concluding that it does not always help medicine in its goal of attending to suffering.

The previous chapter discussed EBM, as a dominant philosophy of practice that claims rigorously justified knowledge is superior to other knowledge. An implication is legitimate medical knowledge is conceived as abstract, explicit and general, with the exclusion of particular and tacit knowing. Although EBM may have genuinely changed to recognise forms of reasoning other than research evidence, this would imply EBM ended with these changes (and should so be renamed). As is suggested by the term “Evidence Based Medicine”, this chapter assumes EBM does prioritise rigorously justified knowledge (i.e. clinical research evidence).

6.1 EBM’s Effect on Clinical Practice

Chapter two concluded that medicine is about the suffering of sick people. That medical knowledge is personal and has tacit, explicit, particular and general features was discussed in chapter three. Chapter four combined these ideas and presented a framework of clinical medicine as a discourse of knowledge between patients, physicians, biomedical scientists and clinical authorities. (Note the subtle but important distinction here between the group that is “clinical authorities” and the attribute of having clinical authority.) EBM has risen in prominence and has become an authority in medicine. Aspects of medicine aligned with EBM are considered “best practice” and “evidence” bears a kind of clinical currency whereby it is a requirement for the
legitimation of practices. Evidence, and therefore knowledge for EBM, is restricted to explicit-general evaluative science. This results in the exclusion of tacit and particular forms of knowledge and also exploratory biomedical science from the medical discourse.

**Figure 5: EBM through the Discourse of Knowledge**

If EBM were a true representation of clinical medicine, the above diagram would encapsulate how the players in medicine navigate the realm of suffering to address it in patients. It is clear medicine *could not* function in this manner. Tacit components of knowledge are essential to almost all aspects of practice (e.g. surgical procedures, diagnosis, interpersonal interactions and suffering), as are particular functions, because medicine is inherently related to the treatment of individual people (with names, needs,
desires, and hopes). Thus, tacit and particular aspects of knowledge cannot be practically excluded from clinical medicine. The following sections will discuss how EBM distorts practice for each of the players in medicine, providing an argument for its inadequacy that ties together what has been discussed in the first five chapters.

6.2 Biomedical Science

Biomedical scientists procure the evidence recognised by EBM. There are limitations intrinsic to science. Many exist independently of EBM, and yet in resting clinical authority on research evidence, EBM does not recognise many of these limitations and may exacerbate them. This limits medicine’s capacity to adequately care for sick persons.

EBM excludes explorative biomedical science, which provides the conceptual knowledge for understanding and pathophysiological reasoning (e.g. rationalising risks and benefits). This is in contrast with evaluative science, which has little conceptual content and is mainly concerned with the odds of specific outcomes in patients. Exploratory science is important in hypothesis formation and choosing the questions that are worth asking. Thus, it has been suggested that its de-emphasis by EBM stifles scientific discovery and innovation.

Although EBM recognises evidence from all levels of the “hierarchy of evidence”, its existence sends a message to biomedical science regarding the value of different kinds of research. One effect is an incentive to utilise study designs at the top of the hierarchy at the expense of those that are not (e.g. qualitative studies). RCTs are near the top because they utilise methods aiming to maximise epistemic strength (e.g. randomisation and blinding). Not only can these methods be practically difficult but also they are expensive. The opportunity cost of a single large RCT would be many studies at lower levels of the hierarchy. Although RCTs are highly internally valid, it has been observed that they perform no better than studies that are further down the hierarchy, indicating the opportunity cost of epistemic rigor is not worthwhile. At a theoretical

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232 See section 5.1.2.
236 Concato, J., N. Shah and R. I. Horwitz ibid.
level the “hierarchy” makes sense, as increasing epistemic strength would be expected to result in more reliable knowledge, however it appears this is not the case in practice.

Epistemic rigor and internal validity are closely related. A consequence of maximising internal validity is a sacrifice in external validity, which in medicine, is the applicability of research knowledge to real patients.\textsuperscript{237, 238} It is possible that EBM’s emphasis of epistemic rigor leads to a misbalance in this trade-off and is causing biomedical science (and consequently medicine) to be falsely assured of the applicability of research knowledge in the clinic. The next sections discuss limits resulting from reductive causation and positivism in biomedical science, before elaborating on aspects of the external-internal validity trade-off, and how EBM shifts clinical authority away from medicine and its goal of attending to suffering.

6.2.1 Reductive Causation\textsuperscript{239}

Evaluative biomedical science utilises a reductionist approach based on the theory that by investigating all the combinations of variables separately, you can build a picture of the relationships as a whole. While this makes things easier, assimilating the pieces into a complete whole relies on the assumption that causative pathways in medicine are simple (e.g. A causes B) and hold independently of their entanglement in complex systems, but medicine is extremely complex and these assumptions may be unrealistic. Diseases typically do not have singular and essential causes. Disease results from combination of a multitude of factors, some unknowable. For example streptococcal infection is a cause of rheumatic heart disease, however these bacteria are commonly present in healthy individuals.\textsuperscript{240} Many other factors are important, some outside the body (e.g. the increased risk of rheumatic fever associated with social deprivation).\textsuperscript{241, 242} We cannot predict when disease will manifest itself, even when we know about the factors we have established as important.\textsuperscript{243} The reality of causation in medicine is non-linear where causative chains have branches and feedback loops that affect each other

\textsuperscript{237} Cartwright, N. (2007).
\textsuperscript{238} Knottnerus, J. A. and G. J. Dinant (1997).
\textsuperscript{239} A supplementary perspective of reductive causation is provided in the appendix.
\textsuperscript{241} Zaman et al. (1997).
\textsuperscript{242} Engel, G. L. (1977).
\textsuperscript{243} i.e. it is not possible to determine exactly which individuals who harbor streptococcal bacteria will go on to develop pharyngitis and subsequently rheumatic heart disease, even if personal histories and contributing variables such as household income are completely known.
dynamically and reciprocally. Though it is possible in certain cases of disease to learn about strong relationships using a reductionist approach to causality (e.g. the aetiology of tuberculosis), that is not always possible with extremely complex systems such as the whole human person (mind + body). Developing scientific domains that focus on non-linear and complex relationships, such as chaos theory, may improve our ability to understand the processes that occur within and outside of us. But for now our scientific knowledge is limited by the ways we gather it and there is much that science as it is cannot know.

6.2.2 Positivism – A Bias in Science

Positivism is central to biomedical science. It is the notion that changes occur when they are seen or measured – if nothing is seen, nothing has happened. Therefore measurement is central in quantitative science. But there are many factors pertinent to health and suffering that cannot be measured in the same way as concrete variables like blood pressure and oxygen saturation. Happiness, clinical judgement and pain are examples of things that are difficult to measure. Likert-style rating systems present tempting tools to “measure” these variables, however they are likely artifice, as these measures are highly simplified and cannot represent the reality of complex (and possibly tacit) variables in suffering that cannot be totally abstracted. Some variables can be concrete but difficult to quantify for pragmatic reasons. And some of these (e.g. dietary energy intake) are well known (even if not experimentally) to have dramatic effects on health. Because of this differential in the accuracy and ease of quantification, there is an inherent bias in biomedical science away from the investigation and later verification of these things (because science relies on measurement). The consequence is a proliferation of evidence for “hard” therapies and outcomes (e.g. the effects of drugs on blood pressure) at the expense of hard to quantify variables, such as diet, exercise, cultural competence or happiness. This bias is not a result of these variables being less important in the determination of suffering, which means there are effective practices in medicine that will not be demonstrated as effective by science - possibly one of EBM’s greatest downfalls. Qualitative studies may provide biomedical science with an avenue for investigating non-quantifiable aspects of health, however these

244 This problem is exasperated as disease modality shifts from infective disease, strongly influenced by the presence of infective organisms, to chronic disease, the causes of which are more subtle and complex.  
245 Positivism is also central to EBM, whereby the presence of evidence is a requirement for the justification of knowledge.
methodologies are not at the top of the “hierarchy of evidence” so are de-emphasised. Positivism results in a bias in medicine towards practices that are difficult to quantify and this occurs through clinical authorities’ policy creation. This will be discussed in section 6.4.3.

“Not everything that can be counted counts, and not everything that counts can be counted.”

6.2.3 External Validity - The Snark and the Boojum

In 1950 Frank Beach published *The Snark was a Boojum*.\(^{247}\) He was concerned by the overwhelming lack of diversity in the species and kinds of behaviours studied in comparative psychology. To illustrate his point, Beach quoted a passage from Lewis Carroll’s - *The Hunting of the Snark*:

If your Snark be a Snark, that is right
Fetch it home by all means – you may serve it
With greens
And it’s handy for striking a light

But oh, beamish nephew, beware of the day,
If your Snark be a Boojum! For then,
You will softly and suddenly vanish away,
And never be met with again!\(^{248}\)

In this metaphor the Snark hunter was the comparative psychologist, who happened upon a Boojum and “vanished away” due to his very narrow conception of animals and animal behaviour. Beach was an influential ethologist, which is the study of animal behaviour in natural conditions. This is in contrast to “scientific” comparative psychology, which focused on behaviour in the laboratory setting. Ethology could be considered a holistic approach to animal behaviour, with other approaches tending to be reductionist.\(^{249}\) Beach observed that at the time, articles in comparative psychology predominately focused on a single species (the Norway rat) and a single kind of behaviour (conditioning and learning). This was in the interest of reproducibility and objectivity of results, but Beach was worried that it would lead to a distorted picture of animal behaviour in the natural world.\(^{250}\) The problem for Beach was the sacrifice in

\(^{246}\) Attributed to Albert Einstein, source unknown.
\(^{247}\) Beach, F. A. (1950).
\(^{248}\) Carroll, L. (1898).
\(^{250}\) Beach, F. A. (1950).
external validity that comes with improvements in internal validity by using rigorous methodologies. Usually animals do not encounter artificial laboratory conditions, it is a leap to assume that their behaviour would not be affected by this unnatural setting.

It is a similar leap to assume that our scientific interpretations of health are not affected by the ways we undertake medical research. It is possible that the biomedical sciences’ desire for epistemic rigour (as encouraged by EBM) is distorting biomedicine in the same way Beach speculated for comparative psychology. In real life, patients are not idealised and their therapies are not standardised, and the “natural” patient would never encounter situations like those imposed in experiments. An example is double blinding in RCTs, done so neither patients nor the physicians treating them know whether active treatment has been given. This is done to minimise bias in results caused by the “placebo effect”. The placebo effect can approach the strength of therapies that would be deemed efficacious if it were ignored, even in surgical interventions. In determining efficacy it is important to consider the placebo effect, however in real clinical situations all parties are aware whether something “medical” has happened, so there will be a therapeutic placebo effect otherwise cancelled out. Because they aim to remove the placebo effect, a focus on rigorous investigative techniques may encourage medicine to view the “placebo” as something that causes bias and so is a bad thing. This is in contrast to an alternative view, that the placebo effect can be useful, is part of self-healing, and is a phenomenon mediated by the patient’s mind yet with effects that are measurable at a physiological level.

EBM has been criticised for encouraging a model of population-based care that can be harmful for individual patients. A feature of RCTs is that they cannot detect variation in outcomes between individual patients. A major assumption of the RCT is homogeneity of treatment effects. RCT results are presented as averages – the effect

254 There is evidence that “placebo” therapies can elicit measurable physiological responses - Scott, D. J. (2007). - This suggests a person’s knowledge (alternatively cognitive processes) can affect physiological mechanisms important in disease. This is an example of “top-down” causation and is a striking anomaly in terms of current reductionist biomedical models. This observation is relevant to discussion in the appendix.
on an “ideal” patient. In reality, patients are not the same and outcomes are affected by: risk without treatment, responsiveness to treatment, vulnerability to side effects and utilities for different outcomes. All of these vary between individuals and RCTs cannot detect differences in this variation.\textsuperscript{257} This is due to randomisation, and also that many important clinical variables resist quantification.\textsuperscript{258} As a result, in a clinical trial showing a significant positive outcome, there may be some patients who are harmed (and others with greater than average benefits).\textsuperscript{259} This presents a major practical (and moral) difficulty for EBM in the application of research evidence to individual patients (i.e. external validity) who may be directly harmed by “best practice”. Other designs exist, (e.g. N of 1 trial) that can detect patient-to-patient variations. However their use is not widespread and they are methodologically complex, which may lead to further deterioration in external validity.

If biomedicine’s quest for epistemic rigour is in fact a Snark hunt, then there is the very real possibility that the Snark might be a Boojum. In which case the claim that rigorously justified knowledge is superior would “softly and suddenly vanish away”.\textsuperscript{260} And the doctor using this knowledge, falsely confident that they are equipped to deal with the uncontrollable range of diverse conditions encountered in the jungle of modern medical practice, might also vanish away.

\textbf{6.2.4 The Direction of Biomedical Research – A Shift in Clinical Authority}

In a practice influenced by EBM, medicine is deemed “good” if evidence based and “questionable” if not. Therefore, decisions of the direction of clinical research (in the creation of evidence) have a bearing on clinical authority. Biomedical research is expensive,\textsuperscript{261} and the knowledge generated by it has little intrinsic financial value until it is applied. For these reasons biomedical science relies heavily on external funding. One source is (the group) clinical authorities, who direct funds towards biomedical science and consequently have a say in what is researched and later verified.\textsuperscript{262} This does not necessarily pose a problem for the teleological integrity of medical practice, as

\begin{footnotesize}
\begin{itemize}
\item\textsuperscript{257} Kravitz, R. L., N. Duan and J. Braslow (2004).
\item\textsuperscript{258} Tonelli, M. R. (1998).
\item\textsuperscript{259} Kravitz, R. L., N. Duan and J. Braslow (2004).
\item\textsuperscript{260} Carroll, L. (1898).
\item\textsuperscript{261} This is especially true for highly rigorous biomedical research.
\item\textsuperscript{262} See section 4.4.4.
\end{itemize}
\end{footnotesize}
clinical authorities are internal to medicine so are intrinsically concerned with suffering, and the allocation of funding will (ideally) reflect this.

Players external to medicine also decide what is researched. Some, such as philanthropists and charities, do not threaten the integrity of medicine because they share medicine’s goals. Commercial entities (e.g. pharmaceutical companies), on the other hand, typically have a different priority, viz. profit. For clinical drug trials in the USA, 70% of research expenditure is private,\(^{263}\) suggesting that commercial interests may play a larger role in the direction of biomedical research than clinical authorities. Furthermore, this research is biased in favour of commercial interests.\(^{264}\) Commercial entities possess clinical authority because of their role in funding allocation and in contrast to the role played by clinical authorities, commercial entities do undermine the integrity of medicine because profitable and humanistic aspirations are often at odds. An example is the fall in funding for antibiotic development despite mounting issues with resistance,\(^{265}\) which could result in a medical calamity if funding models do not change. Sometimes commercial and medical interests align, but only when there is a profit to be made.

Commercial entities also play a role in research evidence’s presentation and can manipulate this to serve their own ends. Speilmans and Parry discuss this, following an analysis of internal documents in the pharmaceutical industry.\(^{266}\) They suggest that publically available evidence may not represent the true data, observing that suppression and spinning of negative data, along with ghost writing, were used to manipulate journal publications to increase drug sales. They also provide evidence of disease mongering and market segmentation of physicians, another way the pharmaceutical industry manipulates medicine to maximise its profits.\(^{267}\) This quite seriously questions the integrity of research from commercial entities (including in reputable journals) and demonstrates how commercial entities can corrupt medical practice. A contributing cause of this manipulation is the authority that is placed on research evidence by EBM.

\(^{265}\) (2013). "IDSA: antibiotic development woefully inadequate."
\(^{266}\) Speilmans, G. I. and P. I. Parry (2010).
\(^{267}\) Ibid.
A goal of EBM was to “democratise” medicine by separating clinical authority and clinical experience. Because clinical authority has shifted from physicians to commercial entities that are external to medicine, EBM’s goal to resolve issues of clinical authority has failed. Due to the authority placed in evidence, medicine may be in a position where “best practice” is determined largely by profit not suffering (externally, and increasingly internally), and EBM can be considered “bad” for medicine because of this. This confounds positivistic considerations of “soft” medicine, as it is difficult to market and sell “lifestyle choices” for example, and questions the actual utility of basing clinical decisions in “best evidence” instead of clinical experience and expertise (even if it is “mere opinion”). The physicians with this expertise have the interests of medicine at heart (in contrast to commercial entities), and the accumulated wealth of personal knowledge in the subtleties of health (i.e. non-measurable variables) that are inaccessible to the instruments of biomedical science.

The next section discusses the effects of EBM on physicians.

### 6.3 Physicians

EBM has affected physicians considerably since its inception and many doctors would consider themselves EBM advocates. Recent versions of EBM claim to equally value clinical research and other factors, however notions of the superiority of rigorous justification and the rhetorical nature of the EBM debate may mean EBM is not understood this way in practice. This may cause physicians to value research evidence at the expense of other aspects of care. In addition to this, EBM encourages physicians to keep up to date with evaluative research, which may mean a sacrifice in physicians’ knowledge of exploratory science. In addition to outcome knowledge, conceptual knowledge of processes is essential for clinical reasoning. EBM’s emphasis on rigorously controlled clinical research may impinge on physicians’ ability to rationalise in the clinic and may encourage a kind of “cookbook medicine”, contrary to heated assertion.

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268 This was an intended consequence of EBM’s de-emphasis of clinical expertise in medical decisions. See section 5.4.2.
269 This is not to deny the value of clinical research in the investigation of “hard” medicine, e.g. pharmaceuticals. However because of this bias it is not possible to compare “hard” and “soft” medicine on the basis of research evidence alone.
In spite of these considerations, negative effects of EBM on physicians are probably minimal because physicians are rational and can act autonomously, being able to follow “best evidence” when they see fit and depart from it according to their judgement.

6.3.1 Physician Autonomy

The reason physicians can practice using tacit and particular knowledge whilst subscribing to a philosophy that does not recognise them as such is that they are essential to practice. Physicians do not have to be explicitly aware they use tacit knowledge, and even if particular knowledge is not seen as “knowledge”, but as a person’s name, opinion or something of the like, it is still used to guide physicians’ actions. Issues arise in practice when the legitimacy of these factors is questioned because they are not considered “knowledge” and are consequently de-emphasised.

Doctors act autonomously according to their perception of what are “good things to do” but with a caveat in that they are restricted in their actions by clinical authorities. In line with recent characterisations of EBM, the physician is able to integrate clinical research with other factors. However, this integration requires judgment about the individual patient and the treatment that will work best for them, a judgement that can be eclipsed by “objective” prescription protocols. Physicians are likely to be hesitant to break guidelines and policy, even when they think it is the right thing to do, for fear of untoward consequences from clinical authorities. Even if policy comes in the form of “recommendations”, the physician is coerced to adhere unless explicitly certain, as they will be forced to “justify” themselves if their departure from policy is accompanied by a unfavourable outcome. This justification may be impossible for tacit judgements and such an outcome would be a normal “casualty” where rules were followed (even if caused by the rules themselves). Physicians justify medical decisions by referring to tacit and particular knowledge as well as explicit and general knowledge, but clinical authorities may not be so flexible in their ability to recognise the legitimacy of these knowledge forms. The most imposing effects of EBM on physicians (and clinical medicine) are exerted through clinical authorities. The next section will discuss the effects of EBM on clinical authorities and how this plays out in wider practice.
6.4 Clinical Authorities

Clinical authorities restrict physician practice by mandating or prohibiting practices in policy and guidelines, and also via the allocation of resources that determine treatment options and timeframes. These measures are typically explicit and generalised. EBM is useful for clinical authorities as it offers a framework for answering difficult questions. Instead of basing policy in the opinions of experts and resolving doubts and disputes via extended discussion, basing policy decisions in “best evidence” can provide concrete answers, simplifying the process with the perceived advantage of increasing policy’s “objectivity”. Although there have been modifications to EBM (genuine or not), its application by clinical authorities is severely limited as it is not possible to ascertain the patient’s clinical state and circumstances, or preferences and actions, from the boardroom where policy is made.

As with physicians, there remains a degree of freedom in clinical authorities’ ability to depart from EBM and consider important factors other than research evidence (e.g. social needs). However because circumstantial factors cannot be evaluated outside the clinic, EBM for clinical authorities requires the use of research evidence in the justification of policy decisions. This has the possible consequence that tacit and particular forms of knowledge are not seen as legitimate. Clinical authorities value objectivity and EBM creates the temptation to look for “objective” solutions on the basis of “best evidence”, which can affect physician autonomy. Furthermore, policy may not reflect tacit and particular forms of knowledge and a reliance on research evidence results in a bias in policy towards measures that are readily investigable by science.

6.4.1 Personal Knowledge in the Clinic – The Loss of Clinical Autonomy

She told me she was not going to continue with psychiatry. She remarked that she did not go into psychiatry to classify people as having this or that disease and then dispense the approved remedies according to current practice guidelines, which, she said, are like a recipe book.271

Clinical authorities practice external to the clinic where patient and circumstantial factors cannot be directly considered. EBM emphasises the use of clinical research in policy creation, which can result in a loss of clinical autonomy for physicians because

research evidence cannot consider tacit and particular knowledge that may vary from case to case. Physicians practise according to this knowledge (along with explicit-general knowledge), meaning their holistic judgement of what is “the right thing to do” in particular circumstances may be at odds with policy. Chapters three and four discussed that much of medicine depends on factors that cannot be explicated or generalised, so the generation of “objective” policy may hinder the physician’s ability to practice according to the “best of their knowledge”.

Some such policies, such as the requirement of safety checklists in surgery, have lead to dramatic improvements in patient outcomes. The value in these kinds of policies is in the prevention of accidents, as physicians are not infallible and may make errors from time to time. This can be rationalised in that surgical checklists contain items such as, “ensure all equipment used is present (and not in the patient) before closing the wound”. Leaving equipment in the body is an explicit accident that is going to generally be bad for the patient, and is therefore a mishap that is likely to be prevented by explicit-generalised checklists. Safeguards can improve practice, however it is important to realise there is a limit here, and over mandating time consuming and possibly menial procedures in the name of safety or completeness can negate intentions. This is especially true when an element of interpretation and judgement is required. The failure of explicit policy may be illustrated by the recent scrapping of the Liverpool Care Pathway in the UK, an explicit process aimed at improving the care of the dying patient. I would argue that the “pathway” failed because it attempted to explicate a usually tacit process into predefined steps and that the particulars are essential to the provision of care.

According to the framework of knowledge in chapter three, knowledge is personal. It cannot exist independently of the knower (i.e. in clinical research), and resides in those individuals who comprehend research. Seen in this way, clinical expertise is medical knowledge and due credit should go to the physician who has accumulated this expertise. A large amount of this expertise is accumulated through the study of clinical care.

274 There are parallels here to the breakdown of a skillful performance when attention shifts away from the holistic performance and to individual aspects of it. The pathway failed because it caused those who provide care to focus on individual actions that are important to care, as opposed to being focused on the care itself.
research but also a myriad of other things, like exploratory research, ethical reflections and the experience of practice. This is not a denial, but an expansion of EBM’s framework of knowledge, as unlike research evidence, clinical expertise includes knowledge of the nature of suffering. This is not to say that physicians cannot be wrong, or that clinical expertise is uniform, but if medicine is ever going to bridge the gap between what is true and what can be known by science, it will be through the physician’s tacit and particular capacities.

Originally EBM proposed that variations in practice caused by personal physician factors (e.g. clinical experience) were a significant problem in medicine because they were at odds with research evidence. I suggest this variation is beneficial given that clinical research is presented as average effect where individual patients may fall above or below this average, and the tacit and particular capacities of the physician provide a potential avenue for optimising outcome differentials that occur due to this variation. As a result of this consideration, I advocate for a greater degree of physician autonomy in their application of personal knowledge and a reversal of prevailing notions of the inferiority of “physician factors” related to this knowledge. This comes with a significant proviso, that the presence of personal knowledge is not a guarantee of the quality of that knowledge. I acknowledge that there are going to be doctors that are sub par, but downplaying the crucial role of personal knowledge serves to hinder the majority, who are good doctors and are capable of exercising judgement (and other tacit and particular capacities). The answer is not to distort practice to make it “standardised” and “objective”, but to reinforce the traditional methods of oversight and good training, re-legitimating what was always done and what continues to be done to some extent. An objective is to recognise situations where tacit and particular knowledge is important (and also where explicit-generalised knowledge can be used). Attempting to squeeze things that don’t fit into the box of “objectivity” and science does not further the cause but is rather a step backwards. As ideas of personal knowledge develop, we will devise ways to ensure it is present in practitioners, but for now, let us recognise its existence and explore consequences of this.

275 See section 5.4.2.
6.4.2 Expert Knowledge in Clinical Authorities

The previous section picked up on the *personal* nature of knowledge and implications of this in the clinic regarding treatment guidelines and physicians’ need for a degree of clinical freedom. Health policy also includes other things, such as resource allocation, where it may not be possible to allow for such freedom (e.g. physicians cannot request an MRI if the machine does not exist). A problem with EBM is that it implies that anyone with access to the relevant research evidence should be capable of providing competent care – or making decisions about care. Currently, those making important policy and funding decisions do not necessarily possess clinical expertise. This is indicated by the increasing prevalence of managed care programs, where business orientated “chief executives” who lack clinical knowledge are appointed to direct institutions. These individuals may rely on research evidence in policy decisions. It was mentioned in section 6.4 that the measures undertaken by clinical authorities are explicit and generalised, and also that because clinical authorities are external to the clinic they are unable to assess circumstantial factors. Clinical expertise is important not only in the clinic, but also in the policy created by clinical authorities. Depending on the nature of the policy, this expertise is possessed by physicians and also others (e.g. patients). Ensuring all forms of knowledge are represented in clinical authorities could result in resource allocation and policy that more accurately reflects clinical reality and could translate into improvements in patient suffering.

6.4.3 Positivism in EBM, Bias and the Rationalisation of Policy

For clinical authorities practicing EBM, the presence of research evidence is often a *requirement* for the endorsement of practices in the clinic. EBM encourages thinking along the lines of “where is the evidence?” and treatments can be denied when there is none:

> The ministry [of health] said in order to meet the criteria the treatment needed to have “proven efficacy through appropriate clinical trials and preferably has also been established as effective when applied in general practice”. It hadn’t so tough.278

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276 This is not so because there are forms of knowledge other than the general-explicit.
277 Again, this relies on the premise that experts are experts because they know a lot, as opposed to because they claim to know a lot.
Positivism in biomedical science results in a bias in research evidence in favour of practices that are easily measured.\textsuperscript{279} Because in practice, an absence of the “right kind” of research evidence can be enough to deny treatments, there is a corresponding systematic exclusion in policy of treatments and practices that are difficult to quantify regardless of their efficacy. This means clinical authorities are more likely to write policy in favour of “hard” biomedical treatments (e.g. drug therapies) at the expense of hard to quantify treatments, like lifestyle changes. Because many aspects of suffering are unquantifiable (compared to factors of disease), this also directly results in policy geared primarily towards the treatment of disease in patients, and not suffering. As these two things are not equivalent, this may undermine the medical telos, and is a reason EBM may be considered as “bad” for practice.\textsuperscript{280}

The need for empirical evidence can be justified on the basis that unproven treatments may be harmful and are a waste of resources if ineffective. Although legitimate concerns, EBM overlooks our capacity to rationalise and that this creates a differential in the requirement for evidential justification.\textsuperscript{281} Some practices are inherently more dangerous than others and this risk may be evaluated rationally (e.g. drug intervention is generally more “risky” than diet modification). It is also possible to rationalise efficacy. For example I am probably justified in the claim that an unproven cancer therapy developed by established researchers, using understood immune pathways, is more likely to be effective in cancer treatment than a “quantum booster”\textsuperscript{282} with very little theoretical support.\textsuperscript{283} I am not guaranteed in this claim, as it may be falsified by empirical research. However this should not discount reason as a valid and useful way of guiding the improvement of medical practice, especially when reason is used to combat limitations of clinical research knowledge.

When weighing up the comparative merits of different options on the basis of research evidence, clinical authorities must recognise the bias existing in favour of measurable and commercially lucrative practices. Because of this bias, a lack of evidence should not

\textsuperscript{279} See section 6.2.2.
\textsuperscript{280} The use of clinical research for the treatment of disease is not a “bad” thing for medicine in of itself (I also advocate it), but this is a “bad” thing when it results in the exclusion of the consideration of suffering because clinical research is the only legitimate justification.
\textsuperscript{281} This follows on from discussion of pathophysiological reasoning in section 5.4.3.
\textsuperscript{283} However this could also mean that the immune therapy is more likely to cause direct harm, as it is known to manipulate processes within the body (unlike the quantum booster, which is likely to do nothing).
be a reason to doubt “soft” interventions that are cheap, and probably safe and effective. It could be better for medicine to assume that such practices are efficacious until demonstrated otherwise, than to rely on research evidence with the limitations of its bias. The consideration of research evidence is useful where it exists, but its presence should only be required for practices that are reasoned as risky or would pose an unacceptable sacrifice of resources if ineffective. For example most drug therapies would require evidential backing, but programs aimed at increasing the cultural competence of physicians would not. EBM makes it difficult to advocate for practices that are not scientifically justifiable (or justified) but nonetheless viable, and as a result it may be causing deterioration in the overall effectiveness of medicine.

6.5 Patients

EBM was introduced with the aim of increasing medical rationality and has failed this goal because its framework cannot account for tacit and particular elements of knowledge that are essential to practice. In terms of the medical telos, patients are arguably the most important players in clinical medicine. The creators of EBM said that:

“The proof of the pudding of evidence-based medicine lies in whether patients cared for in this fashion enjoy better health.”

EBM advocates the use of evidence to justify practices in medicine. Interestingly, as critics have pointed out, there is a lack of evidence to support that EBM improves patient care. Considering the difficulties that would be involved, this lack of evidence is not surprising and does not pose a problem for EBM in terms of the discussion in the last section. However the question remains, “is Evidence Based Medicine good for patients?” Given that this question is unlikely to be answered empirically, this thesis attempts to address it rationally.

284 Cost includes explicit economic costs and also other costs, such as time and inconvenience, personal costs to the patient, or side effects.
285 Some of these practices may be uninvestigable by science.
286 Cultural competence is a possible intervention to improve inequities for Maori in New Zealand, however its acceptance in practice is limited by a paucity of favourable (or negative) evidence around its outcome effectiveness despite it making sense theoretically - McHugh, H. (2013).
EBM emphasises evaluative biomedical science at the expense of explorative science and a consequence is a possible lag in physicians’ theoretical knowledge.\textsuperscript{289} Understanding disease is important for patients, not only for informed consent, but also in the experience of suffering. Knowing about what is happening helps patients to cognise and come to terms with their disease. This kind of understanding also affects disease itself in that knowing about the mechanisms and purposes of prescribed drugs affects how patients view taking them and adherence.\textsuperscript{290} When a patient understands the reasons they take, for example, a diuretic, they are more likely to accept inconvenient side effects like getting up for the toilet, than if they do not understand why they are given drugs. This understanding may mean the difference between their recognition that urinary frequency is good and indicates the diuretic is working, as opposed to an alternative negative connotation. These beliefs may tip the balance as to whether the patient thinks drugs are worth taking, and could have dramatic consequences on their disease, especially when accumulated over years of chronic illness.

Probably the biggest danger of EBM is it encourages the viewpoint discussed in chapter two - that suffering and disease are equivalent and medicine can adequately address suffering by focusing on disease. EBM causes medicine to lose sight of its true purpose by encouraging a reductive perspective whereby its goals are framed in terms of disease, leaving the holistic consideration of humanistic features of illness as noise in a statistical analysis. Because suffering cannot be illuminated by science in the same way as disease, EBM’s insistence that research evidence “is what counts” in medicine has the consequence that for those who practice EBM, disease is what counts - not suffering. This reductive perspective is exemplified in the paper: \textit{Medication nonadherence: A diagnosable and treatable medical condition}.\textsuperscript{291} This paper claims that non-adherence is a disease entity akin to a lymphoma or blocked artery, and that there is “something wrong” with people who choose not to take their medicine for whatever reason. Although this idea may be useful as an abstraction for scientific investigation, the equation – non-adherence = disease – encourages notions that all difficulties in medicine can be overcome with the appropriate scientific “treatment”.

\textsuperscript{289} See section 6.3.
\textsuperscript{290} McDonald, H. P., A. X. Garg and R. B. Haynes (2002).
Non-adherence\textsuperscript{292} is an important problem in health, but advising physicians they need be on the lookout for this new “sickness”, is not going to help them recognise their patient as a \textit{person} worthy of dignified treatment (and not as a disease requiring swift extermination). The real reasons people are non-adherent are human. Sometimes people forget and sometimes they don’t trust “doctors orders”. Medicine’s treatment of non-adherence (and suffering in general) as a disease serves only to expand the disjunction that exists between medicine and real people. Patients are primarily concerned with how they are treated, and not necessarily the treatments they get. This is illustrated by the popular rise of alternative medicines, which often have very little scientific foundation. The recognition of human suffering is missing in a medical \textit{care} that is “evidence based” and preoccupied with disease.

I believe there are two things that continue to hold back an appreciation of suffering and its relief. The first is a continuing failure to accord subjective knowledge and subjectivity the same status as objective knowledge and objectivity. The second is an increasing denial of the inevitable uncertainties in medicine and a quest for certainty.\textsuperscript{293}

Interestingly the EBMWG refers to Cassell in their introduction of EBM.\textsuperscript{294} They do this but concurrently set out to install the antithesis of Cassell’s message into medicine. EBM seeks to enshrine principles of “objectivity”, directly resulting in the inability to see the “subjective” nature of suffering. Because of this, EBM is not aligned with medicine’s end – the care of suffering persons. Instead it is a framework that in its original form, meant the only way to \textit{legitimately} illuminate suffering was through the scientific investigation of disease, a reduction that is not accurately possible. It has been claimed that EBM has changed over its lifetime. This may be true, but if it is then EBM is no longer EBM. Because it causes medicine to lose sight of its \textit{telos}, EBM is not an adequate guide or model for medical practice.

\textsuperscript{292} I believe even the term itself is unhelpful and obscures the true nature of non-adherence in way that overcomplicates the problem. A more accurate term would be “patients not eating their pills”. When viewed in this way and not as a \textit{disease} one can begin to understand why patients might not eat their pills, e.g. they don’t think they work.

\textsuperscript{293} Cassell, E. J. (2004). p. xii

\textsuperscript{294} “Another traditional skill required of the evidence-based physician is a sensitivity to patients' emotional needs. Understanding patients' suffering and how that suffering can be ameliorated by the caring and compassionate physician are fundamental requirements for medical practice.” - EBMWG (1992).
6.6 Conclusions

EBM represents a framework of medical knowledge that not only fails to account for the importance of routinely observed phenomena, but also creates and worsens problems related to the use of knowledge in practice. EBM affects practice via all its players and its major downfalls have to do with pushing the emphasis of knowledge too far in the general-explicit direction.

Biomedical science is inherently limited in its capacity to “know things” that are particular and tacit. EBM encourages biomedical science to strive for epistemic rigor and in doing so, exacerbates issues related to its limited ability to know about things that are highly complex and difficult to quantify – e.g. suffering. EBM may also result in a distortion of clinical reality brought about by highly internally valid, but not externally valid methodologies, and it also causes a shift of clinical authority outside the clinic where medicine’s goals may be subjugated by considerations of profit. Physicians use knowledge from science but also rely on many other knowledge forms, even if they are not aware of this. The rationality and largely autonomous nature of individual physicians means they are able to side skirt many of EBM’s weaknesses. However this is limited by restrictions imposed by clinical authorities, who may not be able to practice EBM so flexibly. Clinical authorities, attracted by the perceived “objectivity” of the “evidence based” method, create policy that may be limited in terms of its ability to allow for variations in patient and circumstantial factors. Furthermore evidence based policy is intrinsically geared towards the legitimation of measures that are readily quantified due to requirements of biomedical science. Expertise is required within clinical authorities to ensure representation of all knowledge forms.

The final measure of EBM’s adequacy is its effect on patients. It fails them because it encourages medicine to view their condition as just disease, leaving aspects of their suffering by the wayside. For this reason, EBM is not an adequate philosophy of practice for medicine and should so be left behind. Curing humanity of disease is an unattainable goal in medicine, and its philosophy should recognise this and focus on the more worldly aspiration of improving the human condition by ameliorating suffering. This will be realised through the use of explicit-general knowledge and also other forms of knowledge able to illuminate things outside the gaze of science.
Chapter 7: Conclusions

Evidence Based Medicine is not a “good” thing for medicine as it results in the systematic exclusion of aspects of suffering from the discourse of knowledge occurring in medical practice. This conclusion briefly summarises my argument before leaving you with a few broad considerations to make your own judgement on the adequacy of EBM in medicine.

7.1 Thesis Argument

To know whether practice is effective, we must first know what it is trying to achieve. The therapeutic success of biomedical science has led to an impression that medicine’s goals may one day be solved by the extensive application of the scientific method to aspects of practice. Because science depends on abstractions, the treatment of disease (one particular abstraction) has come to be seen as the endpoint that determines the adequacy of practices. This is not true and there is much in medicine that cannot be understood through the lens of disease (e.g. palliative care). Suffering is an alternative endpoint that encapsulates disease as well as other important factors in the experience of sickness for the patient. Suffering is about unique persons who cannot be properly understood in a scientific manner. Medicine as the “practice of ameliorating suffering” appears to account for much more of what occurs in the clinic and this thesis frames medicine’s goals through the lens of suffering.

Appropriate practice is determined by what we know about it. As a result the nature of knowledge in medicine is central to the evaluation of practice. Notions that knowledge is a “justified, true belief” may lead to the impression that to be knowledge, something must be explicitly justified and that highly justified knowledge is more reliable. This account of knowledge fails to acknowledge that certain forms of knowledge are tacit - they are known, but not necessarily articulable. Knowledge can also be particular where there is a lesser requirement for justification than for knowledge that relies on generalisations. These two, dimensional features of knowledge are encountered regularly in the clinic and have a bearing on suffering (they are also closely related to the treatment of disease). A consequence of there being knowledge where there are no words is that this knowledge cannot be recorded external to the knower. Because of this, knowledge is personal and exists within those who use it to pursue their ends.
Because knowledge and the knower are inseparable, and our knowledge of suffering determines appropriate practices in medicine, medicine can be seen as a discourse of knowledge occurring within those who participate within it. Medical activities involve patients, physicians, clinical authorities as well as biomedical science, and these groups are in possession of knowledge that is tacit, particular, explicit and general. A philosophy of practice can be derived from these fundamental assertions and this philosophy may be used to evaluate other frameworks.

Evidence Based Medicine is an alternative philosophy that also aims to improve medicine by maximising its use of knowledge in practice. The original characterisation of EBM was founded on a theory that considered justification an essential component of knowledge and that knowledge’s merits can be evaluated by the epistemic rigor of its justification. This framework excludes tacit and particular knowledge forms that exist in practice, instead advocating that medicine should be founded chiefly in explicit-general research evidence. Criticisms related to this exclusion led to revisions in EBM to align it more with observations of knowledge in the clinic. These changes appear to contradict the fundamental notions of EBM which means that: either EBM is a philosophy in crisis and is attempting to realign itself with reality by the ad hoc addition of corollary theory; or since its fundamental notions define it and have changed, EBM ceased to exist as a result of announced changes. Both of these possibilities suggest the status of “Evidence Based Medicine” must be reframed.

EBM influences medical practice and all those who participate within it. Features of biomedical science limit the things it can know, particularly things that are highly complex or difficult to quantify. The emphasis of epistemic rigor by EBM may be diminishing the external applicability of scientific knowledge in the clinic and furthermore, the clinical authority placed in “evidence” by EBM may mean that power in medicine has shifted to commercial entities who know how to manipulate science and are motivated by profit, not suffering. Physicians use scientific knowledge as well as other knowledge forms that are not legitimised by EBM. Because they are autonomous, they are able to avoid many of EBM’s weaknesses, however physicians are restricted by clinical authorities who cannot evaluate particular circumstantial factors in policy, which may be founded in explicit-general “evidence”. This highlights the need for clinical expertise in clinical authorities to facilitate the consideration of tacit and
particular knowledge forms in policy creation (in addition to research evidence). A second factor to consider is that because research evidence is biased in favour of measures that are lucrative and easily quantifiable, there is a corresponding bias in policy for clinical authorities using EBM. The final inadequacy of EBM is that it alienates patients as unique persons, instead encouraging the radical perspective that patients are fundamentally diseases that need to be treated. This viewpoint obscures medicine from its purpose of attending to the suffering of these persons and because EBM encourages medicine to seek an alternative endpoint that can be divergent to suffering, EBM hinders medicine and an alternative philosophy is needed.

7.2 Implications

EBM is potentially harmful within all of medicine, but especially medical education. Students should learn clinical epidemiology and this adds value to medicine, however EBM’s flaws carry with it normative ideals that are at odds with philosophies that implicitly advocate the personality of knowledge and the importance of particular (and tacit) forms (e.g. Patient Centred Medicine)\textsuperscript{295,296}. Medical philosophy should not be taught in a confusing way that expects students to put together a mismatched patchwork of EBM, Patient Centred Medicine and other marginally compatible philosophies. To ensure the holistic integrity of medical students’ world-view, they require an internally coherent philosophy (of knowledge in practice) that encapsulates holistically what it is to practice medicine and navigate suffering from both scientistic and humanistic viewpoints. A simple removal of “EBM” and a replacement with a non-normative term like “clinical epidemiology” in medical education (and policy) may help to resolve many of the issues presented in this thesis. This would be in conjunction with courses teaching students about the purposes of medicine (e.g. suffering) and the dimensional nature of knowledge (highlighting limitations of science). Medicine’s use of science and technology is perpetually held back by the results of the next RCT, or the invention of new technology. Practice is not limited in the same way by non-scientific knowledge (our particular and tacit functions). Medicine does not need invention to optimise what it already has – the compassionate and rational physician – and to improve the ability of such a person to attend to the suffering of sick people. Although it may be adjunctive,

\textsuperscript{295} Stewart et al. (2003).
\textsuperscript{296} In advocating the centrality of the patient, Patient Centered Medicine implicitly recognises that patient’s posses their own personal, particular (and tacit) knowledge that has a bearing on their condition and so should be considered in decisions related to it.
no amount of technology will replace the care that the doctor - as a person - can provide.

What I advocate is a medical philosophy of knowledge that recognises the dimensionality of knowledge and that medicine is about suffering, not disease. This thesis lays down the fundamental assertions for such a “philosophy of practice”, namely that: i) medicine is about attending to patient suffering; ii) medical knowledge is personal and varies in its explicit-tacitness and general-particularity; and iii) medicine has a discourse of knowledge created by those who participate in it. The use of research evidence will remain part of this philosophy, however this must be tempered against science’s limitations. This framework recognises Personal Knowledge\(^{297}\) and that the physician is in a gifted position to evaluate particular and tacit features of the patient and their circumstances that are outside the grasp of clinical research. Furthermore, we should not discount our capacity for intelligent reason on things like safety and efficacy, even if this means we make the occasional error. Surely this would be more fruitful than ignoring our rationality and blindly following the (illusionary) concrete answers of rigid and technologically driven empiricism.

This thesis provides a starting point for an alternative philosophy, however more work is needed in understanding the dimensionality of medical knowledge and how these dimensions may be expanded and capitalised upon in practice. This thesis, in advocating for personal knowledge, emphasises the importance of expertise. Work is also needed to determine what expertise is and how it may be evaluated in ways that are not exclusively explicit, recognising that explicit evaluation of tacit knowledge forms may not be possible. Additionally there are considerations of the politico-economic machineries that exist around knowledge in practice, particularly in terms of clinical authority and the role of private interests in manipulating medicine for profit. The de-throning of research evidence as the legitimate form of knowledge, and the blunting of clinical authority placed in evidence as a result of this, may be a way to return power to those who practice medicine and share its goals. However the issue of commercialisation in medicine is broad and although medicine can advocate for changes, reform is needed at the global political level. There are currently many who

suffer needlessly, especially in the developing world, because profit is not an adequate motivator to place health resources where they are needed most.

I have not provided compelling empirical evidence in this argument for the inadequacy of EBM. What I have provided is what I know is a convincing argument pointing out, as many others have done before me, the many inadequacies of EBM as a philosophy of medicine. EBM may well have come at a time where with the rapid development of information technology, medicine needed a way of coping with the growing corpus of clinical research. Two decades have passed since then and it is now clear, even to the EBMWG, that EBM in its original form was inadequate. Rather than attempting to fix what is already broken, it is perhaps appropriate that medicine moves on to what will become the next “NEW paradigm for medical practice”. This paradigm will eventually be replaced in the same revolutionary process that will see the end of EBM. However as it stands, EBM is either in intractable crisis or has already ceased to be as a paradigm of normal science, and a new philosophy is required. Whether you are convinced by this argument is now out of my hands, but as a player in medicine yourself, you surely have a role to play in the climate of professional practice and therefore in the future of EBM, and medical philosophy in general, revolution or not.

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Appendix I

The Irreducible Nature of Suffering

This appendix provides an argument for the irreducibility of suffering and supplements discussion in section 2.4. Although this argument is intended to apply specifically to the reduction of suffering into disease, it is broadly relevant to reduction in biomedical science.

The Pursuit of Exactitude in Biomedical Science

There is a spectrum of science in terms of its subject matter and the degree it may be explicated concisely and accurately. This variation has an effect on the exactitude of different sciences.

Exact sciences (e.g. physics) deal predominantly with natural kinds like electrons, nuclear forces and carbon atoms, whose properties remain constant and obey natural laws. Instances of natural kinds are identical in essence because that essence is an abstracted set of properties that can be exactly specified (and any variations occur at an unobservable level). In these “exact” sciences things can be explicitly and completely characterised and measured to establish predictions that hold consistently and often come in the form of mathematical formula (e.g. $e = mc^2$).

In the inexact sciences (e.g. biomedical science) the subject matter is more vague than the fundamental natural kinds of the exact sciences. Their complexity means that abstractions must be made in terms of things that are not observably identical. An example of such an abstraction would be “a diagnosis of depression”. Patients with depression will vary according to any number of observable variables (e.g. occupation, interests, feelings of sadness, etc.). This undermines the predictive accuracy of the inexact sciences as things may affect the subject matter in unpredictable ways and be more difficult to measure. This is not to say that abstractions in the non-exact sciences are false; however the resultant scientific knowledge would be better characterised as a probabilistic generalisation, as opposed to an exact natural law.

“Exactness” is desirable for science and therefore for biomedical science, which is not surprising considering medicine’s aim to devise regimens it is “certain” will be good for the patient. One result is the allure of framing the scientific investigation of macroscopic health phenomena in terms of the microscopic entities studied by the exact sciences. At that level, variations between individual people do not exist (or are not observable), so there is the impression of greater accuracy and certainty, a process called reduction.

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1 Quantum mechanics is a sub-discipline of physics that is at odds with this observation, however for classical physics this observation holds and it is the ideal of classical physics that biomedical science pursues (the point of this argument).

2 For example, measuring temperature in a physical system compared to “sadness” in depression.
Life’s Irreducible Nature

“Reductionism” refers to the tendency of science to reduce systems into their constitutive parts. Polanyi argues that reductionism does not provide an accurate representation of things, specifically in biology. He explains that mechanisms (of machines and bodies) are governed by boundary conditions that exist at multiple levels (e.g. molecule ↔ cell ↔ organ ↔ body ↔ consciousness), and that these boundary conditions are under dual control, in that causation occurs from the “bottom-up” and also the “top-down”. This is possible because “principles governing the isolated particulars of a lower level leave indeterminate conditions to be controlled by a higher principle” and “consequently the operations of a higher level cannot be accounted for by the laws governing its particulars on the next lower level”. For example, there are laws governing the levels of literary composition (letters ↔ words ↔ sentences ↔ composition of text), each of these levels leaves options open for the levels above and you cannot determine the rules or composition of levels above by looking at levels below, i.e. you cannot derive a complete text from a vocabulary but the vocabulary determines what can be in a text.

Polanyi applies this observation to biological systems:

The theory of boundary conditions recognises the higher levels of life as forming a hierarchy, each level of which relies for its workings on the principles of the levels below it, even while it itself is irreducible to these lower principles.

In biological systems there is a hierarchy represented by phenomena occurring at different levels of boundary conditions, with biochemistry near the bottom and consciousness near the top. Biomedical science makes use of reduction very widely, for example to characterise depression as something determined by malfunctions in neurotransmitters. Polanyi would argue it is not possible to sufficiently understand depression from the level of biochemistry, as it is a phenomenon governed by rules at the higher level of consciousness. This is not to imply any violation of “biochemical laws”; however changes in biochemistry in depression would be argued as only part of depression (and possibly not the causal part), which would be presented as something that is determined primarily at the level of consciousness, “the mind harnesses neurophysiological mechanisms and is not determined by them”.

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4 Boundary conditions occur when systems (mechanical, physical or otherwise) and the restrictive laws that govern them are pushed to their limits producing phenomena that can be useful. They can be looked at i) intrinsically - how they restrict the entities at the level the system's laws refer to e.g. an experimenter imposes boundary conditions by supercooling a liquid in order to learn about its thermodynamic properties or ii) instrumentally - how they can be manipulated in order to create phenomena at the level above e.g. the engineer imposes mechanical boundary conditions by maximising the load on a cable to build a bridge.
6 Ibid.
7 Ibid.
8 Ibid.
9 A logical conclusion here would be that attempts to correct depression at the level of consciousness by correcting biochemistry at the molecular level presents an indirect intervention and it could be more fruitful to approach the problem from the level of the phenomena, i.e. consciousness.
Polanyi’s critique of reductionism is similar in structure to his argument for tacit knowledge. He argues that when attempting to learn about one level and the focus shifts (or is reduced) to the lower level, there is a loss in ability to fully understand the higher level - akin to the breakdown of a skill when focus shifts. However focussing on the higher level does not have to result in the exclusion of lower ones. When investigating a phenomenon in science, the focus on the highest level must be borne in mind, whilst keeping note of important factors at lower levels, as both need to be understood.

The claims made following the discovery of DNA, to the effect that all study of life could be reduced eventually to molecular biology, have shown once more that the Laplacean idea of universal knowledge is still the theoretical ideal of the natural sciences.

Because mechanisms utilise boundary conditions, DNA is irreducible to physical laws just as higher levels, like consciousness are irreducible to DNA. An analogy would be that although governed by physical laws, a study of physics would not illuminate the nature of road rules, just as a study of road rules would not reveal the nature of road rage. Essentially what Polanyi is arguing is that reductionism represents an exclusively “bottom-up” account of causation, which is passionately favoured by science because it offers greater exactness and perceived “objectivity”. He recognises that study at all levels is interesting but for phenomena that manifest themselves at higher levels, a “bottom-up” (reductive) approach wipes out any possibility of a proper understanding of higher levels of causation and a “top-down” approach may be more fruitful. Therefore for depression, a study rooted in phenomenology could be as enlightening as one based in biochemistry.

The Irreducible Nature of Suffering

Polanyi’s critique of reductionism can be applied to biomedical science’s reduction of suffering into disease. Suffering exists at a level above disease and has its own set of “rules” that can be lost sight of. For science, sickness is about blood pressure, body temperature and biochemical markers. This excludes aspects existing at the higher experiential level of sickness (e.g. the fear of death), which may be more “real” and causally dominant at the level of suffering. This reduction is a “moral inversion” because it erodes our ability to learn of the nature of suffering and attending to suffering is the primary moral objective of medicine. This is not to undermine the value of knowing about disease, as this knowledge can inform us about suffering (like knowing mechanics can inform appropriate road speed limits). However it must be recognised that suffering and disease exist at different levels and that focussing on disease at the expense of suffering will diminish medicine’s capacity to know and address suffering in sick persons.

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11 See section 3.2.1
13 Ibid.
14 Ibid.
Bibliography

Appendix II

“Personal Knowledge” in Medicine and the Epistemic Shortcomings of Scientism – Hugh McHugh and Simon Walker


Keywords Philosophy of medicine; Knowledge; Medical ethics

Abstract

In this paper, we outline a framework for understanding the different kinds of knowledge required for medical practice and use this framework to show how scientism undermines aspects of this knowledge. The framework is based on Michael Polanyi’s claim that knowledge is primarily the product of the contemplations and convictions of persons and yet at the same time carries a sense of universality because it grasps at reality. Building on Polanyi’s ideas, we propose that knowledge can be described along two intersecting “dimensions”: the tacit–explicit and the particular–general. These dimensions supersede the familiar “objective–subjective” dichotomy, as they more accurately describe the relationship between medical science and medical practice. Scientism, we argue, excludes tacit and particular knowledge and thereby distorts “clinical reality” and impairs medical practice and medical ethics.

Introduction

Medical “scientism” is the imperative to define and achieve all medical goals through science. This imperative manifests in numerous ways and is particularly evident in the “objective–subjective” dichotomy, whereby “objective” knowledge is viewed as superior and “subjective” knowledge is regarded as inherently suspect. In this paper, we argue that medical scientism is flawed because it only recognizes what we call general and explicit knowledge and excludes what we call tacit and particular knowledge. This exclusion is epistemic, in that tacit and particular knowledge may be implicitly recognized by scientism, though not as genuine knowledge but as some modulating “factor” in the application of scientific knowledge (from a Kuhnian perspective [Kuhn 1996]; this is because recognizing tacit and particular knowledge as valid “knowledge” would undermine the foundational assumption of the scientistic paradigm that the quality of knowledge is related to the extent and rigour of its justification). Such factors, which are invoked through terms like “clinical expertise” or “patient preferences,” we suggest are more accurately described as valid and necessary forms of medical knowledge, with features that distinguish it from the knowledge science delivers. We argue that the exclusion of tacit and particular knowledge impairs our ability to achieve medicine’s goals, primarily because these knowledge forms are essential to doing medicine and secondarily because the overemphasis of general-explicit knowledge distorts our perceptions of what legitimate medicine should be. These impairments relate to a range of domains of medical practice, from the reasons supporting one treatment over another through to health policy and even to the legitimacy of different kinds of ethical arguments.
The framework for understanding medical knowledge put forward in this paper draws from Michael Polanyi’s (1958) *Personal Knowledge: Towards a Post-Critical Philosophy*. As indicated, it consists of two polar but complementary “dimensions”: the tacit–explicit dimension and the particular–general dimension. Although the poles of each dimension are opposite in nature, they operate together and should not be prioritized as superior or inferior. All knowledge is made up of a dynamic combination of these components—the tacit, explicit, particular, and general—and the relative involvement of each may change according to how given knowledge is used. Distinguishing these dimensions helps to clarify why different forms of knowledge, such as knowledge of physiology or knowledge of a given patient’s personal history, are necessary for medicine to succeed and shows how the grounds upon which we determine “truth” differ according to how knowledge is situated within this framework.

There are similarities between Polanyi’s ideas and other accounts of medical knowledge that emphasize the importance of practical reasoning (particularly the Aristotelian concept of *phronesis* or “practical wisdom”) and have been central to previous criticisms of scientism (Pellegrino and Thomasma 1981; Montgomery 2006). Henry (2006), for example, agrees that medical philosophy should focus on the clinical encounter, but he observes that some of the better-known arguments that advocate this are situated within “modern” epistemologies that fail to “account for how physicians, patients, and philosophers of medicine actually practice and use knowledge as embodied human beings” and argues that Polanyi’s epistemology offers a suitable corrective (Henry 2006, 196). Here we will provide an introduction to Polanyi’s philosophy before discussing the tacit–explicit and particular–general dimensions of knowledge and what these distinctions reveal about the problems of scientism.

**Michael Polanyi’s Theory of Personal Knowledge**

In his book *Personal Knowledge: Towards a Post-Critical Philosophy*, Michael Polanyi (1958) sets out a theory of knowing that rejects objectivist conceptions that aspire to what he terms “impersonal” knowledge. He argues that knowledge originates from the inquisitive mind and cannot be considered “objective” in the mind-independent sense because it always depends on an act of appraisal and commitment by the knower. However, he also argues that knowledge can have a universal quality because it “grasps” at reality—the grasping of which implies its existence. In this light, his notion of “personal knowledge” can be seen as a unification of the “idealist” and “realist” traditions.

Objectivity is a fundamental aspiration of modern science. The scientific method is traditionally thought to lead to the illumination of “objective” truths that are considered present in nature and awaiting discovery. Alongside this is a corresponding notion that human “subjectivity” leads to false belief. These ideas lie behind the ideal of scientific detachment and the utilization of methodologies designed to remove human, i.e., “subjective,” factors (e.g., blinding in clinical trials). This overall approach can be related to a classical conception of knowledge attributed to Plato: knowledge as a justified, true belief (Fine 2003). According to this conception, a subject is entitled to claim knowledge only if that claim can be justified. In science, scientific knowledge is justified by scientific evidence. However, the conception of knowledge as a “justified, true belief” does not in itself specify at what point a conviction is *rightly* justified. For the objectivist this is a problem because human judgement is always necessary for this
appraisal. This requirement for explicit justification may also be related to epistemic “positivism.” Scientific claims are justified by scientific observations—if nothing is observed, nothing scientific has happened. Added to this is the expectation that scientific observation will involve a measurement of some kind. (Though qualitative techniques are becoming more legitimate in medicine, it is unlikely they will have the legitimacy of more “rigorous” methods such as the randomized controlled trial within a scientistic framework.)

The link between observation, measurement, and judgement is developed in Polanyi’s understanding of the relationship between the “knower” and the justification of knowledge. He examines Popper’s (1972) assertion that scientific theories must be falsifiable because no number of positive observations can prove a generalized statement, though a single negative one may disprove it. If falsification is a requirement, then, accurately speaking, science is only able to make positive assertions using the “null hypothesis.” This is based on the prior assumption that there is no relationship between the objects in question and that any pattern discovered in the variables is the result of chance (Fisher 1935). This is because if one is able to falsify the null hypothesis, the opposite is true—that there is a relationship. However, the null hypothesis cannot be absolutely falsified, and the scientist is required to make a judgement as to whether a given result is coincidental, usually on the basis of the “p-value,” for which there is no universal cut-off point representing certainty.\(^\text{15}\) This means that, rather than being based on strict contradiction, positive assertion in science is statistical. For this reason Polanyi describes scientific knowledge as at best only known with a very high probability to be true rather than absolutely proven (Polanyi 1958). The implication is that the scientist must appraise an experimental result against her existing understanding of the object being studied and so judge whether that data counts as knowledge. Given this judgement partly depends on the characteristics and individual understanding of that person, and that these are subjective under a subjective–objective framework, science cannot be considered truly “objective.”\(^\text{16}\) Yet despite all of this, within our day-to-day understanding, scientific claims are regularly presented as positive truths and theories are asserted as “scientifically proven.” Such positive assertions are commonplace in medicine (e.g., that ACE inhibitors reduce blood pressure is generally accepted).

Polanyi goes on to argue that all knowledge depends on a kind of personal affirmation. This claim is ultimately founded on the capacity of people to self-appraise their beliefs and the inherent drive to seek out a clearer vision of an underlying reality (Polanyi 1958). The knower, Polanyi points out, judges what is true by universal standards that he sets for himself. However, this does not render the knower free to arbitrarily “know” what he pleases, as the judgements of the knower are constrained by what Polanyi

\(^{15}\) In the appraisal of a result using the null hypothesis, a low “p-value” suggests a true relationship and a high value suggests a result caused by chance. The degree of justification (in terms of p-value) required to qualify a result as knowledge is not an “objective” truth but is assigned conventionally (p < 0.05 in most situations).

\(^{16}\) The inherent uncertainty of science—and resultant need for judgement—is also reinforced by the theory-laden nature of observation. Although intersubjective agreement might rationally strengthen a claim to truth (as happens with peer review), this does not lead to mind independent “objectivity,” as this agreement is still conditional on each individual’s judgement.
describes as the “personal co-efficient,” which for him reflects the essential and determinative link between the knower and that which is known:

[All] knowing includes an appraisal; and this personal co-efficient, which shapes all factual knowledge, bridges in doing so the disjunction between subjectivity and objectivity. It implies the claim that man can transcend his own subjectivity by striving passionately to fulfil his personal obligations to universal standards (Polanyi 1958, 17).

In other words, the personal co-efficient is the idea that knowledge depends on an act of commitment by the knower. In proclaiming something as true, the knower makes her judgement under a set of tacitly known criteria. These criteria are established by the knower’s relationship to the reality that she is striving to grasp and involve both the nature of the knower and the nature of that which is known. Thus, they are not arbitrary and do not wholly belong to the “subjective” perspective of the knower. The criteria also involve the prior knowledge of the knower and the logical and social structures through which the thoughts are formed, including certain normative and ontological assumptions. An example is Einstein’s rejection of quantum mechanics because he could not reconcile the probabilistic wave function with his personal conviction that “[God] does not play dice” (Calaprice 2000, 245). This conviction arises from the ontological assumption that there is no coincidence and that nature always operates in a law-like manner (or that the universe is deterministic). In recognizing the personal co-efficient, we authorize ourselves to make correct judgements, and yet we also accept the possibility of being mistaken (the persistence of, and developments within, quantum mechanics would suggest that Einstein was mistaken on this occasion, as the unspecifiability of the wave function suggests that God does play dice). However, the commitment itself cannot be false, only the grounds upon which it is made (much like the deceiver is committed to his deception but not to the truth of his deception). The sense of universality implied by the personal commitment “lies precisely in [the knower’s] foreknowledge of a host of yet hidden implications which his discovery will reveal in later days to other eyes” (Polanyi 1958, 64). For example, although Newton may have seen the relevance of the falling apple to the heavenly orbits, it took Einstein, centuries later, to piece together gravity with the nature of space and time and thereby explain (amongst other things) how a watch runs slightly slower on a speeding train.

In summary, Polanyi’s philosophy conceives knowledge as fundamentally personal but as grounded in a relationship between the knower and the reality that is known. This relationship is tacitly implied in any act of knowing and always involves elements that are particular to the individual knower. At the same time, it entails the idea of universality, which may be explicated through various forms of justification and which may in turn be assessed, corrected, or corroborated by other knowers. “Personal knowledge” encompasses all four aspects of knowledge we describe here: the explicit, the tacit, the general, and the particular. In the following sections, we will explain what these dimensional aspects of knowledge involve and then outline how they relate to medicine.

The Tacit–Explicit Dimension of Knowledge

The tacit–explicit dimension of knowledge represents the varying degrees to which knowledge can be articulated and communicated. Where knowledge is situated within this dimension is related to how knowledge is used. Explicit knowledge is knowledge
that can be easily communicated, such as the correct dosage of a drug. Tacit knowledge is knowledge that cannot be easily articulated, which is highlighted by the knowledge of how to identify and characterize heart murmurs. Medicine requires both tacit and explicit knowledge, and yet because medical science can only deliver explicit knowledge, scientism excludes tacit knowledge. Scientific knowledge must be justified by scientific evidence, and for this reason science as it is communicated and disseminated (in journal articles, conference presentations, and so on) is purely explicit. This at least is how science is presented, though, as we will elaborate, both the understanding and practice of science depend heavily on tacit knowledge. Several authors have discussed the importance of tacit knowledge in medicine and have called for further study in the area (Henry 2010, 2006; Braude 2012; Henry, Zaner, and Dittus 2007; Sturmberg and Martin 2008).

Tacit knowledge is not merely the residual unspecifiable aspects of knowledge. Tacit knowledge is foundational to all knowledge (Grene 1977). The various faculties required for identifying and utilizing explicit knowledge are tacit, as are the skills or “know-how” required for our many kinds of activities. As Polanyi notes, though skills are not acquired through an explicit transfer of ideas, they are nevertheless acquired and hence may be known or not known. Moreover, any attempt to make this knowledge explicit tends to disrupt its function. Consider, for example, how difficult it can be to walk while thinking about your leg movements—the explicit thought tends to disrupt the exercise of the skill (Polanyi 1958). The same is evident in the use of tools. When the surgeon uses a scalpel, she is generally focally aware of only the act itself, and yet there is a vast amount of sensory input that she relies upon that is in “the background,” e.g., feeling fine pressure changes in the fingertips and seeing the compliance of the tissue as she cuts it. The capacity to perceive and respond appropriately to this background information is essential to the successful performance of the task and as such is an aspect of the knowledge required for its execution. Polanyi describes these aspects of knowledge as the “subsidiary awareness” of the “parts that make up the whole,” which enables us when using a tool to effectively assimilate the tool as an extension of our body (subsidiary awareness refers to things we perceive [or know] that contribute to awareness but are not manifest [or articulable] at the focal level). Shifting awareness away from the “whole” to any of the “parts” deteriorates a skill, and hence it is impossible for the skilled person to completely communicate these parts (like a skill, judgement has a tacit component in that the judge is subsidiarily aware of the criteria against which she makes a judgement and cannot be totally aware of them) (Polanyi 1958). Thus, the unification of these unspecifiable components in the mind of the knower is a form of tacit knowledge.

Related to the distinction of focal and subsidiary awareness is Polanyi’s from–to structure of knowledge (Polanyi 1975), which Grene asserts is inherent to all cognitive processes (Grene 1977). Polanyi claims that when we use knowledge to attend to something, say if we want to interpret a chest X-ray, we do this by attending from our prior knowledge of radiology and lung pathology along with many other things, like visual sensory input, of which we may be only subsidiarily aware. Even reading explicit text requires tacit faculties, whereby the explicit part of language falls into subsidiary awareness, contributing to our focal awareness of meaning. For example, when reading this you are tacitly attending to the meaning of the text by attending from the letters that make its words (which your eyes see). The from–to structure of knowledge demonstrates how the explicit and tacit components of knowledge are entwined. It also
demonstrates the importance of the context when assessing how knowledge is being used in terms of its tacit and explicit features. While the surgeon is using her scalpel, she might come up with some instructions to teach a student and so make part of her tacit knowledge explicit. The observation that tacit knowledge can be made partially explicit may incline one to support a purely explicit epistemology (like scientism). It is not possible however to make tacit knowledge completely explicit, partly because language is functionally limited but also because tacit knowledge is pervasive and necessary for every kind of task, even those that would be considered highly explicit in nature (this is at the basis of a common misinterpretation of Polanyi that is related to seeing tacit knowledge as merely residual unspecifiability [Grene 1977]). An example is mathematical knowledge, which might superficially appear to be the paradigm of explicit knowledge but which in fact depends heavily on tacit knowing and the personal faculties of the mathematician (Polanyi 1958). The tacit knowledge of mathematics partly is in the understanding of mathematical symbols and their operational rules but also is in the knower’s personal capacity to conceive novel solutions to difficult problems. If mathematical knowledge were purely explicit, then it would follow that anyone who could read the symbols could in doing so grasp the theories they describe (even the most difficult). This is clearly not the case, and even genius mathematicians struggle with problems outside their specialty.

Returning to the scientistic imperative to make knowledge explicit, we must be cautious when attempting to model doctors’ “clinical judgement” on purely explicit means. Doctors rely on both tacit and explicit knowledge, and although a probability flowchart might be useful to a beginner diagnostician to assess a patient for, say, a pulmonary embolism, a consultant physician with consolidated knowledge might tacitly reach a diagnosis long before she could explain her reasoning. Explicit models can be useful tools, but in so far as they overlook tacit knowledge, they do not fully represent how decisions are made in practice. Furthermore, tacit knowledge is most efficiently used tacitly, and the unnecessary explication of prior tacit knowledge can be cumbersome and may create dangers in the clinical setting.

In summary, even in the most explicit realms of thought, tacit elements are required for knowledge to have any meaning or practical usage. While explication may sometimes shed light on tacit knowledge (e.g., the surgeon instructing the student on how to hold the scalpel), the attempt to make all of knowledge explicit is futile, because language is limited and—more importantly—because we are not explicitly aware of everything we know. In this way, the tacit–explicit dimension of knowledge reveals a problem of scientism, for if it is maintained that knowledge must always be explicitly, and indeed “scientificaly,” justified (and so reduced to words and numbers), then unspecifiable tacit knowledge that is important in guiding actions and performing tasks will be denigrated or (at best) overlooked.

The Particular–General Dimension of Knowledge

The particular–general dimension of knowledge signifies the fact that knowledge varies in degrees of application. Knowledge is “general” to the extent that it encompasses or can be applied to a group of some kind. Conversely, knowledge is “particular” to the extent that it is specific to a single individual/thing. Like the tacit–explicit dimension, particular and general knowledge are both required in medicine and are used together. For example, when treating a patient with cancer, a doctor might discuss features of
malignancy in general while also addressing features of the particular patient’s malignancy (and other aspects of his or her illness) that are unique to that individual. The longstanding tension between generalized and particular knowledge is recognized by Montgomery, who argues that a core feature of medical reasoning is the process of *particularization*, whereby the generalized knowledge of science can be applied to the individual patient (Montgomery 2006). Here we explore differences in the justification of particular and general knowledge and suggest that particular knowledge often does not require scientific justification.

Though Polanyi does not directly address this distinction between generalized and particular knowledge in *Personal Knowledge*, setting it alongside the tacit–explicit dimension strengthens the critique of scientism, as both explicit and tacit forms of particular knowledge are obscured under a scientistic paradigm that focuses on generalized (and explicit) knowledge. This is because scientism upholds the idea that the quality of knowledge is related to the extent or “rigorousness” of its justification (e.g., by randomized controlled trial). The particular–general dimension reframes this imperative and recognizes the particular “everyday” information we rely on as *valid knowledge*, as particular knowledge is often justified self-evidently and not scientifically. This way of understanding knowledge incorporates generalized scientific knowledge and the reasoning behind the methods used to justify it, but maintains that knowledge should not be prioritized by the rigour of its justification, because not all knowledge needs to be justified scientifically to be relied upon. Although knowledge of particulars is taken-for-granted by scientism, it is essential to medicine and so should be recognized as a legitimate aspect of medical knowledge.

Much of the knowledge used in clinical life is particular in that it is highly specific to the practitioners and their individual environment. For example, a doctor typically has a list of names of particular patients under his care, he knows where the radiology unit is located in his particular hospital, and there is a particular number he must page to contact the team’s house surgeon, and so on. The fact that this knowledge is highly personal does not render it “subjective,” i.e., in the sense of being merely a product of one’s individual perspective and goals. Patients do have names, there really is a radiology department, etc., and this knowledge may be verified in many ways. Other kinds of particular knowledge could be considered more deeply concerned with the individual person, such as a patient’s love of psychedelic music, but even this kind of knowledge is not wholly arbitrary. Knowledge of the nature of a particular being (including oneself) is still knowledge, and it is still possible for such knowledge to be either true or false (or perhaps more-or-less accurate).

General knowledge is also used routinely in medicine (and indeed in all forms of everyday life). For instance, when going into the drug room to get IV fluids, it does not matter which particular bag one collects, so long as it is an instance of the right kind of fluid (e.g., Hartmann’s solution). This is an example of general knowledge: knowledge of the kinds of things that can be acquired from a particular place. Another example is in the way we interpret and respond to other peoples’ behaviour. Though every patient is unique, patients also all behave in ways that more-or-less accord with general patterns of human behaviour. We know, for example, that if a patient is confused or distressed, then she is less likely to attend to and understand what is said to her. Such knowledge of how people in general act is vital in maintaining our clinical, professional, and social interactions.
Similar to the tacit–explicit dimension, the particular–general dimension also demonstrates a from–to structure. The above examples demonstrate how we attend to particular situations from knowledge of their general features (and also from their particulars). We can also form general knowledge by attending to particular instances—this is one goal of empirical science. An example is how a drug’s efficacy is determined by making generalizations from a sample of individual patients. The methodological constraints and statistical analyses in science have to do largely with inferring an accurate generalization rather than determining what really occurred within the sample. So one might have perfectly accurate data from within the sample, and this would be true particular knowledge of the sample, but there may be aspects of the sample or methods that weaken the generalizability of this knowledge, which makes it less reliable (e.g., the sample did not represent the population). This demonstrates how the particular–generality of knowledge is dynamic and depends on the usage of the knowledge claim. This is illustrated best in the difference between saying “all patients are unwell” and “this patient is unwell.”

The assumptions of inference that are inherent in most empirical generalizations mean that the level of justification required to assert a knowledge claim as true is related to the extent it is generalized. In science, where there is a high degree of generalization, justification is very important and maxims exist that stipulate standards of rigour and evidence. Particular knowledge is different in that it usually does not require the same kind of justification as scientific knowledge and may be adequately justified simply by attending to personal experience (which might be an observation that something works). For example, it is reasonable to ascertain knowledge of a (competent) patient’s preference for treatment by discussing options with her and asking for her informed choice. Though rigorous methods such as N of 1 trials are able to detect important patient-to-patient variations, including in the study of patient preferences (Duan, Kravitz, and Schmid 2013), the justification of particular knowledge is often self-evident and rooted in “real-life.” Rigorous methodologies to justify such knowledge are often impractical and not needed.

The last point further highlights the problem with a “scientistic” privileging of knowledge that is based on scientific justification. Scientism leads to the relegation of correct particular knowledge. This is not a criticism of science, as the scientist’s aim is to generate generalizable knowledge. It is a criticism of the idea that all knowledge must be generated or verified by such means. The relegation of particular knowledge is dangerous in medicine because it has, along with tacit knowledge, a significant role in determining correct medical action.

**Medical Knowledge Through the Lens of Polanyi’s Personal Knowledge**

As well as the explicit–general knowledge of medical science that is essential to medicine, certain kinds of tacit and particular knowledge are equally essential. One cannot become a doctor just by memorizing medical textbooks, because the explicit and general knowledge conveyed by textbooks cannot generate the tacit knowledge required for executing medical tasks or instil the ability to gather particular clinical knowledge about individual patients.

When recounting a clinical history, patients share particular knowledge of themselves with clinicians, who in turn rely tacitly on their examination and diagnostic skills to
formulate a diagnosis. This diagnosis will be informed by the explicit–general knowledge of biomedical science, and the clinician’s conduct will be guided by both explicit and tacit professional standards set by clinical authorities. Thus, the participants of medical practice communicate their varied forms of personal knowledge as they perform their roles, which of course extend beyond the clinical encounter (e.g., handover meetings). If medicine somehow eliminated the particular knowledge of the individual patient and the tacit knowledge of the experienced doctor, it would be unable to achieve its purpose, just as it would if it could not access general–explicit scientific knowledge.

In an effort to clarify and reinvigorate the role of the doctor following the epistemic and social changes of the twentieth century, Eric Cassell reasserted the ancient purpose of medicine as being the relief of suffering. He argued that “the test of a system of medicine should be its adequacy in the face of suffering” (Cassell 2004, v).\footnote{Polanyi, who trained as a doctor before becoming a physical chemist and philosopher, also claimed that medicine’s purpose is to attend to suffering (Polanyi 1965).} A person, he said, is caused to suffer by her perception of certain things as a threat to her personhood (Cassell 2004). This perception may be either focal or subsidiary. Suffering is therefore holistic in nature: it concerns the unitary self and its multiple relations to other things. Thus, suffering itself calls for a kind of knowledge: knowledge of who the sufferer is and how she is relating to other things. Though the sufferer knows she suffers, she may be only more-or-less aware of why she does (Hamilton and Gillett 2012). In attempting to articulate the cause of her suffering, the patient is trying to make explicit the knowledge that she has, so that others may help her. However, there may be aspects of a person’s suffering that cannot be made explicit and which are at best only ever tacit. Equally, knowledge of suffering may have both general and particular features, involving science, culture, and personal experiences. The dimensionality of knowledge and suffering is further reflected in those who care for patients. Physicians must have a thorough grasp of the explicit–general knowledge of disease but also the tacit and particular knowledge that allows them to relate to patients as unique persons at a level above the explicit content of their interactions.

Cassell regarded medicine’s failure to accord “subjective” knowledge the same status as “objective” knowledge as a major factor holding back its understanding of suffering (Cassell 2004). In order to do this, it is necessary to understand how the knowledge Cassell is describing as “subjective” is acquired and validated and why it is not merely a matter of perspective or opinion. Understanding the role of tacit and particular forms of knowledge, and how these differ from explicit and general knowledge, is a step toward this. At every point, the participants of medicine call on knowledge that is both tacit and explicit, particular and general. All forms of knowledge are involved in understanding suffering and how it can be relieved. This is an inescapable clinical reality that is prior to the various frameworks through which we rationalize how knowledge is and should be used in practice. Scientism impairs medical practice because it distorts perceptions of “clinical reality” and limits the kinds of knowledge that can be used to justify clinical practice and broader ethical reasoning.
The Consequences of Scientism in Medical Practice

Medicine has been informed by scientific principles throughout its history. However, perhaps partly because of the success of modern medical science, scientific knowledge is often elevated above other forms of knowledge, such that it might be expected that all medical knowledge should be scientifically justified. This expectation is reinforced by the widespread adoption of “evidence-based medicine” (Evidence Based Medicine Working Group 1992), whereby the idea of “best practice” is governed primarily by the results of scientific research.\(^{18}\) As outlined earlier, science as it is communicated in appraisable forms consists solely of explicit–general knowledge, and so scientism results in the prioritization of explicit–general knowledge over tacit and particular knowing.\(^{19}\)

A key practical problem of scientism in medicine is that it leads to a bias in clinical reality. This occurs through science’s positivistic requirement for measurability, because aspects of treatment or practice that are difficult to measure do not generate scientific evidence and consequently come to be considered less important. This results in a prioritization of so-called “hard medicine,” like pharmaceuticals, over “softer” aspects of health (e.g., a person’s state of mind or doctors’ cultural competence) and is a reason why Polanyi’s philosophy advocates qualitative research (Henry 2006). This bias is further compounded by the commercial manipulation of science to suit profitable ends (by the fact that companies are unlikely to research aspects of health that are difficult to commercialize—e.g., exercise and a balanced diet compared to a novel drug or patentable surgical instrument) (Spielmans and Parry 2010). Bias resulting from scientism also occurs where things are not uniform or easily replicable, creating difficulties where therapies and outcomes are highly personalized and also rare conditions where sample sizes are limited. This is a “bias” because something can be effective and yet difficult to prove, a point represented in the subtle but important distinction between “a lack of evidence” and “an evidence of lack.”

Clinical authorities shape medical practice through policy and resource allocation. In so far as clinical authorities are influenced by medical scientism, they will evaluate health policy and resource allocation alternatives on the basis of scientific knowledge. This might exacerbate the bias discussed above, further increasing and promoting “hard” interventions and outcomes at the expense of those that are difficult to measure (or replicate). Scientism might also support the attractiveness of health systems where policy is enacted by economically trained or otherwise non-medical “executives,” based on the assumption that access to the relevant scientific evidence is the only knowledge they require—leaving clinicians “free” to care for patients. However, if health policy does not take account of the tacit and particular knowledge gained through clinical experience, then it may become “out of touch” with clinical realities, to the detriment of patient care. Just as it takes a scientist to interpret the broader implications of a scientific discovery, experienced clinicians are needed to anticipate and assess the

\(^{18}\) There have been more recent iterations of evidence-based medicine that claim to equally acknowledge other forms of knowledge (e.g., patient preferences and clinical judgement) (Buetow 2009). However, this rhetoric is at odds with evidence-based medicine’s fundamental tenets, as if other knowledge is equally important it is unclear why medicine must be “evidence-based” and not “preference-based” or “judgement-based,” etc. For a detailed argument, see McHugh (2013).

\(^{19}\) Others have argued that there is a fundamental incompatibility between evidence-based medicine and Polanyi’s theory of tacit knowledge (Henry 2006; Braude 2012).
practical effects of a proposed health policy, alongside the knowledge delivered by the relevant science.

As well as framing what is considered clinically correct, medical authority has a bearing on what is deemed morally correct. The scientistic requirement for explicit–general knowledge partly underlies the appeal of highly explicit ethical frameworks like utilitarianism, whereby harms and benefits can be listed in a way that allows a quasi-mathematical appraisal (e.g., cost-benefit analysis), and highly generalized theories such as libertarianism, which operate in terms of abstract principles. Scientism in bioethics ultimately leads to an incomplete vision of ethical life, which involves complex kinds of tacit and particular knowing. This is demonstrated in a physician’s tacit awareness that a patient is suffering: the awareness that something is “wrong” for this person, which comes before any explanation is or can be offered, and in the knowledge that is attained through careful attention to who this particular person is and what is happening to him.

The kind of superficial morality just described may be illustrated through imagining what it might be like to receive medical care from a diagnostic supercomputer that inputs variables to diagnose disease and determine appropriate treatment. Because it works by executing a specified program that follows pre-established rules and inferences that rely on categorization, this computer could be said to deliver only explicit and general knowledge. Thus, it could not have a “sense” of what it is like to be affected by illness and has no capacity to know the person it is communicating with (so to speak). It could never independently discern, for example, when and how to communicate the news of terminal diagnosis or convey the support and empathy that many need at such times. This indicates what is arguably the greatest danger of scientism: the reduction of “what matters” in medicine to the explicit–general and a resulting inability to recognize and attend to suffering.

Conclusion

In this paper, we have discussed a dimensional framework of knowledge based on Polanyi’s account of Personal Knowledge (Polanyi 1958). Articulating the different forms of knowledge operant in medicine in terms of tacit, explicit, particular, and general, instead of simply objective or subjective, allows us to recognize the different roles and grounding that medical knowledge can have, without presuming any one to be superior or inferior to others. This framework is not anti-science (in contrast to scientism’s devaluation of tacit and particular knowledge) but rather indicates science’s range and scope. This approach is echoed in the growing recognition of non-scientific fields of enquiry in medicine, and while the distinctions comprising the framework could be restated via an alternative, more comprehensive epistemology, it may serve as a useful model for understanding medical knowledge and how it is used in practice.

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20 Whether such a computer could be said to have “knowledge” at all (i.e., whether it could be artificially intelligent) is a different question that is outside the scope of this paper. Polanyi’s philosophy is certainly relevant to this debate (Blum 2010), and it would seem that as long as computers are unable to grasp the tacit element (and see meaning), true artificial intelligence will be elusive.
Bibliography


