

General Dental Practitioners' knowledge encounters: how do dentists build their knowledge-in- practice?

Dominic Hurst

A thesis submitted for the degree of
Doctor of Philosophy in Evidence-Based Health Care

Kellogg College, Department of Continuing Education
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Abstract

Evidence-based practice suggested that, to deliver good clinical care, clinicians should consult up to date clinical research whilst drawing on their own expertise and experience and the values and aspirations of patients. Despite there being a large interest in generating more robust research evidence and finding ways to disseminate it, there has been relatively little research interest in the moment-to-moment practice it is intended to be incorporated into. John Gabbay and Andrée Le May theorised that the work of good general practitioners was guided by internal, tacit, socially reinforced *mindlines*. The organisational literature developed concepts of practice as a provisional, ephemeral and socio-material accomplishment. This thesis was inspired by these works to explore the complexity of knowing and interaction when practising as a healthcare professional and, specifically, as a general dental practitioner. It reviews the development of the concept of practice before reporting on three studies: a mixed studies systematic review of how healthcare professionals encounter information and experiences; a mixed methods study of the sources of information and experience GDPs use; and a video-ethnographic study of how knowing in practice arises in clinical encounters in general dental practice. Together, these studies show how knowing in practice arises as GDPs, patients, nurses and things interact in time and space; how the GDPs' performances in these practices are generated from their embodied and in-the-moment knowing; and how diverse the sources of knowing are that healthcare professionals interact with in developing their ostensive and performative knowing. The thesis discusses the implications of taking a more practice-orientated approach to how we think about quality improvement in general dental practice and professional learning generally.

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Acknowledgements

I wish to thank the following wonderful people for their emotional, creative, intellectual and practical support during this thesis:

My wife and family.

My first supervisor, Professor Trish Greenhalgh.

My co-supervisors, Professor Sharon Mickan and Dr Derek Richards.

The dentists, staff and patients who contributed to the design of the studies and/or participated in them.

My masters and undergraduate students who ran with some of my ideas in their own research and who helped to stimulate more discussions.

Staff at the University of Oxford Disability Advisory Service.

Past and present colleagues at the Institute of Dentistry at Queen Mary University of London.

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Glossary

BC2	Bliss Bibliographic Classification
BDA	British Dental Association
BDS	Batchelor of Dental Surgery
BPE	Basic Periodontal Examination
CPD	Continuing Professional Development
EBD	Evidence-Based Dentistry
EBM	Evidence-Based Medicine
EBP	Evidence-Based Practice
FD/FD1	Foundation Dentist / Foundation Dentist (year 1)
GDC	General Dental Council
GDP	General Dental Practitioner
GP	General Medical Practitioner
HEE	Health Education England
MMAT	Mixed Methods Appraisal Tool
QI	Quality Improvement
QMUL	Queen Mary University of London

Chapter 1 Introduction

1.1 Why this Thesis?

I am a practising dentist, a clinical teacher and a teacher of evidence-based dentistry. I came to this project, having completed an MSc in evidence-based healthcare, wanting to find ways to help general dental practitioners use more research in their practice in keeping with the principles of evidence-based practice. My assumption after completing the MSc was that, if more practitioners could follow the steps of ask, acquire, appraise, apply, evaluate, patient care would somehow improve. However, as a practicing clinician and clinical teacher, when I considered this critically, I came to the view that, whilst straight forward as a concept, it was naive, even simplistic.

My early reading explored various attempts from the implementation science field to help facilitate a transfer/translation/implementation of research into practice. I found myself troubled by what seemed like a somewhat partisan literature. As a practitioner with good intentions, who paid attention to the needs of patients and students, I found that much of the implementation science literature came across as condescending. There seemed to be an assumption that the only thing that was right to do in practice was something people not working in that practice advised. The word implementation evoked in me a feeling that non-practitioners felt they had more important and more valid understandings than those of us working in a clinical setting have about what to do in practice. I recall sitting with a fellow DPhil student who is a

General Medical Practitioner (GP) at an Evidence-Based Practice (EBP) conference and him saying that most of what he had heard was devoid of reality and was meaningless for him as a jobbing doctor. I felt the same way. This is the perspective I have brought to the conduct of this thesis.

There is a lot written about dentists and clinicians in general not adopting evidence-based guidelines and other research informed knowledge products into their practice. This deficit model approach appears to assume that the only source of knowledge needed is research findings and ignores other sources of knowledge or knowing that are used as clinicians practice. As a clinician and as a teacher of novice clinicians, I am constantly reminded that research is but one source of information, among many, that we draw on as we practice. It was because I wanted to explore what these sources are and how GDPs use them, that I undertook the work in this thesis. The intention was to develop a better understanding of how knowing is brought to, and arises in, practice.

1.2 Overview of this Thesis

This thesis is organised around three studies I conducted. They are concerned with how GDPs encounter new or confirmatory information and experiences, how knowing in practice is informed by the embodied knowing from these, and how this contributes to the generation of moment-by-moment collective knowing as they interact with people and things in clinical encounters. My empirical work was limited to GDPs but may have wider relevance to other healthcare practitioners.

I begin, in the next chapter, with an exploration of the context for the research. I describe my professional and learning context and the external context in which the thesis was proposed and conducted. The intention is to offer a sense of my embodied practices and the nexus of practices mine interact with, however hard it is to articulate these, which inevitably influence my choice of what to study, how to study it and how to interpret it.

As the focus is on practice, how it is informed and how knowing manifests in it, chapter 3 reviews the theoretical perspectives that have informed contemporary practice theory. The history of practice as knowing dates to Aristotle, though only in the last two centuries has it gained more prominence in the political and scientific literature through the works of authors such as Marx, Heidegger and Bourdieu. Although presented before the first two studies, the understanding I developed of practice was iterative as I engaged with the analysis of the last two studies.

Chapter 4 includes my first study, which was a systematic review of knowledge encounters. The review started as a review of knowledge *sources* so that I could generate a simple way to classify what learning GDPs come across in their working and non-working lives. However, as I gathered the studies and the sources they reported, I realised that these were either tacitly or explicitly encountered in contexts. Sources were not activated until people interacted with them. Even in the largely quantitative data, it was evident that healthcare professionals encountered information and experiences in socio-material contexts. The facet classification that I developed was an attempt to capture some of that socio-materiality in my empirical study to follow and, without being aware of it at the time, I was using elements of practice theory. There is

not knowledge as a source, but knowing in practice, i.e. in the practice that involves encountering information and experiences.

Chapter 5 describes the development of a web tool to use in the empirical study to follow. The classification developed in the previous study was used in the tool so that GDPs could quickly categorise their encounters of new or confirmatory information or experience. The tool also included a qualitative component for GDPs to describe the encounter in their own words to serve both as stand-alone qualitative data about the encounter and as stimuli in a narrative interview to follow. The chapter describes how I developed and user-tested the tool in preparation for the empirical study.

Chapter 6 describes a mixed methods study that used the web tool data and narrative interviews to explore the information and experiences that 11 GDPs encountered day-to-day over a week. From this I theorised how GDPs developed an ostensive and performative knowing which guides their interactions with patients, other people and things.

In chapter 7 I look at knowing in practice using a performative lens. This perspective explores how actors, meanings and roles are constituted as people and things interact. I describe a video ethnography of GDPs, patients, nurses and the things they interact with in 22 clinical encounters. The chapter explains in detail the methods I developed to explore the knowing that arose as people and things performed in practice.

Informed by contemporary practice theory, I theorise how knowing in practice arises in the moment-by-moment unfolding of clinical encounters. I also offer a contribution to the development of practice theory.

In chapter 8 I discuss my learning from this work, the applications I have found for this in practice and the contribution of my analysis of the three studies to the professional learning, quality improvement and evidence-based healthcare literature.

1.3 The context for this research

1.3.1 My professional context in relation to this work

I have been an enthusiast for the use of research evidence to inform practice since my undergraduate training, as well as for continued development of the technical skills that a general dental practitioner requires if they are to execute good quality work. After working in general dental practice and then in community dental services, in 2008 I began work as a clinical lecturer in a new outreach centre for dental undergraduate training at Barts and the London School of Medicine and Dentistry. The role was predominantly a clinical teaching one, with personal clinical practice sessions alongside. Shifting from a practitioner role to one in which I was expected to help others understand what to do encouraged me to explore in greater depth, why it is we do what we do in the clinic.

In 2009 I began a MSc in Evidence-Based Healthcare at the University of Oxford and developed a range of skills that equipped me well to design and evaluate clinical research. The final taught module I completed was on knowledge translation. It was an extremely challenging module. Whereas there seemed to be well-developed structures for designing trials and systematic reviews, and for evaluating studies, knowledge translation seemed to lack the reassuring methodological certainty that the

other modules eschewed. There were a lot of theories that sent my head spinning.

However, as a practitioner and teacher, I recognised the complexity of going beyond finding and appraising research and applying it to practice. Whereas so much of what I learned in other modules seemed straight forward in principle, encouraging research utilisation in practice seemed to be altogether more challenging.

As I neared the end of my MSc I was asked to lead on the design of a strand of evidence-based dentistry (EBD) teaching that would stretch across the five years of a new dental undergraduate curriculum at QMUL that was to begin in 2012. This work continued as I began my DPhil in 2012 and the curriculum was rolled out over the following 5 years. My aim for the delivery from the outset was that it should not be an academic exercise of searching and critically appraising research but that, as far as possible, the learning about research evidence use should be a part of the clinical learning students engaged in. I tried to apply what I had learned in that final MSc module about the complexities of changing behaviour, using techniques such as Fishbone Analysis and Root Cause Analysis to explore why students did not use what they had learned from the previous EBD module on clinic (Principle reason: clinical tutors do not ask them to). I realised that I needed to work at understanding and, if possible, altering the organisational and structural barriers to helping students bring their evidence learning into practice. I organised training for colleagues around EBD principles and using educational prescriptions on clinic to focus students' learning. We incorporated a section for relevant evidence into the case reports students complete over their three clinical years.

At the beginning of 2012, shortly before the new curriculum began, I submitted my proposal for the DPhil (see Appendix A). Looking back, I can see that similar, naive concepts informed both the curriculum development and the proposal. This was that if we could address the phenomena that stop dentists from asking, searching for and appraising research, they would somehow incorporate what they found into their practice. I still carried in my head the nice, neat model of evidence-based practice as a five-step process, its success determined only by the will and knowledge of the practitioner. The five steps are to: ask a structured question; acquire relevant research; appraise the research; apply the research to practice; and evaluate the process [1].

Whilst I was aware of the social and organisational influences on this, I had yet to develop a deeper understanding of what the practice that research was supposed to change is.

1.3.2 The education, policy and available evidence context for this research

Whilst evidence-based medicine has been described as the judicious use of research in combination with expertise and patients values and aspirations [2], relatively little attention has been given to the non-research elements of the practice. It has been argued that the scientific medicine bit has become dominant to the detriment of the interactional components of practice between patients and clinicians [3]. There is a persistence in the duality of knowledge and practice, that knowledge is scientific and the doing of practice is not knowledge at all, hence the so-called know-do gap [4, 5].

In the field of dentistry, the impetus for the incorporation of research evidence into practice begins with undergraduate dental training. In the UK dentists are regulated by the General Dental Council (GDC), which writes in its introduction to *Preparing for Practice* [6]:

“All dental professionals must understand the principles of evidence based [sic] practice and be able to make appropriate decisions on patient care using this approach.” [p. 6]

Indeed, of the seven overarching outcomes to be demonstrated by new registrants, two relate to evidence-based practice:

- “Describe the principles of good research, how to access research and interpret it for use as part of an evidence based [sic] approach to practice
- Apply an evidence-based approach to learning, practice, clinical judgment and decision making and utilise critical thinking and problem solving [sic] skills” [p. 11]

The USA’s Commission on Dental Accreditation writes in Accreditation Standards for Advanced Education Programs in General Practice Residency [7]:

“Residents are expected to have the ability to critically review relevant literature as a foundation for lifelong learning and adapting to changes in oral health care. This should include the development of critical evaluation skills and the ability to apply evidence-based principles to clinical decision-making.” [p. 20]

Over the past couple of decades, dental schools have begun to incorporate EBD elements into their curricula [8-11] and organisations such as the USA's American Dental Association and the World Dental Federation endorse evidence-based dentistry as a means to bring research into practice, thus enabling clinicians to deliver optimal care [12, 13]. Journals dedicated to encouraging evidence-based dental practice exist in the USA (Journal of Evidence-Based Dental Practice) and UK (Evidence-Based Dentistry Journal). Whilst there has been a lot of encouragement to use research in practice, in general, policy and funding has had relatively little involvement. In England and Wales there is an ongoing re-organisation of the NHS funding of general dental practice services that will reward dental teams for improving oral health using evidence-based preventive practices [14]. Beyond the educational and regulatory encouragement for evidence-based practice at the policy level there does not appear to be much structural support for the practices.

As an example, in 2012, in preparation for a lecture I was giving about finding research, I explored what access a GDP would have to the top 81 dental journals by impact factor (see Figure 1.1 below) [15]. Whilst guidelines are generally freely available, and the Cochrane Library's systematic reviews are free for GDPs in the UK, access for a GDP to other research is severely limited, or very expensive. A GDP in 2012, without a subscription, could access 12% of the journals immediately and 22% after 3-4 years. The British Dental Association (BDA) provided access to 86% of the journals, but there was a charge of £2.50 to have them photocopied and posted. At the time I contacted multiple organisations to find out about NHS ATHENS (now called OpenAthens) access and discovered that a) access to dental journals was patchy, b)

the number of journals included was very small and c) GPs did not know how, or whether, they could use it. At the time, those GPs who did not have an NHS contract to provide dental care were not eligible to access the limited number of journals to which ATHENS grants access [16]. I understand that the situation is similar at the time of writing.

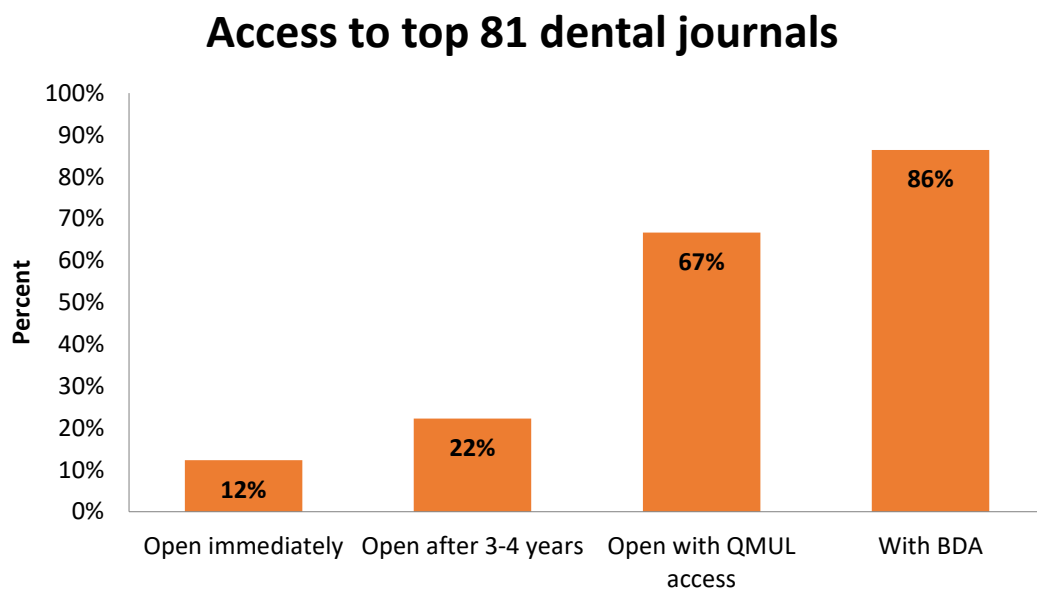


Figure 1.1 Percentage of the top 81 dental journals accessible to non-subscribers (first two columns), QMUL staff and students, and the BDA

As in other areas of healthcare, where it has been studied (primarily in the context of preventive interventions), the uptake of research-informed recommendations is reportedly suboptimal [17-19] and there continues to be scepticism and lack of knowledge and skills to implement the model of evidence-based dentistry [20, 21]. Many areas of practice do not have high quality research to inform them, even if clinicians look, as I showed for two common clinical problems [22, 23]. Systematic

reviews of approaches to managing several often-encountered problems find little or no high-quality research to help guide practice [24-29].

Thus, the context for this research is one in which there is an educational and regulatory aspiration for practice to be informed by research but one in which the research available is often limited or of poor quality, and in which what research is available is not used as well as it might.

Chapter 2 Literature review of practice knowledge

2.1 Introduction

The aim of this chapter is to summarise the literature on the theory of practice, knowledge and knowing that has been of most use to me in designing and conducting the three studies in this thesis.

I began the DPhil programme largely ignorant of this literature and, indeed, the studies themselves speak to my shift in prioritisation from what Cook and Brown called an “epistemology of possession”, or knowledge, to the “epistemology of practice”, or knowing [30 p. 382 and 383 respectively]. Whereas, when I began, I conducted a literature review of the ways in which to get knowledge into practice – the realm of implementation science – I came to realise that this preoccupation with one type of knowledge was too narrow. Gabbay and Le May’s book on mindlines [31], which I came across serendipitously via a tweet, affirmed in writing what I had felt as a practitioner, that there was a lot of knowledge out there relevant to good practice which we did not seem to be paying attention to in our attempts to change practice for the better.

The privileging of research or theoretical knowledge means we are blinkered to the other knowledge that enabled patients, healthcare teams and the materiality of their settings to come together and do something useful. Gabbay and Le May articulated a

sense of the complex internal, personal and tacit thinking that guided practitioners as they practiced. Their challenge at the end of the book to explore where clinicians acquire knowledge inspired the design of my first and second studies. However, in analysing the dentists' accounts of their practice in the latter, it became evident that I only had a partial understanding of what was going on from a theoretical perspective as they practiced. The mindlines work created a more realistic sense of what guided practitioners but did not help me to understand the knowing in the action of practice, what I later came to understand as knowing that is transient and ephemeral and distributed through intra-actions between humans and materiality [32]. Mindlines were still in the realm of the epistemology of possession. Doctors have mindlines. The theories that I encountered as I explored more what happened moment-by-moment in practice was more concerned with the knowing that arose as people and things interacted. Such knowing is not possessed by anyone but is in the practice. It is an epistemology of practice instead of possession.

In this thesis I am concerned with understanding how dental practitioners practice, how that practice arises and what its relation is to concepts of knowledge. Dreyfus, in his introduction to his commentary on Heidegger's *Being and Time*, writes that "one cannot understand something unless one has an accurate account of what it is one is trying to understand" [33 p. 1]. The neat triad of research, clinical expertise and patient values as an aspiration of evidence-based practice seemed not to have much to say about how these three phenomena might combine to create an interactional practice between patients, healthcare teams and the material world. Others have noted the lack of integration of research evidence with expertise [3] and it seemed to

me that those of us working in the evidence-based paradigm aspire to introduce new knowing into practice without understanding what knowing is already in practice.

2.2 Practice

2.2.1 A historical overview of the development of practice theory

Feldman and Orlikowski identified three ways that practice has been studied: empirical, theoretical and philosophical. The empirical – the what of practice – pays close attention to the everyday activities of people's lives which organise routines and improvised practices. Practice theory – the how of practice – is concerned with explaining everyday activity, how activities are generated and what happens in different contexts and time. There is no single, unifying theory of practice, but common strands shared by different theorists. The philosophy – the why of practice – argues that social life is made up of practices. The social world is neither external to people nor created by them but is brought into being through activity [34]. Situating knowing in the interactions between people and things is not restricted to practice theorists. Social anthropologists have suggested how apprentices embody motoric representations of practices they observe and, in practicing themselves, come to know in the environment in which they work [35-38]. The distinctions made above help to show the different ways of approaching practice. Below I will explore how different authors have contributed to these in different ways. Whilst these foci are analytically separable, they are intertwined in any empirical study, so a chronological account of practice necessarily involves their interweaving.

The performance of practice demands multiple ways of knowing and exposure to a diverse range of evidential types. Whilst there is acceptance in evidence-based medicine of clinicians' experiential knowledge and the knowledge which the patient brings to clinical decisions, the movement has tended to focus on research or propositional knowledge as the ultimate knowledge type, and a whole academic tradition of implementation science seeks to transfer this into practice. The dichotomy of knowledge and practice has a long history and for many this is a false one.

A distinction was forged between practice and theory by Plato with an intellectual prejudice that sought to control uncertainty through the application of general principles [39]. Ever since, Western thinking has similarly favoured *episteme* and, in elevating this intellectuality to moral supremacy, Plato put practice, materiality and performativity out of reach of a theory of knowledge or ethics.

Although associated with virtue and the political activity of freemen in the *polis* [40], Plato's student, Aristotle gave practical wisdom and action considerable legitimacy in his *Nicomachean Ethics* [41]. He wrote that humans can have three mindful dispositions, i.e. a scientific knowledge, *episteme*; a skilful knowledge, *techne*; and a practical wisdom, *phronesis*. Aristotle argued that *phronesis* gives rise to *praxis*, or action. *Techne* gives rise to *poiesis*, or production of something. The difference between *poiesis* and *praxis* is that the former is production of an end, e.g. a healthy patient. *Praxis*, in contrast, is activity with no end other than its own performance [41]. There is skill in action which belongs to practical wisdom, *phronesis*, which is non-inferential and non-deductive, and does not imply "the application of universals" but uses rules as summaries and guides. Excellence in *phronesis* relates to local

contingencies and so *praxis* cannot be captured in universal rules due to its “mutability, indeterminacy, and particulars” [39 p. 27]. Later writers would pick up on this concept to suggest that medical practice does not have an epistemology but a *phronesiology* – not a theory of knowing of practice but a theory of wisdom of practice [42]. Despite this concept of knowledge as practice it was lost to the Western philosophical tradition for centuries until Marx used the term *praxis* again, albeit in a contrary way.

For Marx, as for another important thinker of the 19th century, Nietzsche, there was no distinction between a theory of thinking and a theory of practice [43]. For Marx, thinking was the reflexive element of human action [40] and when he used the term *praxis* he did not see a disjunction between this and *poesis* as Aristotle had. Thinking and action were unitary and *praxical*, i.e. action which is “intransparent, preformed, tacit, contingent, historicized, concrete, constructed, horizontal, interested, ideologized, emergent, perspectival, prejudiced, purposive, effective, transformational, evolving, creative, unsystematic, and nontotalizable” [40 p. 378]. Marx saw workers as producing not just products but also the social relations between them and ideas of what these social relations are. The ideas are transient because the social relations are and, therefore, ideas as abstract renditions of practice are not primordial but reflexive. That is, ideas are created in social practice not *vice versa*. He wrote, “It is not the consciousness of men that determines their being, but, on the contrary, their social being that determines their consciousness” [44 p. 425]. Humans have no fixed nature but they create it through practical activity [43]. This, for Marx,

included so-called idealists and intellectuals. The abstract theory they generated was just as much a result of a practice as making machines or cloth.

Dewey and Heidegger shared this anti-intellectualist, anti-Cartesian view of the world. For them understanding was not something autonomous and intellectual. With his term *Dasein* Heidegger, according to Dreyfuss, wanted to reverse Cartesian thinking by making an individual's being dependent on shared social practices rather than something in the individual alone. We exist in the world with others [33]. For Dewey and Heidegger theory and cognition were a continuation of practice. Dewey called cognition a part of our "practical machinery" [45 p. 232] alongside legs, eyes and other anatomical aspects of our bodies. Both Dewey and Heidegger conceived of cognition as helping the rest of the body overcome obstacles in the flow of activity, as a phase that helps restore practice [45]. Heidegger wrote of the largely unproblematic interaction with social and material practices in the world. It was only when things broke down – something did not work and was no longer ready at hand – that it became problematic [46]. Only when something previously usable stops being usable does theoretical thinking begin [39]. For Heidegger, intelligibility and rationality are based in practice.

Along with Heidegger, Wittgenstein has also had a substantial influence on modern practice theory. Wittgenstein drew attention to the outward-ness of our practices, i.e. our being is deeply influenced by our reactions to our surroundings and other beings. We know the world we encounter "with and through society" [47 p. 113]. And we do not decide before we act but act blindly according to our interrelationships with society and the world [39]. The meaning of acts and words are established in the time

and space in which it occurs, in relation to the people and things with which they occur. Johannessen, commenting on Wittgenstein's concepts of practice, says "the really important things in the life of human beings are not expressible in words, they take the form of deeds" [48 p. 361]. Interpretation, which involves conscious or intellectual activity, cannot determine meaning. This is what practice does. And for Wittgenstein, practices of rule-following are not learned by learning rules but by examples and training, by learning judgements and their connections to other judgements. Mastery of a practice is expressed tacitly in its performance. It is shown in carrying out the sayings and doings of the practice correctly [48].

Several related practice-orientated approaches have built on the foundations that Marx, Heidegger and Wittgenstein laid. Schatzki explains that for most practice theorists, theory is a "general and abstract account" of a field of practice and they would be very suspicious of theory as an explanation of social life [49 p. 12]. Practice theorists tend to think of practices as arrays of activity, mediated by materiality, around shared practical, embodied understandings and are linked by a sense that phenomena such "as knowledge, meaning, human activity, science, power, language, social institutions, and historical transformation occur within and are aspects or components of the *field of practices*" [49 p. 11]. Earlier so-called modern practice theorists tended to address the individualism / holism dualism [50]. Giddens' structuration theory attempted to combine intentional and meaningful conduct of human actors, adopted by interpretive and subjectivist ontologies, with the constraints that limit action that structuralist and functionalist ontologies accentuated: "The basic domain of study of the social sciences, according to the theory of

structuration, is neither the experience of the individual actor, nor the existence of any form of societal totality, but social practices ordered across space and time” [51 p. 2].

For Giddens, the majority of what he calls the mutual knowledge of interactions between people is not directly accessible to the consciousness of the individuals but is knowledge of a practical kind, inherent in a capability to go on with the activities of social life, similar to what Polanyi described as tacit knowledge [52] but in encounters between people rather than simply embodied within a single person. Giddens described actors as having a “rationalization of action” [51 p. 4] which he did not intend to mean that they could explain it but that their action was reflexive, involving the ongoing monitoring of the social and physical dimensions of their context.

Rationalisation in this active, reflexive sense is critical to the competence of agents. Echoing Marx, Giddens puts temporality – history – and space at the centre of his structuration theory of practice [51].

Concepts such as intentionality, motivation and purpose need to be treated carefully, Giddens warns, as they de-contextualise human agents from time-space. Human action and cognition are a continuous flow of conduct. Giddens explains that, whilst individual agents might intend to do something, the consequences of their doing may well be unintentional due the contingent nature of this flow of conduct. Indeed, as multiple agents interact the consequences may not be what was intended by *any* of them. It is “everyone’s doing and no one’s” [51 p. 10]. The unintentional consequences of actions may be latent functions that help to sustain a practice. Thus, although the intentional actions of a practice may seem irrational, they allow a latent function to occur, and it is the latent functions that sustain institutions and social practices over

time and space. Giddens is concerned with describing how structuring allows recognisably similar social practices to exist over time and space. Structures are not external phenomena that determine what people do but are sustained through social practices: “structure exists, as time-space presence, only in its instantiations in such practices and as memory traces orienting the conduct of knowledgeable human agents” [51 p. 17].

Structures, in the sociological sense, are the recursively organized sets of rules and resources which are organised as properties of social systems. Social systems are made up of the situated activities of knowledgeable people. These draw on the rules and resources in action and in context to produce and reproduce the systems through their interaction [51]. As different practices interact over time and space, their interdependence may be reproduced or not [53]. The consequences of a community of practice’s structuration, therefore, will impact their interaction with the structures produced by other communities. (In the second study reported in this thesis, it was evident, for example, that GDPs’ practices in relation to patients who have undergone orthodontic treatment (to move their teeth), reproduced over many years, were disrupted by a change in practices among the orthodontic specialists.)

A criticism of Giddens’ structuration theory has been that it does not attend enough to the inherent properties of material objects and, instead, is too agentic. Indeed, some have argued that his attempt to overcome the duality between agency and structure failed because of the centrality of the intelligible human being and their memory traces of practices. For example, Callinicos, a Marxist philosopher, argues that Giddens ignored the variable conditions of action in which people find themselves [54].

Important second-generation practice theorists, whilst broadly sympathetic towards structuration theory, found it wanting when conducting empirical research because of the duality that seems to have been sustained in the theory between human agents and structures. Orlikowski, for example, argued that technologies are reproduced in practices through everyday action and therefore it is more relevant to focus on technologies in practice rather than how technologies and humans interact [34]. I will discuss more the theorists who sought to address the human-material duality later.

Still with the first-generation of practice thinkers, Pierre Bourdieu was highly influential on those that followed. Like Giddens, he believed that people create social structures but that social structures also influence how people act. The individual is conditioned by their existence within social structures and develops structures of their own as principles and representations that generate and organise practices. These are not necessarily conscious and nor is there a supposition that someone or something directs the practice. He called this *habitus*.

“...the principle of this construction [of objects of knowledge] is the system of structured, structuring dispositions, the *habitus*, which is constituted in practice and is always oriented towards practical functions.” [55 p. 52]

Structures are put in place by past and present circumstances and structuring occurs as *habitus* shapes present and future practices [56]. In keeping with Marx, *habitus* is a product of history which through its production of individual and collective practices creates more history [56]. *Habitus* ensures that experiences are retained in individuals as “schemes of perception, thought and action” and that these provide for more

“correct” practices than any formal rules or explicit norms [55 p. 54]. These dispositions – what Bourdieu calls the “present past” [55 p. 54] – are reactivated in similarly structured practices, thus perpetuating but at the same time transforming the practice over time. Habitus is the active presence of an embodied history, a forgotten past of which it is the product [56]. Bourdieu wrote that history is objectified in the habitus and structures. My understanding of this is that the embodied past is not itself concrete but becomes concrete momentarily as we practice, in our actions and interactions. These actions and interactions generate a new version of the embodied history of moments before, which then becomes concrete in future practices. This concept of practice as something transient but perpetuated through embodied knowing and action is a key feature of the later literature on knowing in practice which I will return to in due course. Habitus is not the only element of practice, however. It is intertwined with capital and field. Practice, Bourdieu wrote, involves the relations of an agent’s dispositions (habitus) and position within a field (capital), within the ongoing game within a social space (field). Agents’ habitus and actions are structured by the field and their position in it. This does not mean that they are automatons but that they must by necessity respond to the other agents in the field.

Bourdieu writes of habitus that it ensures its own constancy and, as such, early experiences (or primary conditioning) are more important than later ones [56]. This homogeneity means that habitus chooses from all the possible choices it could make, those which reinforce it, protecting itself from crises and critical challenges. This is how habitus is structured and continues to structure. The habitus, in perpetuating the perspectives and dispositions of the primary conditioning, means that the

performances within similar practices are adapted and appropriate. But where the objective conditions are quite different the dispositions of the habitus may not adapt. Durable dispositions can outlive, in Bourdieu's terms, the economic and social conditions in which they were produced. I think that the concept of habitus offers us a starting point for understanding why clinical practices persist long after they have been shown to be ineffective or harmful.

Bourdieu's habitus adjusts to the demands of a social field through practical sense. Practical sense allows an agent to perform sensible actions within that social field. Practical mastery of the specific regularities of a field gives rise to a sense of probable outcomes which form the basis for sensible practices. These are linked to the conditions of their enactment and fill the agent immediately with sense and rationality. Entrants to a field are controlled through practices such as examinations and sanctions so that they adhere to its fundamental presuppositions. The interaction between habitus and field by those with the "feel for the game" [57 p. 66], Bourdieu calls *doxa*. It is a "pre-verbal taking-for-granted of the world" [57 p. 68] that arises from practical sense. Practical sense is what gives rise to practices by its conversion into "motor schemes and body automatisms" [57 p. 69]. Bourdieu asserts that we do not know completely what we are doing and, therefore, what we do has more sense than we know. Our practices are sensible, informed by common sense that, for the most part, we are unaware of.

As with Giddens, Bourdieu did not really address the interaction between the social and material. It was the second generation of practice thinkers who began to theorise about this. Having discussed the development of practice up until now in a historical

and linear format, I will change tack to address the concept of knowing in practice by its characterisation rather than by a linear description of the ways in which authors have contributed to it.

Whereas Wittgenstein emphasised the social nature of practical knowledge, Polanyi emphasised what he called *personal* knowledge. Cyclists will not know, in general, the physical principles that keep them on a bike as it begins to fall to the right but their body will respond so that they stay on the bike. This is a personal knowledge known by the body, a feel for what is the right thing to do at this moment that would be very hard, if not impossible, to vocalise. For Polanyi, not only is tacit knowledge often impossible to articulate but it is necessary before explicit explanations can be made [52]. It is the tacit knowing that surfaces the explicit question or idea, a tacit sense of there being something that needs to be vocalised. The dependency on the use of senses to acquire knowing, which Polanyi contrasts with Copernican objective knowing [58], is very similar to the concept of aesthetic knowing in which people acquire knowledge through their perceptive-sensorial faculties and aesthetic judgement [59].

When we attend to a task Polanyi distinguishes between the focus or goal of the activity, which we may be able to vocalise (e.g. to hammer a nail into a wall), and the subsidiary part, which is an awareness of the action of the task. In skilled activity it may be that, if we were to focus on precisely how we manipulate things, we would fail to perform the activity well since so much of what is needed to do it is tacit and hidden from our conscious knowing. Instead, the embodied understanding and learning that occurs in the subsidiary part of the activity is what allows us to achieve anything at all.

Heidegger's concept of tools that are ready to hand also conveys this sense of embodied knowing [46]. Knowledge is within an action:

"The hammering does not simply have knowledge about... the hammer's character as equipment, but it has appropriated this equipment in a way which could not possibly be more suitable." [p. 98]

And a little further on:

"...the less we just stare at the hammer-Thing, and the more we seize hold of it and use it, the more primordial does our relationship to it become, and the more unveiledly is it encountered as that which it is – as equipment." [p. 98]

There is a contrast between Polanyi's personal knowing and practice being a social phenomenon. Heidegger's concept of ready to hand does not preclude a shared understanding of what this means but, I would suggest, it is still bound up with a knowledge or knowing that can only be personal. This phenomenological approach is one that is concerned with how people make sense of the world [60]. The aesthetic way of knowing the equipment, whilst influenced by social concepts of interacting with that equipment, is necessarily individual. Loftus uses the example of a tooth extraction to show that, whilst one can discuss the principles of an extraction, dental students must experience the movement of the tooth themselves in order to know how to extract a tooth [3]. The link with Heidegger's tool being ready at hand is clear, i.e. the forceps are used as an extension of the body and the relationship between the dental student and the instrument means they learn to be equipped as an integral unit to take out the tooth.

This kind of knowing has also been described as embodied knowledge, or bodily knowing, and comes before language and articulation of that knowledge [3]. It assumes that we know more than we can articulate and that this is part of our practice. Although we might explain to others what we do in the form of rules and procedures, it would be a mistake to assume that these caused us to act the way we did [3]. Todres describes embodied relational understanding as drawing “on ongoing personal resources that are experiential and preconceptual, that are located in the way the body knows, where language is never alone and always mixed with what is more than language” [61 p. 1573].

2.2.2 Knowing in practice

As several of the authors whose work was described in the preceding section argued, knowledge and action of practice are inseparable [32, 62]. Practices are social and interwoven actions [63]. Whereas actions in individualist theories are the properties of the individuals who perform them, practice theories depict actions as existing within a nexus between human and, with the second generation of theorists, non-human actors. Knowing is predominantly socio-material rather than personal or even social as it is shared and exists within the interactions of its various actors [64]. Knowing is situated in shared practices [65] and is generated in the interaction between individuals as they practice [66]. Whereas propositional knowledge (knowledge of a proposition) is described as something (knowledge of a guideline, for example), the vocabulary used when talking about knowing in practice is, necessarily, verbal, temporal and socio-materially related [67] because knowing is in the doing of practice,

a socio-material performance is situated in space and time [68]. It is important to be clear that knowing in practice is not a knowledge of practice, something brought to the practice by an individual, or agent. It may be helpful to recall Bourdieu's habitus encountering the field and this being doxa. Knowing in practice is what arises in the interactions which are necessarily informed by the individual and collective habitus as they engage with the temporal-spatial field. Knowing in practice, as with practice since Marx's writing, is situated in historical and social contexts [69] as well as in the spatial and material context of the current practice. Harris, writing from an anthropological perspective, tells us that knowing is bound up with the world and that "a person does not leave their environment to know even when she is dealing with the most abstract of propositions" [38 p. 1].

Knowing in practice is virtual and provisional. No two situations are the same and the performances within each are unique [68]. Because knowing is bound up within the activity of the moment of practice a clinician's knowing cannot be extracted as a thing from that specific activity. Knowing how to ride a bike is bound up within the activity of cycling and, as Orlikowski describes this, the repetitive nature of cycling to work each day causes us to lose sight of the fact that each time we cycle it is an active and recurrent, and at the same time unique, accomplishment [32]. This might come into relief when, one day, we wake up and for some reason no longer have the capability to cycle. The previous occasions when we knew how to cycle would not count for anything. This is not to say that the knowing in practice does not inform and is not informed by an abstract representation of this knowing, for example, as mindlines [31], ostensive routines [70], mental representations [37] or embodied knowledge

[52]. These enable a practitioner to come to a clinical encounter with a preparedness for the action integral to knowing in practice. Knowing, when conceived of as something ephemeral means that it must always have a virtual existence and, because in the next moment there is a different activity, it is always provisional [32].

Knowing in practice is imaginative. Wenger has argued that as we do not have personal experience of everything we learn and cannot experience the outcome of our actions until they occur, we need to imagine them [71]. We also need to imagine how other people and things will react in the practice. Thus, knowing is about imagining outcomes from actions already undertaken and constantly readjusting the images as actions respond to the context of practice and the interactions with other actors. This is Bourdieu's practical sense – the feel for the game of this practice, which allows it to go on. Eraut suggests practitioners are constantly theorising about what will happen if they do something, a generative process as they “interpret, explain or judge intentions, actions and experiences” [72 p. 60]. Indeed, Cook and Brown argued that there is a “generative dance” between knowing and knowledge as the former generates new knowledge and ways of knowing [30 p. 381].

Knowing in practice places an emphasis on the collective, communal or social rather than the individual [30], though not always with animate actors [31, 65, 67, 73].

Knowing is about participating in joint enterprise, it is co-constructed or appropriated. Knowing, as activity within ongoing social relationships, must be structured by power relations through communication and control of the environment and time [74].

Power shapes the performances of others by “structuring the possible field of actions” within which they perform [75]. The logic of Bourdieu's field in shaping habitus – what

makes sense to do practically [57] – suggests the effect of power on practice does not need to be immediate or direct but indirect as, for example, the habitus of a clinician shaped by professional norms. In attempting to influence the way others act power can be found in technologies and codified procedures such as buildings, informational infrastructures or hierarchies [75]. If knowing is practice and practice is in relations and action, then knowing cannot be ontologically separated from power.

Some areas of social anthropology and social psychology have been interested in the way people learn, particularly in the context of apprenticeship. For some, there has been a shift from a focus on cognitivism to action with its inseparability from context. Action is always situated [76]. Suchman wrote that action and its context are mutually constituted [77]. In this view, activities are improvised in situ rather than being controlled by pre-existing cognitions and artefacts such as plans [76]. This literature does not tend to use the term socio-material but the parallels with the organisational practice literature are many, i.e. activity is an ongoing accomplishment which arises as humans interact with people and things, with their personal and shared histories. The study of situated action is not about cognition – about what people think – but about how they relate. It is concerned with the “relations among people, and between people and historically and culturally constituted worlds they inhabit together” [78 p. 71]. The structuring of behaviour is not done by individuals but relationally with other people and the real-world situations people are engaged in. Suchman argues that, whilst plans as conceptual and rhetorical devices can have meaningful consequences for situated activities, they do not determine them. Her example is that a canoeist could plan how they might descend a set of rapids to give them the best opportunity

to use their embodied knowledge but when it comes to the activity of descending the rapids the plan is abandoned and the activity arises out of the canoeist's embodied knowing and response to the material relationship with the water and everything else interacting with them moment by moment. Plans, for Suchman, are the artefacts of just another situated activity [78] what might be called proxy routines when written down, e.g. as protocols [79], or ostensive routines when referred to as providing structure to performed routines, or activities of a recognisable series of interactions between actors [70].

Social anthropologists also use the term knowing, reflecting the concept that knowing is always bound up with the world and a practical and continuous activity [38]. As Mark Harris writes, "a person does not leave their environment to know, even when she is dealing with the most abstract of propositions" [38 p. 1] and their way of knowing reflects a movement from one set of transient relationships to another, rather than from one type of knowledge to another.

Ingold takes an ecological psychological perspective and considers that to distinguish between material and social is an antithesis to an ecological model, in which we, along with other creatures, play our part in the formation of the world. Rather than talk about process as the transcription of form (social or material) his view is that form is held in place within process [35]. That form, though, is not a social or material one. These two terms arbitrarily delineate relationships into one form or another when, Ingold argues, types of relationships are relative and sit on a continuum that include "humans, animals, plants, and apparently inanimate objects" [35 p. 187].

The practice literature tends to emphasise the embodied knowledge that people have and, in some cases, things have. Social anthropologists, such as Trevor Marchand, emphasise the importance of this in their experiences of living and working with crafts people [36, 37].

There has been an interest in the role of experience in learning from some working in the higher education or adult learning literature. This literature also seeks to de-emphasise the cognitive and argues that the distinction between this, the affective (emotional knowing) and conative or psychomotor (action), is ontologically flawed. Learning is a holistic practice arising from experiencing experiences, these two being inseparable [80]. Sharing some similarities to other ideas covered in this chapter, Boud et al also propose that learners actively construct their experience, learning is socially and culturally constructed, and learning is influenced by the socio-emotional context in which it occurs [80]. These authors stress the relational and yet individual nature of learning, recognising that experiences can yield many learning opportunities over time. Since we are always experiencing experiences there are always learning opportunities, and this is well aligned with the incremental learning and acting in socio-material practices described previously. The emotional aspect of learning finds some resonance with the habitus concept – our dispositions as we engage in practices. However, I think there is more that this literature can offer in exploring knowing in practice, such as the role emotions play in the activity of practice and the knowing that arises.

Professional education researchers have also taken an interest in socio-materiality and knowing in practice. Drawing on several of the authors previously mentioned, Fenwick

has used the approach to explore, for example, how police forces co-produce knowing with the public and objects, writing: “The point is that materials are performative and not inert; they are matter and they matter.” [81 p. 322]. Fenwick argues that rather than a representational idiom that maps and understands a world outside of the actors our focus should be on the ongoing production of knowledge by the world which is full of (human and non-human) agency [81]. In considering the material, we are not just concerned with material dimensions of humans but also material participants in practice whether these be designed objects and artefacts such as technologies and furniture, or phenomena like the weather [81].

For some authors there are no anterior distinctions between the various agents involved in practices. Instead, boundaries and properties of heterogenous elements arise in a continuous process, called “vital materiality” by Jane Bennett.

“By “vitality” I mean the capacity of things—edibles, commodities, storms, metals—not only to impede or block the will and designs of humans but also to act as quasi agents or forces with trajectories, propensities, or tendencies of their own” [82 p. viii].

Barad describes material-discursive practices as:

“...specific iterative enactments—agential intra-actions—through which matter is differentially engaged and articulated (in the emergence of boundaries and meanings), reconfiguring the material-discursive field of possibilities in the iterative dynamics of intra-activity that is agency” [83 p. 822].

In such situations the relationships generated through this delineation and assembly produce force. Performance gives everything its existence [81] and Bourdieu's field is "a structured social space, a field of forces, a force field" [quoted in 84 p. 72]. These authors would, I think, argue that the space is structured as much by non-social phenomena and that, perhaps, what we think as social and material is an arbitrary distinction, as Ingold argues when talking about context [35].

In the Science and Technology Studies (STS) literature, Jensen has also argued for consideration of situated practices. For him, science practice is a performative ontology which is created in the moment to moment interactions of people and things [85]:

"...knowledge is constructed precisely at the intersection of the many different agencies concretely interacting in the world." [p. 11]

For Jensen, science is as much a situated practice as it is organisational, anthropological or educational activity:

"...science provides situated ways of knowing, which are always relying on specific, practical, institutional and conceptual orderings, which always come packaged with their own disorders." [p 12]

The knowing in practice that this body of literature has argued for, from theoretical and empirical grounds, is that knowing in practice be construed as ongoing activity which is situated in the relations or interactions between people, things and other matter.

Several theorists have proposed categories of knowledge in the healthcare and education settings. Most of these have tended to focus on knowledge as that of the individual and not considered knowing as a socio-material activity in the way the literature above has. Although I came to adopt the knowing in practice approach, when I began the DPhil, this literature helped to direct me to considering non-propositional, non-scientific ways of knowing in practice.

Carper, in 1978, wrote that there are four ways of knowing in nursing: empirics, the science of nursing; aesthetics, the art of nursing; personal knowledge; and ethics, moral knowledge [86]. Higgs and Titchen, in 1995, suggested there are three forms of knowledge used in practice: propositional, theoretical or scientific; professional craft knowledge; and personal knowledge [87]. Eraut, coming from the professional practice field, divided knowledge into codified (also known as public or propositional) and personal [88]. Codified knowledge is “(1) subject to quality control by editors, peer review and debate and (2) given status by incorporation into educational programmes, examinations and courses” [p. 114]. Personal knowledge is the cognitive resource that a person brings to a situation and incorporates codified knowledge in its personalised form, procedural, process and experiential knowledge, as well as “impressions in episodic memory” [p. 114]. Gabbay and Le May coined the phrase *mindlines* to describe something similar to Eraut’s personal knowledge, the personal schema that guided clinician practice, as “internalised, collectively reinforced, tacit guidelines that serve as their knowledge-in-practice-in-context” [31 rear cover]. For them, *mindlines* are akin to common-sense practical knowledge that, with formal clinical knowledge acting as a map, enables them to navigate the disorder of clinical practice. Kemmis

recognised the store of professional practice knowledge that experts brought to their practice which he described as their expertise. He argued that they also have developed the capacity to search for saliences that allows them to respond wisely and prudently to different situations, perhaps something akin to Bourdieu's "feel for the game" [57 p. 66]. For experts to perform in practice – in interaction with others – they must consider the likely consequences of their actions in relation to the "conflicting aims, understandings, values and self-interests" they and others bring to, and which arise in, practice [89 p. 393]. Kemmis describes the extra-individual features of practice in ways that others writing in this field have not, echoing the contrast between epistemology of possession and of practice, which Cook and Brown describe [30].

2.3 Summary and conclusion

The above literature review has shown that there is a rich literature exploring knowledge and practice, and that emerging from this has been the development of an approach to viewing practices that recognises multiple ways of knowing that arise in action. This literature posits that knowing as practice cannot be separated from knowledge as theory and rather than conceiving of knowledge as something retained in the minds of individuals knowing is generated in the interactions between humans, things and other material phenomena. As such, it is emergent and provisional, and sustained through socio-material structures.

Relatively little has been written using this approach in dentistry, though tacit and embodied forms of knowing [3, 90] and Carper's four ways of knowing [91] have been described in relation to undergraduate learning. In addition, ethnomethodology which uses an interactional approach to develop understandings of practice has also been applied to dental clinical teaching [92]. However, knowing in practice seems not to have been explored systematically in general dental practice. That is, we do not appear to have empirical studies to help us theorise about what knowing in practice looks like in the dental setting.

Although presented as systematic, as something written in preparation for the studies that follow, the review is the result of an emergent practice – the practice of a DPhil. As authors since Marx have pointed out the theory is sought or created to answer practical problems. This literature review, as with all the thesis, is a codified version of a fragmented, temporal and evolving knowing that arose from my interaction with the field of doctoral studies. My habitus and capital engaged with the field and produced a practice. The production of this and any new knowledge or knowing associated with it is an accomplishment brought about by the alignment of many heterogeneous elements.

Chapter 3 Describing knowledge encounters in healthcare: a systematic mixed studies review and development of a classification

A version of this chapter was published in the following peer-reviewed journal:

HURST, D. & MICKAN, S. 2017. Describing knowledge encounters in healthcare: a mixed studies systematic review and development of a classification. *Implement Sci*, 12, 35. (Sharon Mickan provided feedback on the protocol, assisted with piloting the data extraction form and provided editorial input to the article.)

3.1 Introduction

The idea for the study described below arose early in the DPhil programme after reading Gabbay and Le May's book *Practice-Based Evidence for Healthcare* [31]. In their concluding chapter, they write:

"Our work suggests not only that practitioners glean new information about best practice from multiple sources, but also that they often require many confirmatory sources (including trusted colleagues) to triangulate it. Does this not at the very least require strategies for introducing research evidence through a wider range of media than at present? Should not those who hope to impart useful information ensure that it is distributed along more of the channels that practitioners actually use...?" [p. 200]

At this early stage in the DPhil this plea led to me thinking that I needed to develop my understanding of what those different channels might be for dentists. I envisaged an

empirical study in which I would ask dentists to record the channels they used and try to build up a richer picture of how they encountered new or confirmatory information and experiences. The intention was to collect quantitative data from dentists and with that build a picture of those channels most used allowing implementation efforts to concentrate on these. So that I would be able to present a comprehensive list of options for dentists to select from in the study, I set about conducting a systematic review of information and experiential knowledge sources. Having done so, organising these into a tool that could be used by dentists daily was more complex than I had first thought. There was no existing categorisation of sources that captured the complexity of the sources the review identified. Instead, each of the sources I extracted from the studies had multiple facets. There was no such thing as a source but, if only implicitly, an encounter with a source. For example:

“Observation of others' practice”

“Formalised supervision”

“Telephone hotline to specialist”

As I write this, and having become more familiar with the dynamic, verbal nature of practice and knowing in practice, the facets I described captured, I think, in some way the embodiment of social and material knowing that arises through interactions between people and things. The facets, in describing encounters according to what was encountered, how, through what mode, with whom and where, helped to situate the action. They were an intuitive stepping stone for me as I incrementally moved my

focus from an epistemic position of knowledge as possessional and representational to one of knowing as performative. Being is in action and knowing arises in action.

3.2 Abstract

BACKGROUND: Implementation science seeks to promote the uptake of research and other evidence-based findings into practice but for healthcare professionals this is complex as practice draws on, in addition to scientific principles, rules of thumb and a store of practical wisdom acquired from a range of informational and experiential sources. The aims of this review were to identify sources of information and professional experiences encountered by healthcare workers and, from this, to build a classification system for use in future observational studies that describes influences on how healthcare professionals acquire and use information in their clinical practice.

METHODS: This was a mixed studies systematic review of observational studies. **Data sources:** I searched OVID MEDLINE and Embase, and Google Scholar using terms around information, knowledge or evidence and sharing, searching and utilisation combined with terms relating to healthcare groups. **Eligibility:** studies were eligible if one of the intentions was to identify information or experiential encounters by healthcare workers. **Data extraction:** I extracted data alone after piloting the data extraction form with my supervisor. **Study appraisal:** I assessed studies using the Mixed Methods Appraisal Tool (MMAT). **Primary outcome:** the primary outcome extracted was the information source or professional experience encounter. **Analysis:** I grouped similar encounters together as single constructs. My synthesis involved a

mixed approach using the top-down logic of the Bliss Bibliographic Classification System (BC2) to generate classification categories and a bottom-up approach to develop descriptive codes (or facets) for each category, from the data. Using an iterative approach of thematic content analysis, I customised the generic terms of BC2. I developed facets using available theory and keeping in mind the pragmatic end use of the classification.

RESULTS: 80 studies were included from which I extracted 178 discrete knowledge encounters. I developed six classification categories: what information or experience was encountered; how was the information or experience encountered; what was the mode of encounter; from whom did the information originate or with whom was the experience; how many participants were there; and where did the encounter take place. For each of these categories I identified relevant descriptive facets.

CONCLUSIONS: I have sought to identify and classify all knowledge encounters and have developed a faceted description of key categories which will support richer descriptions and interrogations of knowledge encounters in healthcare research.

3.3 Background

Well-evidenced interventions intended to improve patient well-being may not be used optimally across healthcare professions [17, 93-99] with many barriers identified to the uptake of best evidence [96, 97, 100-103] and interventions designed to overcome these [104-106]. Implementation science seeks to promote the uptake of research and other evidence-based findings into practice [107] but for healthcare professionals this

is complex as practice draws on, in addition to scientific principles, rules of thumb and a store of practical wisdom [108] acquired from a range of informational and experiential sources. Gabbay and Le May's ethnographic study of how primary care clinicians build mindlines found it was rare that medical practitioners searched for guidelines [31, 109]. Instead, clinicians drew on multiple sources of information and experiences as they cared for patients. Much of the knowledge they acquired was tacit, i.e. it could not be put into words [52] as, for example, when someone tries to convey to another exactly how not to fall off a bike when riding. The knowledge is embodied. We know how to cycle, and yet cannot fully explain it. So, rather than conceiving of a single knowable reality, mindlines are based on a more "fluid, embodied and intersubjective view of knowledge" that accommodates context and multiple realities [110 p. 1]. In this way, the knowledge of the practitioner is in the moment and in their practice (knowledge-in-practice) in a particular context of space and time (knowledge-in-practice-in-context) [31]. Implementation science, with its aspiration to change practice, could benefit from a richer understanding of how the complex, personal and context-laden phenomenon of knowledge-in-practice develops over time.

Several reviews have sought to collate the sources of information clinicians use and the ways in which they seek them [111-117]. These include the information sources used by rural health professionals [116], nurses [114], physicians [111, 112, 117] and dentists in developed countries [113]. The reviews found that colleagues were often ranked as primary information sources and that learning informally was widespread. However, none of them attempted to synthesise the research from across healthcare

groups, and none attempted to classify the context and other attributes of healthcare professionals' interactions with information or experiences. Thus, implementation research is not yet able to explore what characteristics are associated with the information and experiential encounters that matter to healthcare professionals.

I came to use the term knowledge encounters only after I had collated the data from the studies included in this review and was attempting to organise it thematically.

When writing my protocol, I naively intended to thematically organise sources or things (journals, meetings, conferences) in the systematic review until I realised I was dealing with practices that involved socio-material experiences with those things.

Before publishing the paper, I was asked by my supervisor what the term knowledge encounter meant. In response, I wrote a blog to draft an explanation (see Appendix B).

I use the word encounter to describe the occasions when clinicians happen upon or discover new information or experience something new or in a new way. The intention was to reflect the way in which mindlines [31] appear to be formed. These are through experiences that happen in non-linear and unexpected ways, in various contexts, as well as through so-called knowledge transfer attempts (e.g. professional development courses, publications).

The more familiar terms in the literature around knowledge transfer, translation, exchange and sharing were not sufficient to allow description of the totality of the experiences clinicians were reported to have in coming across new information and experiences. Elements of these may surface in some of the occasions when clinicians come across new information, e.g. as a part of a knowledge translation project they

may read some guidelines; they may happen to come across information or an experience as someone shares it with them; or they may indeed exchange information or experiences with a colleague. But none of these terms alone were able to incorporate the multitude of ways in which clinicians come across new information and experiences that were identified in this systematic review. Encounter was a word that kept surfacing in my mind to describe what I was seeing as I read the sources I had extracted from the included studies.

Encounter is defined as “an unexpected or casual meeting with someone or something” in the Oxford Dictionaries [118]. The Random House Dictionary (accessed via Dictionary.com) defines it as “to come upon or meet with, especially unexpectedly” [119]. Merriam-Webster defines an encounter as “a usually brief experience with another person” or “an occasion when you deal with or experience something” [120]. Although these suggest that the encounter is an unexpected event, the second definition does not suggest that it is always unexpected. And, although it may usually be brief, it is not always. Furthermore, an encounter may be with a person or a thing allowing for that thing to be a journal article, a procedure or internal thought process.

The word encounter also has numerous synonyms or related words that help to show the interactional, often unplanned, and serendipitous nature of experiential learning in professional practice. Gathered from Roget’s print and online thesauri [121, 122] these include:

- discover
- meet
- meeting
- experience

- find
- detect
- bump into (happen upon)
- come upon
- stumble (happen upon)
- detect
- feel
- find
- talk (discussion)
- turn up (be discovered)

Encounter is, of course, commonly used in the context of a medical encounter (for example [123-125]), which is often a planned event, even if the interactions and outcomes within the event are uncertain. Thus, encounter seemed appropriate to describe the many ways in which healthcare workers come across, happen upon, or plan to discover new or confirmatory information or experiences.

Tsoukas and Vladimouri give the following distinction between information and knowledge:

“Information is a context-based arrangement of items whereby relations between them are shown (e.g. the subject index of a book). And knowledge is the judgement of the significance of events and items, which comes from a particular context and/or theory (e.g. the construction of a thematic index by a reader of a book)” [126 p. 976].

Stenmark [127] helped me to conceive of information as a means (e.g. written, oral, performative) of attempting to articulate an individual’s embodied knowledge, but it lacks the personal, and tacit, understanding that the individual has of the particular

phenomenon they describe. Experiential knowledge, on the other hand, is the knowledge gained through observations, encounters and other interactions, for example, of what does and does not work [128] and is often followed by a period of sense-making [129]. Information, from Stenmark's perspective, may alter another individual's prior knowledge but is not in itself knowledge.

Therefore, healthcare professionals encounter information or experiences but, within the encounter, they will make a judgement of the significance of the information or experience and, therein, turn the encounter into one of embodied knowledge or knowing. Thus, knowledge does not refer to the object of the encounter but to the meaning made of the experience.

Much later in my DPhil reading I came across the experience-based learning literature and this statement by Boud et al, "...the idea of experience has within it judgement, thought and connectedness with other experience – it is not isolated sensing" and, quoting Oakshott, "experience is always and everywhere significant". Experiences always come with meaning [80 p. 6].

Therefore, I came to define a knowledge encounter as an expected or unexpected circumstance in which an individual comes across new or confirmatory information or experience and, in doing so, makes a judgement (consciously or not) about the significance of that information or experience.

I would alter this now to reflect my conceptualisation of all encounters being experiential, whether they be with things or people. A person experiences an experience as they feel, read, day dream and whatever else, whether it be with a set

of guidelines or an instrument in their hand. A knowledge encounter might be better described, then, as a socio-material experience with anyone or anything that has the potential to confirm, or develop new, embodied knowing.

Despite my reflections above about experiences, when designing and analysing the study, I used “information or experience” and will, therefore, continue to use them here.

The aims of this review were:

- to identify the sources of information and professional experiences (referred throughout this chapter as experiences) experienced by healthcare workers that could influence their embodied knowledge or knowing
- to build a classification system, for use in future observational studies, that describes influences on how healthcare professionals acquire and use information in their clinical practice.

3.4 Methods

3.4.1 Identification of studies

A systematic mixed studies review was conducted to identify the information sources and experiences that health professionals reportedly encounter. Mixed studies reviews include quantitative, qualitative and mixed methods studies to provide a more holistic view of a given problem [130, 131]. I did not want to use different studies for the purpose these authors conceive of them, i.e. to synthesis “what works” from

quantitative studies with “how or why it works” from, generally, qualitative studies. As I wanted to collate a comprehensive list of sources and the way they are encountered, there was no reason to exclude one type of study. Quantitative, qualitative and mixed-methods studies could provide data from which I could organise a typology of knowledge encounters.

Observational studies in English, that sought to identify sources of information and experiences, and the ways in which these were encountered, were eligible.

Experimental study designs were excluded because I was interested in gathering data from existing practice rather than a modified one. With hindsight, however, an experimental study with a control of normal practice, could have provided data from a cohort of healthcare workers not exposed to the intervention.

All healthcare professionals responsible for human or other animal care were eligible. Studies involving mostly undergraduate students were not eligible because I wanted the included studies to reflect knowledge encounters for qualified healthcare professionals. I anticipated knowledge encounters in educational settings to be quite different to those of people in mainly work-based settings. I defined as eligible healthcare professionals any clinical professional that fell within the MEDLINE MeSH term “Health Occupations” [132]. This includes allied health occupations (e.g. occupational therapy), chiropractors, dentists, medical doctors, nurses, optometrists, podiatrists, and veterinary practitioners. I included all of these, including veterinary practitioners, because I felt that, whilst there are differences in the contexts within which information or experiences are encountered, the underlying process of

professional learning and development are sufficiently similar across professional settings.

Any information source or experience related to patient care (this includes the care of animals in the case of veterinarians) was eligible.

The following databases and search engines were searched: OVID MEDLINE, OVID Embase, and Google Scholar. Embase was searched from the first records in 1974 to June 6th, 2014. Medline was searched from the first records in 1946 to May week 4, 2014, using terms relating to information, knowledge or evidence and sharing, searching and utilisation combined with terms relating to the various healthcare groups. (For search strategy see Appendix C). The final search was conducted on February 2nd, 2014. Google Scholar was searched using the combinations of “sources of knowledge” and healthcare groups. The searches were run again on July 29th, 2016, to identify studies that included any information or knowledge sources not identified in the studies from the original search. With hindsight, the search missed out terms I would have included, if I had done this now including, for example, knowing, knowing-in-practice, learn, learning, experience, experiencing and practice. However, I also used reference lists and citation searching so that my intention of gathering a comprehensive list of sources (rather than quantifying their use) was hopefully fulfilled.

I carried out backward citation searches for all included studies in Google Scholar and forward and backward citation searches in Web of Science for the more comprehensive studies [109, 128, 133] and 10 systematic reviews [111, 112, 114-117,

134-137]. Bibliographies and reference lists in books about implementation science and evidence-based healthcare, that I possessed, were checked for potentially relevant studies.

Potentially eligible studies were identified from the databases and Google Scholar searches, exported to EndNote X6 and duplicates removed. I screened titles and abstracts of all studies for potential inclusion in the review. Where a study was potentially eligible the full text was retrieved, and I made the final decision on eligibility according to my inclusion criteria.

3.4.2 Data extraction

I created a purpose designed data extraction form in Microsoft Excel to extract data from eligible studies (see Appendix D). This was piloted by me, with Sharon Mickan, using five studies. We independently extracted data and then met to discuss the process. We did not feel there were any problems using the form.

I completed the data extraction alone. From eligible studies the following were extracted: author; contact details; citation; year; study design; whether the study was reliant on recall, real-time data collection or both; instrument / tool / method used and, in the case of quantitative instruments such as questionnaires, the status regarding validation and reliability; study period, if longitudinal; participant description (number of participants, healthcare profession); setting – primary, secondary or tertiary; sources of knowledge; themes or categories used / developed by the authors;

types of knowledge considered, i.e. tacit, explicit or both; and references of potentially relevant studies or reviews.

The final spreadsheet of all studies for which full papers were retrieved, with either reasons for exclusion or included data, was uploaded to an open access data repository [138].

I collated the sources of information or experiences in a single spreadsheet. Where descriptions of sources were different, but shared the same meaning, these were grouped together as a single construct.

I wanted to be able to, in some way, assess the quality of the included studies, consistent with conventional systematic review protocols. I realised later that this was a very difficult task. At the time, though, I chose to use the Mixed Methods Appraisal Tool (MMAT) [131, 139] as it was one of few tools that allowed for qualitative and quantitative studies to be evaluated.

3.4.3 Analysis

My preliminary reading of the literature suggested that information sources and experiences, and the way they are encountered, are multifaceted and would benefit from a classification system that could accommodate this. Kwasnik states that “classification is the meaningful clustering of experience” and argued that the way we classify knowledge can assist in the discovery of new knowledge [140 p. 24]. My intention was that the classification system I developed help to organise the experience healthcare workers have of encountering new information and experiences

and, therefore, assist with the discovery of new methods to facilitate the embodiment of learning from experiences that could improve directly or indirectly the health of patients.

I chose to adopt the facet classification approach to describe the important contexts within which information and experiences are encountered because facet classifications recognise that there is more than one way to view the world, and that facets themselves are flexible to accommodate new phenomena over time [140]. This approach has been used to classify information on the world-wide web [141] and in information seeking tasks [142]. An example of a facet classification is the way we classify wines using the categories of country (France, Germany, Australia, Chile, etc.), grape variety (chardonnay, cabernet, merlot, etc.), alcohol content (0% through 15%) and colour (white, red, rosé).

To describe and organise the experiential and information sources, I adapted the Bliss Bibliographic Classification System, known as BC2. This system classifies, for any piece of knowledge, what is being done, what are its parts or properties, how is this achieved, by what means and by whom, where, and when? [143] and was developed from the work of Ranganathan, who identified repeating elements of all subjects such as personality, matter, energy, space and time [144].

After extracting the data, I developed a classification of knowledge encounters together with a description of facets that described key elements of information and experiential knowledge sources that healthcare workers encountered. I used a constant comparative method to refine the classification.

My synthesis involved a mixed approach using the top-down logic of the BC2 classification to generate thematic categories and a bottom-up approach to develop facets (or codes) for each category from the data. That is, I altered, added or removed the specific terms used in the BC2 classification, for example, from “what is being done” to “what information or experience is encountered”. I then read and re-read the extracted sources, using the constant comparison technique, to develop descriptive codes. As an example, when an article reported “colleagues via internet” I recognised that “someone” was involved in the encounter. Similarly, “someone” was involved in an article that reported “mentor” and another that included “patients’ experiences of illness”. Thus, I created a category to describe the someone from whom a healthcare worker might have obtained information in their knowledge encounter. I called that category “from whom did the information originate or with whom was the experience”, to fit the BC2 logic. Then, I re-read my data to generate facets for each category. The facets were higher level descriptive codes of the people involved in the encounter. For example, from the following raw data I created the facet “practitioner”: “peers”, “observation of others’ practice”, “formalised supervision”, “systematic self-evaluation”, “specialist”, and “email contact with specialist”. In a similar way, the facets of “non-practitioner (colleague)”, “patient”, “researcher”, “educator”, “regulator”, “employer” and “salesperson” were generated.

3.5 Results

3.5.1 Study characteristics

9,138 potentially eligible reports were screened by title and abstract (see Figure 3.1 below). Of these 113 were potentially eligible and, therefore, the full text was retrieved. 37 of these were not eligible. 76 studies were eligible for inclusion in the review from the 2014 search [109, 128, 133, 145-217]. The additional search in 2016 identified a further 4 eligible studies [218-221]. Their data are included in the analysis for completeness, but they did not identify any additional descriptions of knowledge encounters and did not, therefore, affect the classification.

Four studies used a mixed methods design (interviews and surveys), 22 used qualitative methods (ethnography, case study, vignettes, interviews, focus groups or qualitative questionnaire) and 54 used quantitative methods (survey, observation, critical incident technique, or interviews). Of the 80 studies, only 24 allowed for the inclusion of knowledge encounters that were experiential or tacit.

71 of the studies included a single group of healthcare professionals, and 9 involved two or more healthcare groups. Across the studies the quality was evaluated by MMAT as moderate or low quality. The study characteristics are summarised in Table 3.1 (see below). Details are in Appendix E.

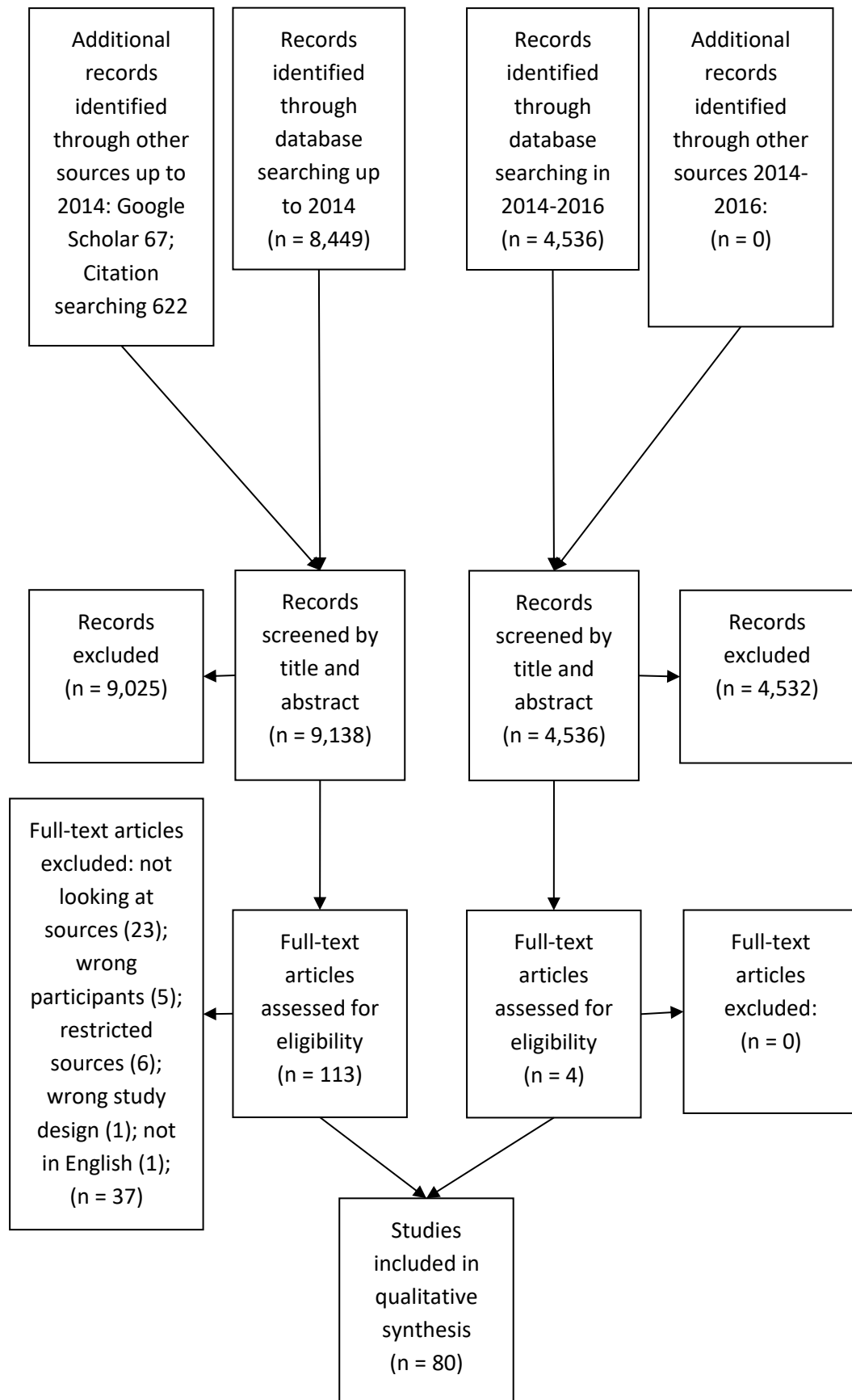


Figure 3.1 PRISMA flow chart of study selection process

Table 3.1 Characteristics of included studies

Study design	Mixed methods	4
	Qualitative	22
	Quantitative	54
Cross-sectional or longitudinal	Cross-sectional	76
	Longitudinal	3
	Unclear	1
Recall or real-time	Recall	72
	Real-time	1
	Recall and real-time	7
Setting	Hospital only	22
	Primary care only	28
	Hospital <i>and</i> primary care	15
	Any setting or unspecified	15
Country	Australia	6
	Brazil	1
	Canada	9
	Denmark	1
	France	1
	Ghana	1
	Germany	2
	Iran	4
	Ireland	2
	Italy	1
	Jordan	1
	Mongolia	1
	New Zealand	1
	Norway	2
	Philippines	1
	South Korea	1
	Spain	1
	Sweden	4
	Taiwan	1
	Tanzania	1
	Turkey	2
	UK	11
	USA	25
Healthcare professional groups included across the studies (greater than 80 as some studies included more than one group)	Dentists	8
	Doctors	42
	Radiologists	1
	Nurses	31
	Hygienists	1
	Midwives	1
	Pharmacists	1
	Phlebotomists	1
	Podiatrists	1
	Psychiatrists	1
	Rehabilitation & physical therapists	2

	Speech & language pathologists	1
	Vets	1
Knowledge sources included	Explicit (codified) only	56
	Explicit <i>and</i> tacit or experiential	24
MMAT quality score (maximum ****, minimum *)	****	6
	***	20
	**	37
	*	17

3.5.2 Development of a classification of knowledge encounters

178 individual descriptions of encounters with information sources or experiences were identified across the 80 studies (see Appendix F). Some of these were described simply as nouns, e.g. journal, but there is an implicit requirement for a verb, i.e. to read a journal. On other occasions, the verb was recorded, e.g. informal conversation with colleagues. Thus, what authors described as sources were often encounters with sources that might have been intentional or unintentional.

I did not begin with an idea of how I would develop a classification or taxonomy in mind before collating the data. The process was tortuous, and I sought inspiration from several existing classifications to help. Among these were Carper's four fundamental patterns of knowing in nursing (aesthetic, personal, ethical and empirical) [86] and Estabrooks et al's four overarching categories of sources used by nurses (social interactions, experience, documents, and a priori knowledge) [128]. However, both are one-dimensional. I was realising that such an approach would not be suited to the complexity of classifying not just the *experienced* but also the *experiencing* within an encounter. I was also concerned that, as Patrick Lambe has written about any taxonomy, it be clear to the end-user [222], in my case the GDPs I anticipated being involved in the study to follow. Lambe also addressed the issue of having

multiple dimensions, by suggesting the use of matrices within taxonomies, and that there are classifications based on facets [223]. This immediately helped me to begin making sense of the data I had extracted. To classify both, the experienced and the experience, I needed to think of knowledge encounters in a multidimensional way and describe the dimensions according to different facets.

I modified the BC2 classification to add categories where differentiation was required and remove others where there were redundancies. In summary, the classification I developed included the following six key questions about the knowledge encounter (short versions used in Figure 3.2 below are in brackets):

- What information or experience was encountered (“What information or experience?”)?
- How was the information or experience encountered (“How?”)?
- What was the mode of encounter (“What mode?”)?
- From whom did the information originate, or with whom was the experience (“From / with whom?”)?
- How many participants were there (“How many?”)?
- Where did the encounter take place (“Where?”)?

I removed the BC2 categories “what are its [the knowledge’s] parts or properties” and “when”.

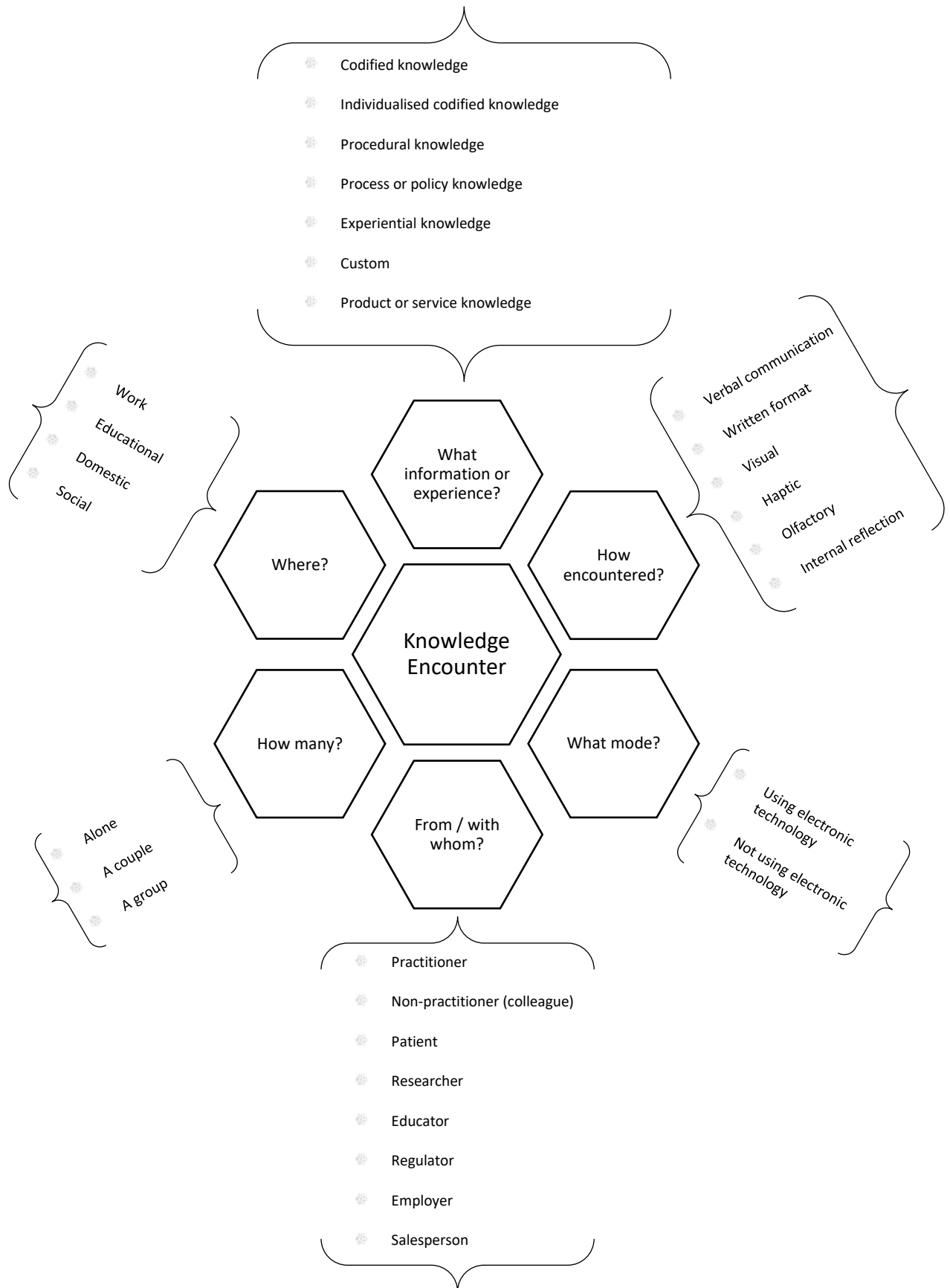


Figure 3.2 Six categories of knowledge encounters with descriptive facets

3.5.3 Facets of categories

While multiple facets were recognised in the literature, I have organised them to describe the important components of the six key classification questions just identified.

What information or experience was encountered?

This category reflected the knowledge that the information attempted to articulate, or experiential knowledge. I reviewed existing models of knowledge (see discussion) to help construct the facets of this category (see Table 3.2).

Table 3.2 A classification of knowledge encounters: knowledge facets, descriptions and examples

Knowledge facet	Description	Examples from included studies
Codified knowledge	Research, theoretical or practice-based knowledge subject to quality control by editors, peer review and debate	Journal, guidelines, textbook
Individualised codified knowledge	Codified knowledge presented in some manner by individuals in person	Informal conversation with colleagues, seminars, grand rounds
Procedural knowledge	The individual actions required to carry out a given activity	Observation of other's practice
Process or policy knowledge	Local or national processes and policies	Local care delivery, national health policy
Experiential knowledge	That obtained through personal experience	What has worked / not worked before, personal clinical experience, patient's experiences of illness
Custom	The implicit norms of a given healthcare setting or professional group	The way it has always been done
Product or service knowledge	Commercial product and service characteristics	Company representative, company literature

How was the information or experience encountered?

It was evident from the data that senses, such as smell and touch, were used by healthcare professionals as they encountered sources of knowledge, in addition to seeing and hearing. Additionally, there were clearly internal, i.e. non-sensory means, of encountering knowledge, such as reflecting on one's experience (see Table 3.3).

Table 3.3 A classification of knowledge encounters: how the knowledge is encountered facets, descriptions and examples

How encountered	Description	Examples from included studies
Verbal communication	Through voice either face-to-face or via a medium, such as a telephone	Informal conversation with colleagues, telephone hotline to specialist
Written format	Through print either in paper or electronic form	Company literature, textbooks
Visual	Through observation either directly or through some form of print or electronic medium	Video
Haptic	Through touch	The patient's body
Olfactory	Through smell	Reading the patient using senses (smell, listening, watching, touch)
Internal reflection	Through conscious exploration of personal thoughts and experiences	Nurses' known explorations

What was the mode of the encounter?

It was evident that some encounters took place in person and some remotely, or through a medium. Where the encounter was not in person, electronic means were dominant ways of bridging the gap. Technology would be used in many settings to augment the sharing of information, for example, at a conference, but the distinction

here is more to do with whether the individual is present in person rather than using a medium to communicate (see Table 3.4).

Table 3.4 A classification of knowledge encounters: mode of information or experiential knowledge encounter facets, descriptions and examples

Mode of encounter	Description	Examples from included studies
Using electronic technology	Through any form of electronic medium	Email contact with specialist, telephone hotline to specialist, medical websites
Not using electronic technology	Through non-electronic media or by being present in person	Conference, local audit, hand over, handbooks

From whom did the information originate or with whom was the experience?

My thematic organisation of the people from whom information originated, or with whom there was an experience, resulted in eight facets (see Table 3.5 below). Whilst in this table the facets are singular, e.g. salesperson, I conceive of the terms being used in the plural, too, e.g. to classify the source “pharmaceutical / product literature”. This will have originated from the company (more than one person) selling a product.

Table 3.5 A classification of knowledge encounters: from whom did the knowledge originate facets, descriptions and examples

From whom	Description	Examples from included studies
Practitioner	A healthcare practitioner from any field	Colleague, colleagues via internet, clinical leaders, personal clinical experience, journal club, email discussion list, professional association
Non-practitioner (colleague)	A colleague who is not a healthcare practitioner and who may work within or without the same organisation	Social services, non-medical personnel

Patient	A person or group of patients receiving healthcare interventions	Patients, patient questioning, patients' experience of illness
Researcher	A person or group of people who have investigated something in an organised and systematic way	Thesis, journal
Educator	A person or organisation providing instruction	Teacher, educational booklet, laboratory manual, patient information
Regulator	A person or organisation that directs or regulates some aspect of healthcare practice	government documents, health policy
Employer	An individual or organisation that employs the healthcare professional	Policy and procedure manuals, local guidelines
Salesperson	An individual or organisation that sells good or services	Company literature, company representative, drug company functions

How many participants were there?

In addition to determining the role of the individual or organisation involved in sharing the information, it was evident that some of the encounters with sources might involve an individual alone, with one or two others, or as part of a larger group. Social learning is believed to be an important element of how individuals acquire new knowledge, particularly in practice [73, 89, 224], and therefore I felt that this facet of a knowledge encounter was an important one to capture (see Table 3.6).

Table 3.6 A classification of knowledge encounters: how many people were involved facets, descriptions and examples

How many	Description	Examples from included studies
Alone	An individual encountering information or experiential knowledge without others present either physically or virtually	Personal development of acquired knowledge through experience and prior knowledge
A couple	Two people involved in the knowledge encounter	Informal conversation with colleagues
A group	Three or more people involved in the knowledge encounter	Email discussion lists, seminar

Where did the encounter take place?

For this category I tried to distil from the sources identified a sense of place in which the knowledge encounter could occur. The setting was in part determined by the intention e.g. whether a meeting was intended to be an educational event or if it was intended to be social but where new information was encountered nonetheless (see Table 3.7).

Table 3.7 A classification of knowledge encounters: where did the knowledge encounter take place facets, descriptions and examples

Where	Description	Examples from included studies
Work	Setting in which the healthcare professional works	Grand rounds
Educational	Setting intended for educational activity rather than work	Conferences
Domestic	Home	Online continuing education, chatrooms [if carried out at home]
Social	A setting given over to social activities rather than educational or work	Professional societies [when primary reason for meeting is social]

3.6 Discussion

I conducted a systematic mixed studies review to identify all encounters with information and experiences reported in the healthcare literature and identified 80 qualitative, quantitative and mixed methods studies that reported on such encounters. I then developed a faceted classification to describe what I term knowledge encounters using a mixed didactic-inductive process. The classification has six categories that describe different aspects of any encounter, i.e. what information or experience was encountered, how the information or experience was encountered, what the mode of encounter was, from whom did the information originate or with whom was the experience, how many participants there were, and where the encounter took place. Each category is described by key facets that enable a deeper understanding of the actual knowledge encounter.

3.6.1 Discussion of the generation of facets

Higgs and Titchen [225] describe three knowledge types in professional practice: theoretical or scientific knowledge; craft knowledge; and personal knowledge. Similarly, Kemmis proposes that there is public knowledge (theoretical, scientific), action (as an object of knowing or thought) and practice [89]. Eraut divides knowledge into codified (also known as public or propositional knowledge) and personal [88]. Gabbay and Le May identified six knowledge types from their work with healthcare providers over many years: experiential, research, theoretical, policy, custom and practice, and trial and error [31]. I drew on all of these in developing the classification.

One source of information that arose from the data was that produced by commercial companies, often for marketing. It is not clear whether this has been subjected to quality control in the sense of codified knowledge. I, therefore, included an additional category of “product or service knowledge”, though I acknowledge that there may be occasions when the product knowledge truly reflects codified knowledge, i.e. when it is based on peer-reviewed research.

There were multiple roles individuals or organisations could be envisaged to perform depending on the context of the encounter. From a relational perspective, a “colleague” might be someone whose “practice is observed” or with whom an “informal conversation” is had. Colleagues might take on the role of an educator or as a “mentor” or “peer opinion leader”. They might also be an employer and responsible for creating “locally developed guidelines”. In many cases, it was not possible for me to define the role due to lack of contextual information, but there were sufficient examples of different roles across the included studies for me to develop several facets to describe the various roles others play in knowledge encounters.

Given that an individual can perform several different roles I defined this category according to the primary role taken by the individual(s) or organisation at the moment of information or knowledge encounter. Thus a “journal club” may be dependent on the interpretations of fellow practitioners, whilst the reading of a research article in a “journal” alone would entail the source being a researcher.

There was a challenge in how to classify non-human sources such as “journal” articles and “video”. I determined that the primary role of the individual(s) or organisations

creating the information source would follow the same categories as for the in-person encounters. Thus, a research article may be written by a researcher who might write another article that explains a clinical technique as an educator. These facets could also be ascribed to the self or to other colleagues. In such a case, personal reflection by a healthcare professional on their practice would be described by the facet “practitioner”.

3.6.2 Limitations

There are several potential limitations associated with this review.

The search for studies used a combination of formal search strategy and citation searching. It is possible I have missed potentially relevant studies because authors have used terms I did not include in the search strategy, and because I confined the eligible studies to English. However, as I was not seeking to quantify the encounters with knowledge sources I feel that I reached a saturation of both classifications of knowledge encounters and descriptions of their key facets in the studies I did identify.

The screening of titles and abstracts was conducted by me alone. This increases the possibility that potentially eligible studies were not included. Similarly, it is a limitation that the coding and design of the classification were done by me alone, though it was with ongoing discussion with my supervisor at this time, Sharon Mickan.

The discreet facets identified may not reflect all the facets that a particular knowledge encounter could include. Thus, users of the classification will have to make a choice about which facet is most appropriate of all those that could be used.

I have also identified limitations of the studies included. The literature on knowledge sources identified here has been largely dependent on recall of exposure to different sources. Apart from three studies that used brief periods (4 hours or half a day) of observations [150, 174, 198] all of the quantitative data has depended on recall. This review was not concerned with quantifying the proportion of encounters ascribed to each source but, due to the impact of recall bias [226], I may not have a complete picture of sources of information encountered by healthcare professionals. In the qualitative studies, more contextual information was given to understand what the encounter with a source meant to the clinician. Finally, several of the closed question surveys I identified appeared not to follow a theoretical structure, and I was unable to identify one that had all the knowledge source encounters identified in this review.

I used the MMAT tool to assess the quality of the studies. I value the attempt by the authors of MMAT to provide a means for evaluating and comparing the quality of different study designs when conducting mixed studies reviews. However, whilst it was apparently straightforward to use with individual studies, I found I was unsure what the results meant when compared, in particular, to studies conducted within different research paradigms where “quality” can mean something very different [227].

3.6.3 Implications for Implementation Science

There is a growing body of evidence to support the assertion that healthcare professionals’ knowledge-in-practice – the knowledge that is used as they practice – is influenced by interactions with a variety of formal and informal sources of information

and experience. However, as shown in this review, there has been relatively little real time empirical study of the ways in which this happens. I think that, by studying the ways in which healthcare professionals' knowledge-in-practice is influenced by what they encounter and how they encounter it, we can begin to better understand how to work with the grain of practice to promote the uptake of research into practice.

From their ethnographic work in general medical practices Gabbay and Le May coined the term mindlines to describe the internal, personal, and tacit guidance medical practitioners used as they went about their practice. Mindlines develop as healthcare professionals interact with, and make sense of, multiple sources of information, and experiences. Recognising that quantitative methods can rarely develop the rich understanding of individual practices that ethnographic methods can, I nonetheless think, that the classification described here will allow for longitudinal survey tools to be developed that capture rich contextual data of how healthcare professionals develop their knowledge-in-practice in a variety of contexts.

With the increasing availability and functionality of digital means to record experiences in real time [228], there is an opportunity to study larger numbers of healthcare professionals in any number of settings as they go about their lives. Observational methods are limited not only by the large amount of time needed and ability for a researcher to be in only one place at a time, but also by restrictions of access to, for example, peoples' homes and social gatherings where knowledge encounters are bound to occur. Real time data capture has been used to study a wide range of health and social topics [229-232], and I envisage research that explores knowledge encounters in a similar way. This could be done qualitatively, with

participants recording in their own words their experience of the encounter. However, by using a classification to describe the knowledge encounters participants may be able to record encounters more quickly and record key characteristics of the encounter. Meanwhile, researchers would be able to gather larger quantities of data and analyse it much more quickly. Through a better understanding of what, how, where and with whom information and experiences diffuse into practice it is hoped that we can develop new implementation approaches to promote research uptake alongside other information and experience as healthcare professionals develop their knowledge-in-practice.

Further development of this longitudinal approach could explore whether, and how, particular facets of knowledge encounters are associated with changes in knowledge-in-practice, and how these facets change, for example, as healthcare professionals mature. Implementation researchers might then develop interventions that leverage these facets to help improve uptake of evidence-based practices. For example, if knowledge encounters that share the facets of individualised codified knowledge, verbal, non-electronic, with practitioners, in social settings and occur in groups are associated with more change in knowledge-in-practice, can we adopt, adapt or design new opportunities for professionals to experience knowledge encounters with research based on these, rather than on facets not associated with changes in knowledge-in-practice?

Finally, whilst classifications function as descriptive and explanatory frameworks for ideas or phenomena, they also act, like theories do, in providing the basis for the generation and testing of new ideas [233]. I think that by describing what is a complex

phenomenon using a faceted classification, implementation researchers may find new ways of thinking about knowledge-in-practice, and how to work effectively with it, to promote the use of research and other evidence-based findings in practice.

3.7 Conclusion

Healthcare professionals encounter information and experiences that may change their knowledge of patient care in many ways. I have developed a classification to organise and describe the complexity of how healthcare professionals encounter information and experiences. I have identified six key classifying questions to understand the context in which information and experiences are encountered and described important facets for each of these. This novel faceted classification for knowledge encounters has been developed as a tool for future observational studies of healthcare professionals. Future research should explore how this classification of knowledge encounters can deepen our understanding of how healthcare professionals learn and develop their knowledge-in-practice. Over time, I want to be able to facilitate knowledge encounters that improve the uptake of evidence-based practices in healthcare.

Chapter 4 Design and testing of a web tool to record and classify knowledge encounters

4.1 Background

In the previous chapter I described the development of a faceted classification of knowledge encounters. The classification identified six key questions about knowledge encounters: what knowledge was shared during the encounter? How was the knowledge encountered? What was the mode of exchange? From whom did the knowledge originate? How many participants were there? Where did the encounter take place? For each of these questions or categories I defined several facets.

The purpose of the classification was to help organise the sources of knowledge, and contexts, within which they were encountered when conducting self-report empirical studies with general dental practitioners (GDPs). Sometimes known as ecological momentary analysis (EMA) [234] there are several potential benefits to participants self-reporting data in real time. These include a reduction in the risk of recall bias by participants [234]; the recording of contextual data that may influence behaviours [235]; and the collection of data by participants in places and at times to which researchers may not have access to [234]. Studies of knowledge sources and the ways in which healthcare professionals encounter them have largely been based on surveys or observation [236]. Whether the intention is to gather quantitative or qualitative data, each has limitations that I hoped the use of self-report would help address.

Surveys capture clinician recall of their encounters with knowledge at a single moment in time. These are prone to recall bias and rarely able to capture contextual information about how those knowledge sources are encountered. Observational studies in this field have tended to involve few participants and rarely extended beyond the workplace. Particularly for the quantitative observational studies these have involved short periods of observation of individual practitioners with a maximum of four hours. Real-time self-report offered the opportunity to gather quantitative and qualitative data from each participant over several days, rather than hours, and in locations not normally accessible to the researcher, e.g. the home or social settings.

The aim of this chapter is to report on how I have designed and tested a tool to be used in a study to explore GPs' knowledge encounters using a mixed methods approach.

My objectives were:

1. To create a web-based tool to collect real-time data based on the classification developed in the previous chapter
2. To create an online training tool to help familiarise participants with the classification
3. To evaluate the ease of use of the web-based tool

4.2 Methods

4.2.1 Development of a web-based tool to record knowledge encounters

There were several attributes that, from my reading of the literature and informal discussions with researchers using real-time self-report data collection, I felt would be ideal in a tool for my study. Due to technical and/or financial reasons this ideal would inevitably have to be compromised. The attributes were:

- accessibility via mobile telephone, computer or tablet computer
- ability to be synchronised across devices
- ability to record a knowledge encounter in less than 30 seconds
- ability to prompt participants to record data
- secure and immediate data transmission
- ability to download qualitative and quantitative data into a spreadsheet for analysis
- free or low-cost (as the study was unfunded)
- ability to include a training element to help participants familiarise themselves with the format and classification

I considered several approaches before determining that I would use Google's web form. The Ethos App – ethnographic observation system mobile application (www.ethosapp.com) – had been used in a small study that explored the behaviours of 22 football bettors reported in a blog [237]. Although the system allowed data collection on multiple mobile devices, it was primarily designed to collect qualitative data on mobile phones and would have been difficult for me to incorporate the

classification system. I also explored using Evernote (www.evernote.com), which is a note-keeping application that allows synchronisation across mobile devices and computers. It is possible to share folders of notes with others, and I experimented on my own using this to record knowledge encounters. However, though it would have been adequate for the qualitative descriptions of knowledge encounters, as the application is designed for free text note-keeping, there was no way to provide participants with the classification choices.

I had discussions with a developer about the possibility of creating a custom web form or application, but the cost of developing this was prohibitive. They did suggest, however, that a web form such as Google's could allow much of the functionality that I required.

I was already familiar with the suite of online software available from Google Drive (drive.google.com), which include online spreadsheets, word processor, presentation software and forms for surveys. I, therefore, explored this option further and realised that I could develop a tool that would have most of my desired attributes. Google docs are provided free of charge once one has created an account, which was important, given my lack of financial resources. However, it is not secured like other online survey tools (See REDCap, which I became aware of only after conducting this study [238]), which would mean that the data captured on it needed to be anonymous as far as possible.

Google forms are survey tools. One designs the form by choosing different combinations of text and question types. From my form, I used an open question with

a free text box for participants to describe their knowledge encounters (qualitative data) and a series of drop-down boxes for each of the facets of the knowledge encounter (quantitative data).

Google forms also allows one to customise the format, so I could incorporate the University of Oxford logo and choose a matching background (see Figure 4.1 below). It is straightforward to incorporate images, which proved very useful for the scenario training I developed for participants.

As can be seen in Figure 4.1, I included two additional questions to the original six, namely “Was the encounter sought by you?” and “How do you intend to use the knowledge encountered?”. The first question was intended to identify whether the encounter was an intentional one or one that arose serendipitously. The second one was intended to ascertain, at that moment, what their intended use of the knowledge encountered was. The possible responses were based on Graham et al’s categorisation of research use [239]:

- I won’t use it
- I will use it instrumentally (do something with it)
- I will use it conceptually (think about it)
- I will use it politically (make an argument for something). Graham used the term “persuasive” rather than political.

The form allowed for GDPs to describe each knowledge encounter using six facets.

Whilst this could never capture the depth of an encounter that a qualitative approach might do, it gave some more information about where, with whom and how

information and experiences were encountered. At this stage in my DPhil journey I had not encountered the generative concepts of knowing in practice and was still heavily influenced by rationalistic approaches.

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Knowledge encounters

*Required

Knowledge encountered

Describe the information or knowledge encounter in your own words. *
Please be as descriptive as possible. What did you encounter? Where? With whom? What did you think of it? Please include journal, titles and authors if you read something

Was the encounter sought by you? *
Examples: did you ask a question or did someone tell you something without asking? Did you consciously try and solve a problem or did a "solution" come into your mind on its own?

What did you encounter? *
Codified knowledge is usually peer reviewed in some way e.g. in a text book or a journal. When it is in a personalised form this is someone else's interpretation of it e.g. in a conversation. Procedural knowledge is learning how to do something either through a demonstration or reading.

How was the information or knowledge communicated? *
A lecture might include slides and photos but could be considered to be mainly a verbal encounter. Watching a procedure might include verbal explanations but could be mainly visual. Opt for which you feel best describes this from your point of view.

What mode was it transmitted by? *

Who communicated the information or knowledge? *
We all have many different roles. A dentist may at one time be a practitioner and at another a researcher or educator. Choose which best describes the role at the moment the encounter was going on.

How many people were involved in the encounter including yourself? *

What was the setting where you encountered the information or knowledge? *

How do you intend to use the knowledge encountered? *

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Figure 4.1 Screenshot of web-based tool developed

4.2.2 User testing of the tool

I wanted to test the feasibility and reliability of GDPs using the form and the classification system to record their knowledge encounters. Four GDPs were recruited via a Facebook entry that explained the nature of the tool development and invited GDPs willing to help to get in touch through Facebook. There was no offer of financial reward. As the purpose of the study was to develop a tool rather than generate generalisable new knowledge as research, ethics was not sought. GDPs, who agreed to take part, were sent an email (see Appendix G) with a pdf attached with descriptions and/or examples of the facets in each category (see Appendix H). The examples of knowledge encounters were taken from those extracted in my systematic review (Chapter 3).

Before they collected data by themselves, I wanted to see the variability of classifications when GDPs used the survey tool with several scenarios. At the same time, I wished to give a sense of the interactions that they could record themselves in due course. In this way, the scenarios also served as a familiarisation tool.

For this stage, I developed five scenarios of knowledge encounters based on the knowledge encounters identified in the mixed studies systematic review and personal experience. The intention was to provide scenarios that could be classified with several of the different facets. The scenarios were on sequential web pages, and the GDPs were asked to progress through all five, classifying the scenarios. There was also a free text box for them to provide feedback or ideas after each scenario. All but one scenario included one or more images intended to give more context to the encounter

and encourage the users to imagine they were present in it. The texts of the scenarios were:

1. Please imagine you are a dentist looking at this dental journal.
2. You are attending an implant course. You and three other dentists have observed the clinical stages of placing an implant.
3. You have looked through a discussion in a dental chat forum, a portion of which is reproduced below.
4. During a coffee break you pop into your colleague's surgery because you would like to know how they would manage a particularly difficult endodontic case. You discuss the case with the help of a couple of periapical radiographs, and your colleague shares their opinion of how you should manage the case based on their experience.
5. After arriving back from work, you sit down and read some of the Care Quality Commission's "A fresh start for the regulation and inspection of primary care dental services" document.

The first two pages of the survey are shown below (see Figures 4.2 and 4.3).

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Knowledge encounter simulations

Thank you for agreeing to take part in this study to improve, and assess the reliability of, an online tool to record dentists' daily knowledge encounters. If you have some thoughts on the design or content of the tool, or any other ideas related to it, please do send me an email.

Thanks!

Dominic

Dr Dominic Hurst
richard.hurst@kellogg.ox.ac.uk
<http://knowledgeproject.info/>

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Figure 4.2 Page 1 of the user-testing web form

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Knowledge encounter simulations

Description of exercise

In the pages that follow there are 5 simulations of knowledge encounters you may experience as a dentist.

Please look at each scenario. After each there are 6 questions phrased as questions to you - please imagine that you are in the simulation yourself when answering the questions.

The questions relate to 6 different ways of categorising the encounter. You can choose one word or phrase that best describes that particular aspect of the knowledge encounter for you - there is no "correct" answer. There may be others but please opt for the one you think is most appropriate.

If you don't think the choices you are given for each category make sense and you think a different term would be more suitable please enter this in the free text box at the end of the questions.

Finally, I would like to be able to discuss with some participants the choices they made to help me understand where there may be problems with the tool. At the end of the form is a request for you to agree for me to contact you. If you consent to this, please tick the box.

Thank you.

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Figure 4.3 Page 2 of the user-testing web form

Figures 4.4 to 4.7 are screenshots of the first scenario, which followed the introduction above. Although there are several screenshots, it was all on one webpage, requiring users to scroll down. On the first page only, I included descriptions of the different facets, to help the users orientate themselves. At this stage, I did not include the questions “Was the encounter sought by you?” and “How do you intend to use the knowledge encountered?” because the GDPs were not classifying their own knowledge encounters. Subsequent pages omitted the detailed descriptions but provided an online link to the same list of descriptions / examples of facets in case they needed it midway through (see scenario two in Figure 4.8, below, as an example).



Figure 4.4 First scenario in user-tester web form (screenshot 1 of 4)

periorbicular and soft tissues resulting in an

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Refereed Paper

Accepted for publication: 2014




What did you encounter?

- **Codified knowledge:** research, theoretical or practice-based knowledge subject to quality control by editors, peer review and debate e.g. *Journal, Guidelines, Textbook*
- **Codified knowledge in a personalised form:** codified knowledge presented in some manner by individuals in person e.g. *informal conversation with colleagues, seminars, or grand rounds*
- **Procedural knowledge:** e.g. *observation of other's practice*
- **Process or policy knowledge:** explicit descriptions of local or national processes and policies e.g. *local care delivery, national health policy*
- **Experiential knowledge:** e.g. *what has worked / not worked before, personal clinical experience, patient's experiences of illness*
- **Custom:** the implicit norms of a given healthcare setting or professional group e.g. *the way it has always been done*
- **Product or service knowledge:** e.g. that provided by a company representative, company literature

What did you encounter? *

Please refer to the descriptions above

Figure 4.5 First scenario in user-tester web form (screenshot 2 of 4)

How was the information or knowledge communicated?

- **Verbal communication** e.g. *informal conversation with colleagues, telephone hotline to specialist*
- **Written format** e.g. *company literature, textbooks*
- **Visual** e.g. *video*
- **Haptic** e.g. *the pressure applied to an instrument during a procedure*
- **Olfactory** e.g. *reading the patient using smell*
- **Internal reflection** e.g. *thinking through a problem*

How was the information or knowledge communicated? *

Please refer to the descriptions above

What mode was it transmitted by?

- **Using electronic technology** e.g. *email contact with specialist, telephone hotline to specialist*
- **Not using electronic technology** e.g. *conference, local audit, hand over, handbooks unless this is accessed electronically*

What mode was it transmitted by? *

Please refer to the descriptions above

Who communicated the information or knowledge?

- **Practitioner** e.g. *colleague, colleagues via internet, clinical leaders, personal clinical experience, journal club, email discussion list, professional association*
- **Non-practitioner (colleague)** e.g. *those working in social services, non-medical personnel*
- **Patient** e.g. *patients, patient questioning, patients' experience of illness*
- **Researcher** e.g. *thesis, journal*
- **Educator** e.g. *teacher, educational booklet, laboratory manual, patient information, package insert (if educational rather than promotional)*
- **Regulator** e.g. *government documents, health policy*
- **Employer** e.g. *policy and procedure manuals, local guidelines*
- **Salesperson** e.g. *package insert (if promotional rather than educational), company literature, company representative, drug company functions*

Who communicated the information or knowledge? *

Please refer to the descriptions above

How many people were involved in the encounter including yourself?

Figure 4.6 First scenario in user-tester web form (screenshot 3 of 4)

How many people were involved in the encounter including yourself?

- **Alone** e.g. *personal development of acquired knowledge through experience and prior knowledge*
- **A couple** e.g. *informal conversation with colleagues [assuming conversation is with one or two at a time]*
- **A group** e.g. *email discussion lists, seminar*

How many people were involved in the encounter including yourself? *

Please refer to the descriptions above

What was the setting where you encountered the information or knowledge?

- **Work** e.g. *practice meeting, observing a colleague*
- **Educational** e.g. *conferences*
- **Domestic** e.g. *online continuing education, chatrooms [assuming respondents did both of these at home]*
- **Social** e.g. *over dinner*

What was the setting where you encountered the information or knowledge? *

Please refer to the descriptions above

Additional comments

If you have any thoughts about the terminology used for the different categories please enter them here

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Figure 4.7 First scenario in user-tester web form (screenshot 4 of 4)



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Knowledge encounter simulations

*Required

Simulation 4

During a coffee break you pop into your colleague's surgery because you would like to know how they would manage a particularly difficult endodontic case. You discuss the case with the help of a couple of periapical radiographs and your colleague shares their opinion of how you should manage the case based on their experience.

What did you encounter? *

How was the information or knowledge communicated? *

What mode was it transmitted by? *

Who communicated the information or knowledge? *

How many people were involved in the encounter including yourself? *

What was the setting where you encountered the information or knowledge? *

Additional comments
If you have any thoughts about the terminology used for the different categories please enter them here

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Figure 4.8 Fourth scenario in user-tester web form

I sought feedback about the simulation exercise at the end of the second stage of the user testing (see Appendix I for questions) as I intended to use these and other simulations in familiarisation exercised with GDPs, who would record their knowledge encounters for a longer period in the study that followed.

In the second stage, the four GDPs were invited to use a personalised and anonymous web form to record their own knowledge encounters over a day, or more, if they felt able to. As mentioned earlier, two additional questions were included, “Was the encounter sought by you?” and “How do you intend to use the knowledge encountered?”, and a free-text box was added to the start of the web form where GDPs were asked to describe the information or experience encounter in their own words (see Figure 4.9).

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Knowledge encounters - user testing

Thank you for agreeing to help with this user testing exercise.

This form allows you to capture a knowledge encounter that relates to your work as a dentist. You can do this using both your own words and using predefined categories.

An encounter might be a conversation with a colleague, reflection on something you've done clinically, or something more formal like attending a seminar or reading a dental book.

Please opt for the response that best matches the encounter where you could use different terms.

During this exercise I would like you to catch as many encounters as you can over a 24 hour period - or longer if you are able.

The data for this project is stored on Google Drive. The data will never be intentionally divested to others. However, due to the nature of the cloud please ensure all entries do not contain identifiable data - particularly of patients.

Thanks again.

All the best,

Dominic

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Figure 4.9 First page of user-tester personal web form

This user-tester web form (see Figure 4.10) included an introductory page reminding the GDPs of what they could record as a knowledge encounter. After submitting their web form, the form would reload. Therefore, it was removed for the study that followed to minimise on the number of clicks.

The four GDPs were encouraged to record the encounter as close to the time it occurred as possible. In the explanatory email I sent to them, I suggested that they could use some form of reminder or alarm to help them remember to record their encounters but left it up to them whether they did this and, if so, how frequently.

In addition to the four GDPs who would collect data over 24 hours, I asked eight GDPs attending an Evidence-Based Dentistry short course, that I was running in London, to trial the web form. I asked them at the beginning of the session to think of a recent knowledge encounter, and to classify it using the web form.

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Knowledge encounters - user testing

*Required

Knowledge encounter

If you would like to refer to the descriptions for each category you can download a pdf of them here: <http://goo.gl/vaBvoj>

Describe the information or experience encountered in your own words. *
Please be as descriptive as possible. What did you encounter? Where? With whom? What did you think of it? Please include journal, titles and authors if you read something

What did you encounter? *

How was the information or knowledge communicated? *

What mode was it transmitted by? *

Who communicated the information or knowledge? *

How many people were involved in the encounter including yourself? *

What was the setting where you encountered the information or knowledge? *

How do you intend to use the knowledge encountered? *

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Figure 4.10 Knowledge encounter user-tester web form

4.2.3 Data management

The data from the web forms automatically populate an online spreadsheet in Google Drive. The data was downloaded and for stage one similarity was calculated as a maximum percentage agreement for each scenario and each category.

I did not intend to collect the data from the web form used by the dentists, as the purpose was to allow them to use it and gather feedback on its usability.

The data from the feedback web form, the email exchanges and face-to-face discussions were noted in an offline spreadsheet.

4.3 Results

4.3.1 Simulations

Figure 4.11 shows the percentage agreement between the four dentists recruited through Facebook, who classified the five scenarios. Where the score is 100% all four GDPs used the same facet. Where it is 75% three out of the four used the same facet. 50% indicates that two used the same facet. In both cases below, where 50% is indicated, two GDPs used one facet and two GDPs used another facet. Overall, the agreement provided me with reassurance that the GDPs were not guessing but were classifying in a reproducible way. However, it is important to stress that, as there were no right answers, a slight disagreement over some categories was expected.

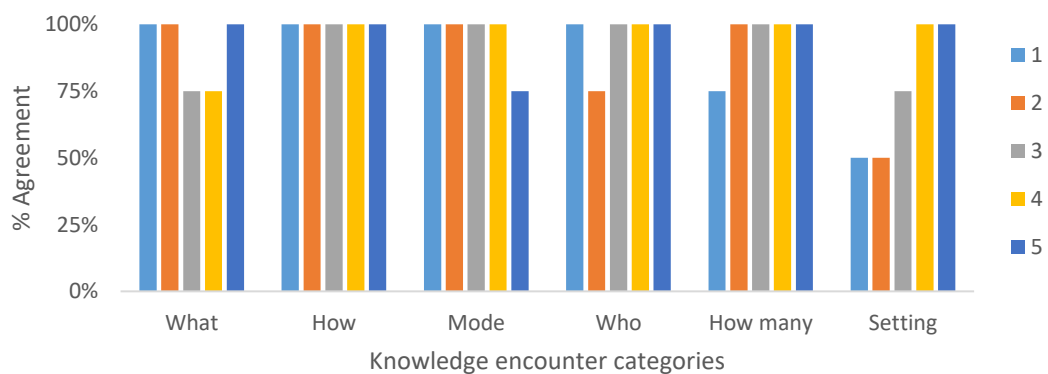


Figure 4.11 Agreement between four dentists on facets used for each category for scenarios 1-5

4.3.2 GDPs' own knowledge encounters

The four GDPs between them recorded 17 knowledge encounters using the web form.

These are reproduced in Table 4.1 below. The qualitative descriptions are quite detailed and rich with contextual information. This was a pleasant surprise, as it encouraged me to think that in the study to follow, GDPs would provide sufficient information to serve as stimuli for in depth interviews about the knowledge encounters.

Table 4.1 Seventeen knowledge encounters reported by the four GDP user-testers (the table is divided into four)

GDP 1							
Describe the information or experience encountered in your own words.	What encountered?	How?	What mode?	Who?	How many?	What setting?	Intended use?
1. How to improve your endodontics in 2 days (day 1) Held at the dental education centre at Northwick Park hospital. Hands on practical on accessing teeth and lecture based using power point on diagnosis/restorability of teeth. Also visual demonstrations using microscope projected on screen. Given by 2 DWSI in endodontics to a group of 8 GDPs. Very informative and a good refresh to skills	Procedural	Verbal	Electronic technology	Practitioner	Group	Educational	Instrumentally
2. Oral health promotion event in Hillingdon held by NHS England on 3rd March 2015. Presentations on dental public health. Addressing how to increase access of children to dental practices as Hillingdon has highest caries rate in North west. Discussion of upcoming school outreach programmes.	Process or policy	Verbal	Electronic	Regulator	Group	Educational	Conceptually

3. Patient with pain after endo stage one LR3. I wanted to know frequency of 2 canals and their relative position to check for this patient. used google to find an article on pubmed. 5% lingual	Codified	Written	Electronic	Researcher	Alone	Work	Instrumentally
4. I want to know why I get a lot of people wanting work experience as a dentist, including one today who has already done 2/52 elsewhere. I was busy so didn't bother getting info on this	Experiential	Internal reflection	Not using electronic	Practitioner	Alone	Work	I won't use it
5. I was using a new material called icon to remove white spots from teeth. I followed the instructions but the product didn't produce the desired result	Product or service	Written	Not using electronic technology	Educator	Alone	Work	Instrumentally
6. Hands on course titles " How to improve our endodontics in 2 days" Day 1 on 4th March, held at the dental education centre at Northwick Park Hospital. The course was given by 2 DWSI [Dentist with special interests] in endodontics to a group of 8 GDPs They day included powerpoint presentations and hands on access of teeth, with demonstration on screen under a microscope.	Procedural	Visual	electronic	Practitioner	Group	Educational	Instrumentally
7. Talk given on access and child oral health by Hillingdon LDC [Local Dental Committee]. they spoke about prevention regimes and how to increase access of children in Hillingdon, focussing on the fact that the children of Hillingdon had neglected dentition (evidence from dental public health consultant given). They also spoke about out reach schemes which they wish to implement with NHS England and asked for practices to put their names forward who would be interested in taking part.	Process or policy	Verbal	Electronic	Regulator	Group	Educational	Instrumentally

Describe the information or experience encountered in your own words.	What encountered?	How?	What mode?	Who?	How many?	What setting?	Intended use?
8. I sat with a colleague over coffee and we discussed how to encourage a particular patient to wear a splint. He continues to fracture cusps off teeth and several restorations I have provided have failed. We discussed what the ethical issues relating to not providing further treatment were, given the high risk of failure.	Experiential	Verbal	Not electronic	Practitioner	A couple	Work	Conceptually
9. We attended LDC meeting	Process or policy	Verbal	Not electronic	Regulator	Group	Educational	Conceptually

GDP 3							
Describe the information or experience encountered in your own words.	What encountered?	How?	What mode?	Who?	How many?	What setting?	Intended use?
10. Discussion of emergency treatment of periapical periodontitis where there is no spreading infection, lymphadenopathy or systemic symptoms	Procedural	Verbal	Electronic	Practitioner	A couple	Social	Conceptually
11. Discussion of what to do when a patient asks for records. Discussed why a patient would ask, and what consent forms need to be signed. Discussed the role of having a procedure form as a step to step guide when this happens	Process or policy	Verbal	Not electronic	Practitioner	Group	Work	Instrumentally

12. Discussing re root treating a lower right seven before crowning it, because it had not been suitably root filled and not crowned. This was discussed at work with a colleague, before sending the referral form out to a specialist.	Codified in a personalised form	Verbal	Not electronic	Practitioner	A couple	Work	Instrumentally
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GDP 4							
Describe the information or experience encountered in your own words.	What encountered?	How?	What mode?	Who?	How many?	What setting?	Intended use?
13. Discussion over the placement of clasps on Co/cr dentures with colleague.	Codified in a	Verbal	Not using electronic	Employer	A couple	Work	Instrumentally
14. Alcohol wipes can cause crinkling at the edges of radiograph films.	Product or service	Verbal	Not using electronic	Non-practitioner	A couple	Work	I won't use it
15. The guidelines surrounding radiographs being taken and when, with a special focus on periodontal radiographs. Via E-learning for healthcare online (e-den) - produced by RCS	Codified	Visual	Electronic	Educator	Alone	Work	Conceptually
16. Orthodontic paper in the BDJ on the use of "short term" orthodontic systems in general practice.	Codified	Written	Not using electronic	Researcher	Alone	Work	Conceptually
17. Information regarding primary impression taking for lower completes using impression compound using a youtube video,	Procedural	Visual	Electronic	Educator	Alone	Work	Instrumentally

As can be seen in Table 4.1 above and Figures 4.12-4.18 below, the GDPs used a wide range of facets to describe these few knowledge encounters. Again, this was

encouraging as they were recording information and experiential sources of knowing rather than just codified sources of information.

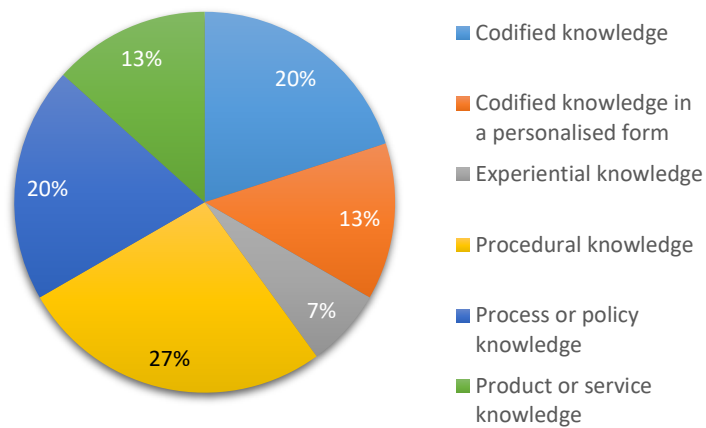


Figure 4.12 What knowledge was encountered?

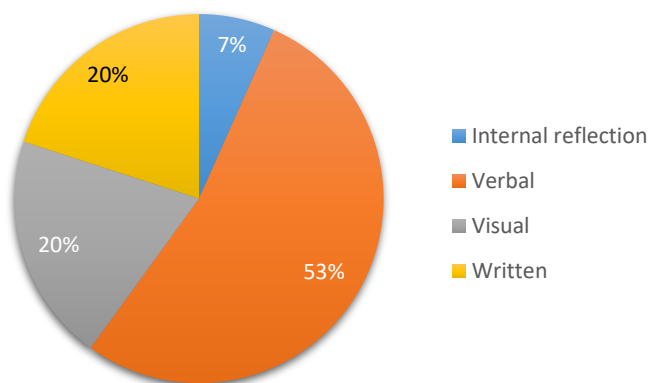


Figure 4.13 How was it encountered?

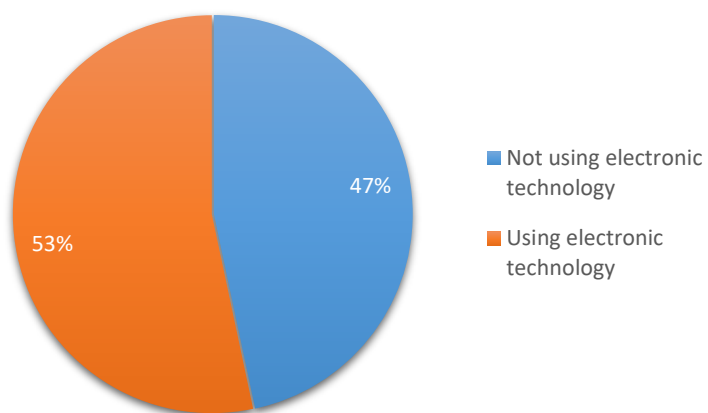


Figure 4.14 By what mode was it encountered?

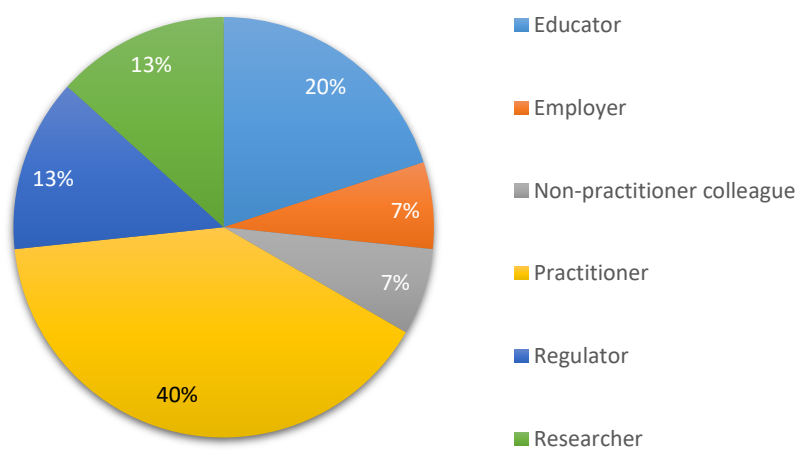


Figure 4.15 From whom did the knowledge originate?

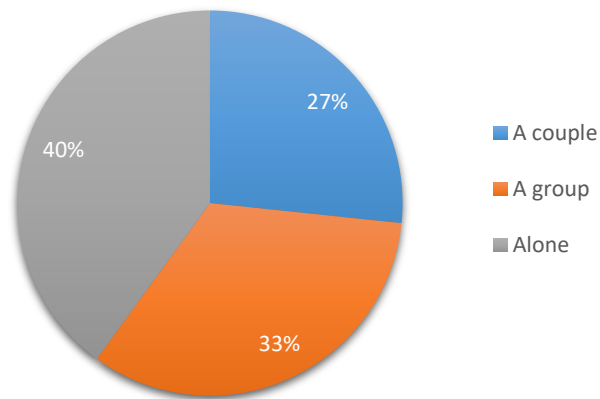


Figure 4.16 How many were involved in the encounter?

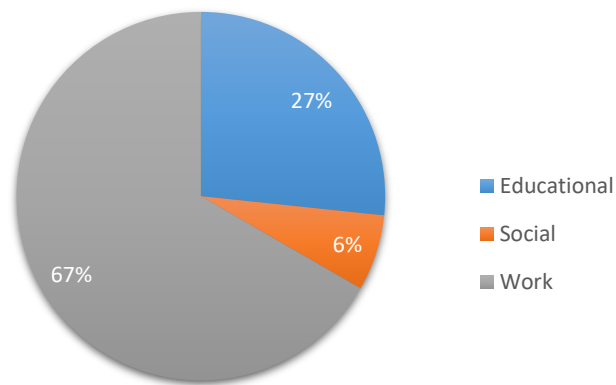


Figure 4.17 Where did the encounter take place?

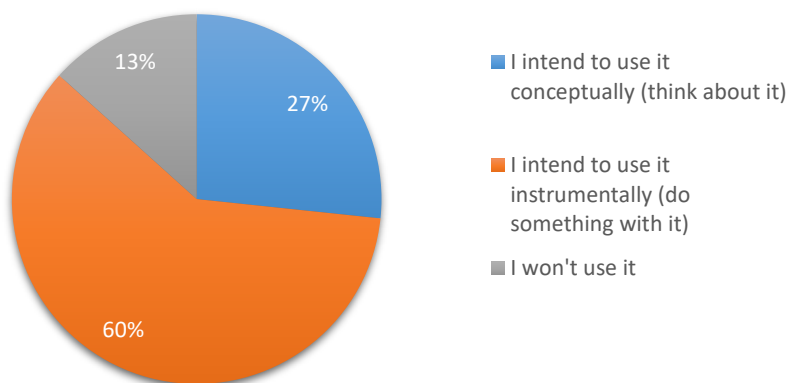


Figure 4.18 How do you intend to use the knowledge?

4.3.3 Feedback

Feedback via the feedback form, email and verbally was that the web form itself was easy to use. Dentists used phones, tablets and computers to record their encounters. A couple of dentists found choosing a single facet for some categories challenging. This was anticipated as it is evident that such a classification will necessarily force GDPs to choose one or the other facet when multiple might be applied. It is one of the limitations of using quantitative methods to explore the knowledge encounters.

There was also a suggestion from one GDP that there be an additional facet for the setting category that reflected that someone might be reading on their way somewhere. This suggestion was adopted and an additional facet of “Travelling” added to the setting category for the study that followed.

Several dentists noted that, because they may not have been able to enter the knowledge encounter at the time it occurred (for example, if they were in the middle of seeing a patient), they might forget to enter it later. There was little that I could do about this with the web form. Asking GDPs to record the occasions when they come across information or an experience will inevitably only represent a fraction of the explicit and tacit sources of learning they encounter. However, even at this stage, the diversity of encounters reported offered insight into how dentists learn or confirm their knowing day to day.

4.4 Discussion

I designed a tool for clinicians to use the faceted classification to describe their knowledge encounters. I tested it using five scenarios and asking GPs to record their own knowledge encounters. Agreement between dentists on coding scenarios with the same facets was high in most cases. Dentists found the tool easy to use to record their own encounters.

To understand better how we can create knowledge encounters, that could lead to greater uptake of evidence-based practice, I think it would be helpful to understand better clinicians' existing knowledge encounters by recording and describing them as soon after they occur as possible. I could have asked dentists to record these using a diary, in which each encounter would be described in their own terms. However, I felt that important clues about the contexts of doing so would not be uniformly recorded and once more than a handful of knowledge encounters have been recorded qualitatively it would be very difficult to analyse them.

The classification developed previously helped me to describe the contexts that may influence the use of different evidences in practice and, therefore, to help organise them in a structured way. This could allow the recording and describing of many more knowledge encounters by many more clinicians than I could manage using qualitative methods alone.

Any classification system has flaws and will likely miss meaningful phenomena, but I feel that in developing a faceted classification I can move the science of understanding how clinicians develop their clinical practice forward, even if some of the rich

description achieved through qualitative study cannot be produced. The tool developed here is a first step in capturing the range of information and experiential knowledge that clinicians encounter, how they encounter it and how the resulting knowledge is used.

I do not think that it is possible to validate the tool in a conventional sense as the phenomena to be recorded are interpreted by individuals in unique ways. In stage 1 of this study I restricted the variation of personal experience by giving limited scenarios to check that GDPs were not describing similar phenomena in wildly different ways. However, I do not believe this approach is one of validation of the phenomena they experience in real life. What the classification can do is to describe the way in which each encounter was experienced by the individual. Each encounter is subjective and, as Stephen Billett has argued, subjectivity is central to “the personal process of construing, constructing, and responding to what individuals encounter in the world beyond them” [240 p. 6].

Electronic diaries and other electronic tools for recording experiences have been developing for many years to help characterise, for example, experiences of pain [231], tobacco and drug use [229, 241], and mental health [230]. Real time (or close to real time) self-reporting has been advocated as a means of overcoming, in particular, recall bias [234]. I am unaware of self-reporting being used to study how clinicians learn when in practice. Indeed, most of the studies that I reviewed in the previous study, were cross-sectional and relied on recall of information or experiential knowledge encounters. Those that rely on ethnographic methods were noted for the depth of their descriptions of such encounters but are extremely time intensive and

intrusive, limiting the ability to observe a diverse sample of clinicians as they experience knowledge encounters in different settings. I believe that, in using a self-reporting tool that allows clinicians to record knowledge encounters in any setting and at any time of day or night, whilst allowing for a more complex description of knowledge encounters through the use of a faceted classification, we will be able to sample larger populations of clinicians in diverse contexts and generate greater insights into how clinicians develop their knowing in practice.

4.5 Conclusion

I developed a tool to capture the quantitative and qualitative descriptions of knowledge encounters. I was motivated to use this approach by previous work on real time data capture that explored behaviours such as smoking and betting. As I write up this thesis, though, my perspective is that most of what we learn we are probably unaware of, and that we come to learn through our experiences with diverse practices too complex to capture in this way.

The tool itself proved to be most useful in capturing the qualitative aspects of the GPs' experiences, which became rich stimuli for in-depth interviews with them. However, developing and testing the tool forced me to learn more about the theory and practice of real-time data capture, design of tools to do this, working with no budget and the limitations of this method when exploring participants' lived experiences.

Chapter 5 A mixed-methods study of how GDPs come to embody knowing for and in practice

The content from this chapter was presented at a poster presentation in July 2018 at The Network for Practice-Based Research Session during the International Association for Dental Research (IADR) Conference, London entitled, “What Knowledge-in-practice is for General Dental Practitioners” [242]. (see Appendix T)

5.1 Abstract

Professional knowledge is critical to clinical care. Whilst knowledge translation strategies typically assume knowledge to be codified and explicit, other theoretical approaches take a broader view of knowledge as embodied, practical, craft-like and shared among communities of practitioners (mindlines). The empirical study of clinicians’ knowing in practice has, to date, received relatively little research attention. I undertook a mixed-methods study of how general dental practitioners (GDPs) develop knowing for and in practice, with a view to exploring and theorising the tacit, embodied and collaborative aspects of professional knowing. For one week respectively, 11 GDPs used the purposely designed web-based tool described in chapter 4 to record free-text descriptions of their knowledge encounters, and to classify these using a facet classification developed in chapter 3. The data collection was followed by narrative interviews with the GDPs to study their knowledge encounters over a week. I analysed the classification of knowledge encounters using simple descriptive statistics and qualitative data using the constant comparative method. I found that GDPs’ knowing for and in practice developed iteratively from the merging of an abstract, plastic component (reflecting the internalised routines of

clinical mindlines, case-based knowledge and codified knowledge) with a situated component manifested in the actual performance of case-based reasoning, and the generation of innovations-in-practice-in-context – the use of new ideas, practices and products to solve a unique here-and-now problem. GDPs drew on diverse sources of information and experience in varied socio-material contexts.

5.2 Background

Research interest in clinical knowing partly reflects its pivotal role in the quality of care. Much research on clinical knowing uses a knowledge translation or knowledge transfer model, which assumes that knowledge is (to a large extent) codified, explicit and directly informed by the findings of research studies such as randomised controlled trials [243-246]. However, other theoretical perspectives take a broader view of what knowledge or knowing is, both generally [126] and more specifically in clinical practice [31, 225, 247]. These perspectives depict clinical work as neither science nor art but science-informed practice [248] and consider the study of knowing in practice to be central to the analysis of clinical work. However, this knowing in practice is often poorly understood, little explored empirically and under-theorised.

Gabbay and Le May's ethnographic study of general medical practitioners supported a view of practice that was informed by mindlines – by which they meant a set of unwritten rules and assumptions about good practice that were tacit, socially constituted and contextually responsive [109]. Mindlines are an analytical concept, whereby internal and personal guidelines form within an individual clinician's mind.

They build iteratively over time through interaction with multiple sources of information and experience often garnered from their own practice, but also through interaction with professional communities of practice.

Contemporary clinical practice is not only an individual activity but a complex, inter-professional and inter-organisational phenomenon. Dentist X links to nurse Y, receptionist Z, specialist Q (perhaps in a different organisation), each doing aspects of a shared work programme with and for individual patients. Clinical practice also evolves through interactions with material objects [249, 250].

I undertook a mixed methods empirical study of how GDPs encounter information and experiences that help develop knowing of, for and in their practice. I had a view to capturing the full range of different types of information and knowledge they encountered, considered and generated. My focus included, but was not limited to, how GDPs access and use research evidence in and around a clinical encounter. I sought to explore and theorise the shared, collaborative aspects of professional knowing, recognising not just the contribution of other professionals to this, but patients and things, too.

5.3 Methods

5.3.1 Management and governance

This study was deemed out of the remit of NHS ethics and governance arrangements because NHS patients were not directly involved. The protocol (see Appendix J)

received ethics clearance through the University of Oxford Central University Research Ethics Committee (CUREC), reference number MS-IDREC-C1-2015-088, on 15/05/2015.

5.3.2 Study design

The study was a mixed methods study. The design was convergent [251], with the quantitative data from the facet classifications and the qualitative data from the encounter descriptions and interviews synthesized in the theoretical developments at the end (see Figure 5.1 below).

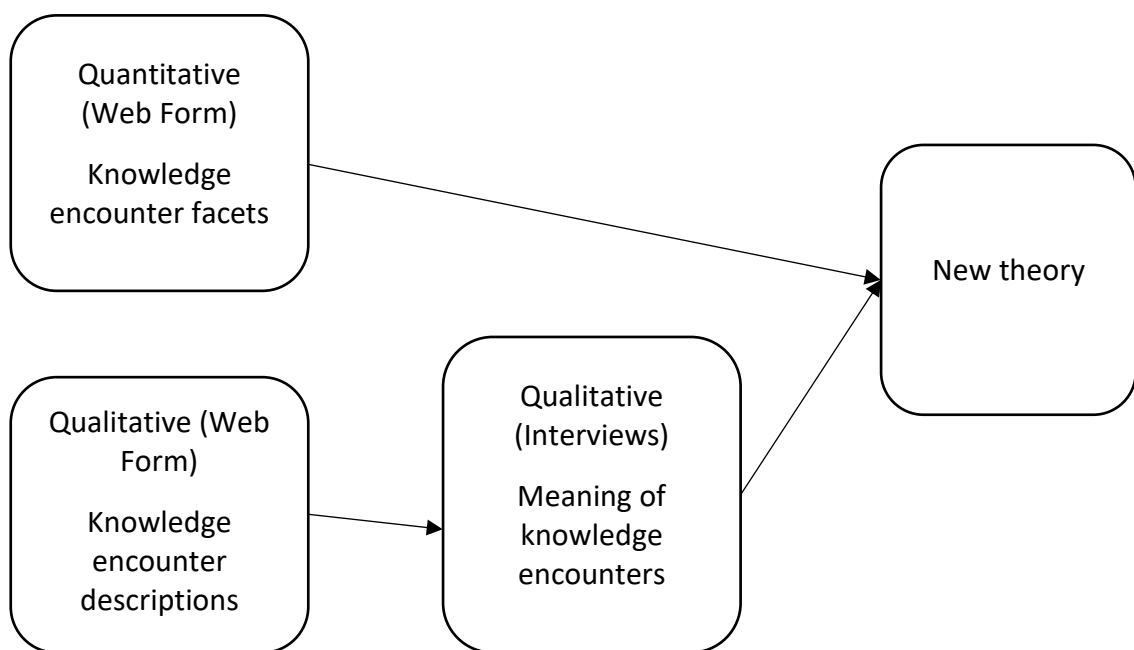


Figure 5.1 Convergent mixed methods study design

Both elements were exploratory in nature. The quantitative data was gathered to give an indication of what, where and how GDPs encountered new or confirmatory information and experiences. It charts the diversity of information, experiences and

socio-material contexts of the knowledge encounters. The qualitative elements sought to explore in more depth what GDPs experienced during the encounters and how these experiences influenced knowing for and in practice.

5.3.3 Sample and setting

In my protocol, I hoped to recruit 100 GDPs to take part in the web form stage of the study. This calculation was based on assumption that it would allow for a diverse sample of GDPs and, because of this, a diverse sample of knowledge encounters categorised using a wide range of facets to be recorded. Given the exploratory nature of the data, it was not based on statistical calculations.

From these 100, I estimated that I would interview between eight and ten GDPs based on recommendations from Creswell [251]. I had intended to purposefully sample these using maximum variation sampling [252], the purpose being to identify a heterogenous mix of cases based on demographics and, therefore, offer a greater opportunity to explore knowledge encounters from multiple perspectives. The criteria are in Table 5.1 below.

I used several different methods to try and recruit GDPs including via dental Facebook groups, dental forums, Twitter, personal contacts, and GDP Continuing Professional Development events.

Table 5.1 Criteria for maximum variation

Gender
Male
Female
Number of years in clinical dentistry
Regions of the UK
Dental qualifications
Number of practices worked at
Number of colleagues with whom participants come into contact each week
Remuneration models
Mainly/all NHS
Mainly/all Private
Mixed NHS & Private
Trainee Year 1 and non-trainee practices
With and without a hygienist working at the practice(s)
Number of hours of clinical work per week

I created a recruitment flier to post on websites and to print (see Appendix K), as well as a three-minute video explaining what the study was about, which was hosted online (see Figure 5.2 below). I also created a website hosted by WordPress, called The Knowledge Project, where I posted all documents for the study and blogs related to the research (see Appendix L). I linked to this from posts I made on Twitter, Facebook and in two popular dental forums, GDP-UK (www.gdpuk.com) (see Figure 5.3 below) and Dentinal Tubules (www.dentinaltubules.com), with their respective owners' consent. The largest single source of participants was the GDP-UK forum.

Recruiting: dentists who will share their knowledge encounters

As part of my DPhil research at Oxford I am hoping to recruit general dental practitioners from the UK who would be willing to record their knowledge encounters for a week and be interviewed for between 30 minutes and one hour about one or more of the encounters.

You can see what is involved in recording knowledge encounters [here](#) by working through a few simulations.

And as this is an educational activity for those participating everyone who takes part in recording their encounters and the interview afterwards is awarded **2 hours of verifiable CPD**.

Below is a 3 minute video introducing the study. I hope you'll feel motivated to join the endeavour and get in touch via the form below.



Figure 5.2 Screenshot of my project blog with explanatory video embedded

The editor of the Evidence-Based Dentistry Journal posted a summary and link to my study in the News section of the journal [253]. The use of social media, apart from as an attempt to recruit GDPs, also helped to generate interest in the project (see Figure 5.4 below). In combination with the blog, too, it enabled me to engage people in discussion about my research. For an example, see Appendix M.

When GDPs contacted me I sent them by email the participant information sheet (see Appendix N), consent form (see Appendix O) and a registration form (see Appendix P). Participants were asked to return these to me via email or post. Confirmation was obtained from The University of Oxford's Medical Sciences Interdivisional Research

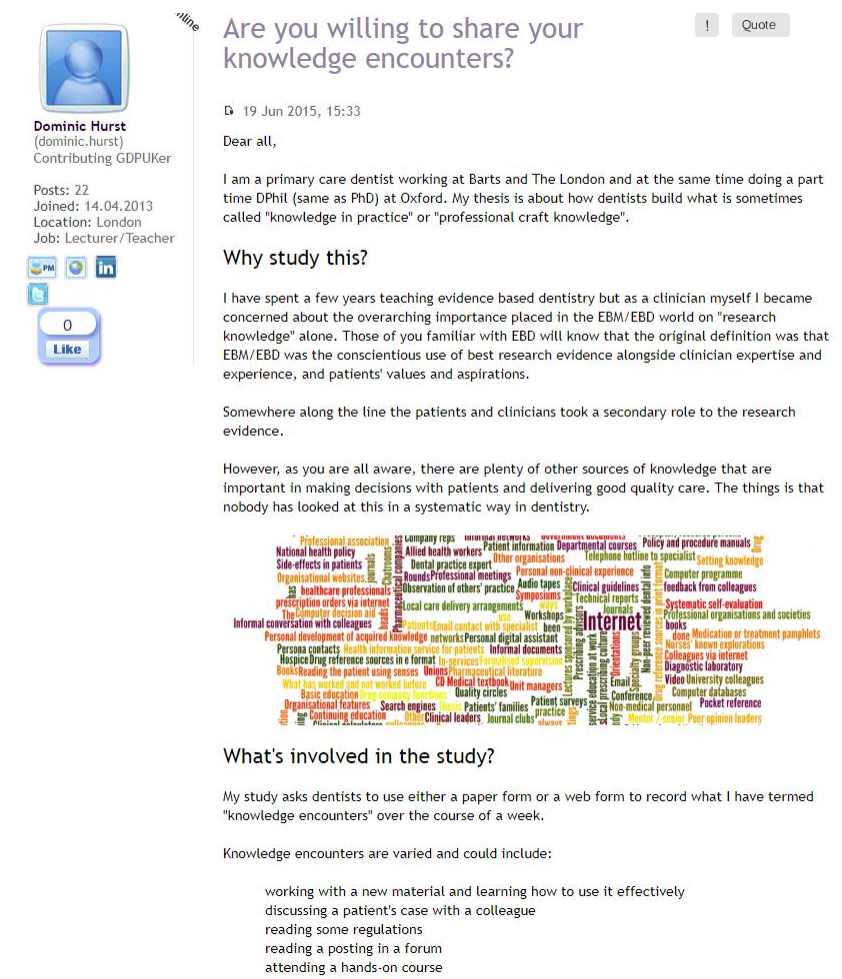


Figure 5.3 Screenshot of posting on the GDP-UK forum

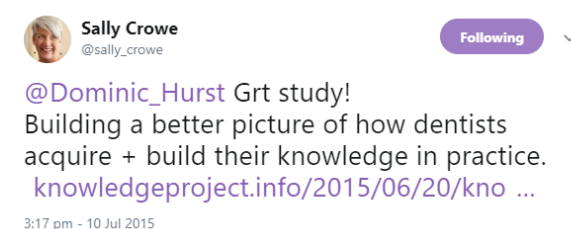


Figure 5.4 Tweet referencing a blog about the mixed methods study (Permission for reproduction granted by Sally Crowe, 21 07 2018)

5.3.4 Procedure

To familiarise participants with the facet classification, and to show them the range of experiences that were eligible to be recorded as a knowledge encounter, I developed an additional three scenarios to those for the testing of the web tool described in the previous chapter, making a total of eight, for each GDP to classify. As with the user-testers, the free-text box and final question about intended use was not included (see Figures 5.5 and 5.6 below).

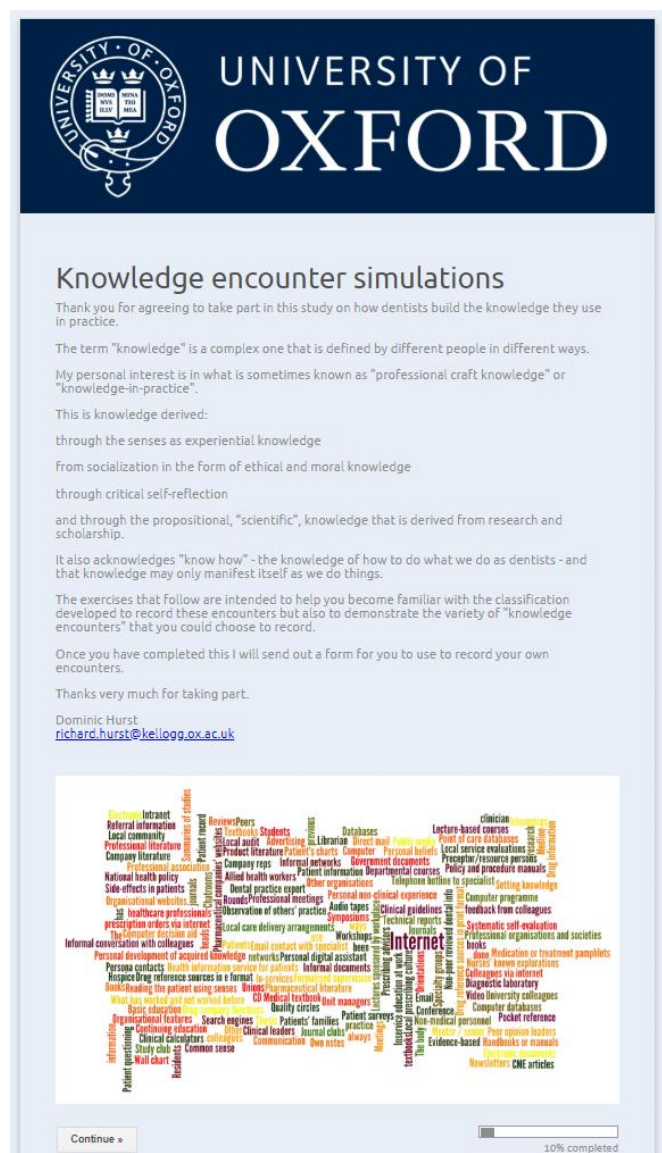


Figure 5.5 Screenshot of introduction to familiarisation exercises



Figure 5.6 Instructions for completing familiarisation exercises

The eight scenarios were:

1. Please imagine you are a dentist looking at this dental journal.
2. You are attending an implant course. You and three other dentists have observed the clinical stages of placing an implant.
3. You have looked through a discussion in a dental chat forum, a portion of which is reproduced below.
4. During a coffee break you pop into your colleague's surgery because you would like to know how they would manage a particularly difficult endodontic case. You discuss the case with the help of a couple of periapical radiographs and your colleague shares their opinion of how you should manage the case based on their experience.

5. After arriving back from work, you sit down and read some of the Care Quality Commission's "A fresh start for the regulation and inspection of primary care dental services" document.
6. You are using a new composite to restore an incisor. You initially find the material problematic to work with but learn to manipulate it effectively, producing a result you are pleased with.
7. You ask a patient whether they use tobacco in any way. The patient has returned from a few months in Sweden and has started using snus - a local variety of tobacco in a pouch, which you had not come across before. The patient shows you how she places it in the labial sulcus.
8. A sales rep you have known for years comes to the practice and shows you some new instruments.

The exercise, as well as orientating the participants to the classification and range of eligible encounters, also provided an inter-rater agreement score. There is some disagreement over the use of this in qualitative research but it has been used to explore the similarity of coding between researchers [254], for example, and so I felt it was reasonable to attempt to explore the similarity of classification by the GDPs of a restricted but interpretable "data set". This was intended to provide me with a sense of how similarly participants classified the scenarios, and to be conscious of the variability in classification when the GDPs classified their own encounters. Participants were not expected to classify the encounters in the same way, as their classification choices are assumed to be based on a personal interpretation of an experience. The

classification also forces a choice to be made when alternative facets could be used. Thus, if participants felt that two or more facets could describe the encounter, they might each select different facets. So, the reliability was measured to explore the variation, not to validate the tool.

An indicative inter-rater reliability or agreement was calculated from the number of matching facets divided by the total number of possibilities (11 for each scenario). I then calculated the average of these across the eight scenarios (see Figure 5.7). I did this calculation just to get a sense of the homogeneity between GDPs in classifying a limited scenario.

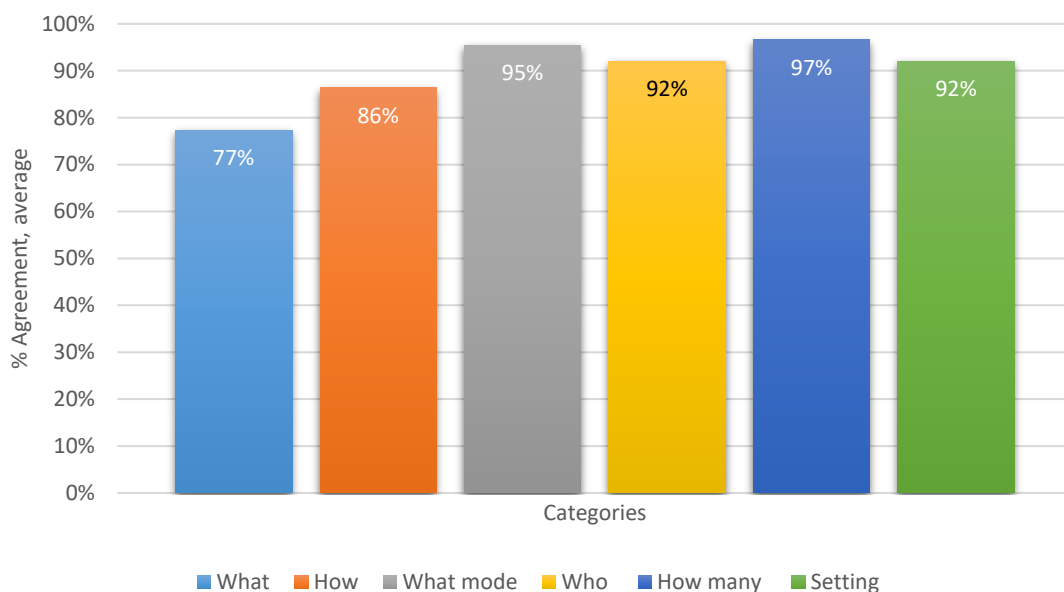


Figure 5.7 Average agreement between 11 GDPs of facets used to describe knowledge encounters in eight scenarios

The least agreement was for *What did you encounter?* But, otherwise, the 11 GDPs chose similar facets to describe the other categories. The variation in the “what” category may be due to the greater interpretive nature of the source encountered.

The other categories are relatively objective, e.g. how many people, the setting, etc.

But classifying what the information and experiences are is more subjective. Is a journal article describing a procedure codified or procedural knowledge? Is a salesperson conveying product or services information or research in their pamphlets and presentations?

Reading the entries that the GDPs made of their own encounters also demonstrates that in each encounter, as a complex phenomenon, there were multiple information and experience sources only one of which the GDP could code in this study. Different GDPs showed a different attentional lens, so to speak. For example, some recorded more detail about the patients, others more about their reflection, and yet others more about clinical techniques. Projecting that back to these simulations, even as highly constrained as they were, would mean different GDPs focusing on different aspects of them as they interpreted the simulations in their own way.

In Table 5.2 below, the coding of the different scenarios (columns) by the participants (rows) is consistent for half of them. However, in scenarios three, four, six and seven, there is some heterogeneity that includes the use of codified knowledge in a personalised form, experiential and procedural knowledge. This heterogeneity is understandable given that the interpretations of each scenario will involve participants diverse representations and dispositions, generated from a unique history of related experiences.

Table 5.2 Individual participants' classifications of the "What did you encounter?" category for the eight orientation scenarios (listed in body of text)

Participant	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
1	Codified knowledge	Procedural knowledge	Codified knowledge in a personalised form	Codified knowledge in a personalised form	Process or policy knowledge	Experiential knowledge	Experiential knowledge	Product or service knowledge
2	Codified knowledge	Procedural knowledge	Codified knowledge in a personalised form	Codified knowledge in a personalised form	Process or policy knowledge	Procedural knowledge	Procedural knowledge	Product or service knowledge
3	Codified knowledge	Experiential knowledge	Codified knowledge in a personalised form	Procedural knowledge	Process or policy knowledge	Procedural knowledge	Experiential knowledge	Product or service knowledge
4	Codified knowledge	Procedural knowledge	Codified knowledge in a personalised form	Experiential knowledge	Process or policy knowledge	Experiential knowledge	Procedural knowledge	Product or service knowledge
5	Codified knowledge	Procedural knowledge	Experiential knowledge	Experiential knowledge	Process or policy knowledge	Product or service knowledge	Procedural knowledge	Product or service knowledge
6	Codified knowledge	Procedural knowledge	Experiential knowledge	Codified knowledge in a personalised form	Process or policy knowledge	Experiential knowledge	Experiential knowledge	Product or service knowledge
7	Codified knowledge	Procedural knowledge	Experiential knowledge	Procedural knowledge	Product or service knowledge	Experiential knowledge	Experiential knowledge	Product or service knowledge
8	Codified knowledge	Procedural knowledge	Codified knowledge in a personalised form	Codified knowledge in a personalised form	Process or policy knowledge	Experiential knowledge	Experiential knowledge	Product or service knowledge
9	Codified knowledge	Codified knowledge in a personalised form	Experiential knowledge	Codified knowledge in a personalised form	Process or policy knowledge	Experiential knowledge	Procedural knowledge	Product or service knowledge
10	Codified knowledge	Procedural knowledge	Experiential knowledge	Codified knowledge in a personalised form	Process or policy knowledge	Experiential knowledge	Codified knowledge in a personalised form	Product or service knowledge
11	Codified knowledge	Procedural knowledge	Codified knowledge in a personalised form	Experiential knowledge	Process or policy knowledge	Experiential knowledge	Experiential knowledge	Product or service knowledge
Agreement	100%	82%	55%	55%	91%	73%	55%	100%

As a reminder, the scenarios (three, four, six and seven) with greater heterogeneity were:

- You have looked through a discussion in a dental chat forum, a portion of which is reproduced below.
 - a. Codified knowledge in a personalised form
 - b. Experiential knowledge
- During a coffee break you pop into your colleague's surgery because you would like to know how they would manage a particularly difficult endodontic [root canal] case. You discuss the case with the help of a couple of periapical radiographs and your colleague shares their opinion of how you should manage the case based on their experience.
 - a. Codified knowledge in a personalised form
 - b. Experiential knowledge
 - c. Procedural knowledge
- After arriving back from work, you sit down and read some of the Care Quality Commission's "A fresh start for the regulation and inspection of primary care dental services" document. [I found it surprising that none of the GDPs coded this as "Regulatory knowledge"].
 - a. Experiential knowledge
 - b. Procedural knowledge
 - c. Product or service knowledge (once)

- You ask a patient whether they use tobacco in any way. The patient has returned from a few months in Sweden and has started using snus - a local variety of tobacco in a pouch, which you had not come across before. The patient shows you how she places it in the labial sulcus.
 - a. Codified knowledge in a personalised form [This surprised me, but it is possible that this was interpreted by the GPs as the patient having read how to use snus (codified knowledge) and then personalised it as she showed how to use it.]
 - b. Experiential knowledge
 - c. Procedural knowledge

As mentioned in the previous chapter, I was influenced by the literature on ecological momentary analysis (EMA). This approach involves repeated sampling of research participants' behaviours and experiences in real time and in the participants' natural environments [234]. In EMA, one is concerned with sampling a participant's experience. Those experiences are of events that might be continuous or discrete [228]. Mood is an example of the former and smoking a cigarette an example of the latter [234]. It is important to determine what events one is trying to record experiences of, as it determines how one samples the experiences. Shiffman, Stone and Hufford described how they sampled the discrete events of smoking by asking participants to record these as they occurred, and sampling randomly to describe the continuous moods [234].

“Since episodes of smoking (“lapses”) were of key interest, subjects were asked to record any episodes of smoking as they happened and were then prompted to complete brief assessments of their craving, mood, and activities during the episode. On top of this, about five times each day, at random times, the electronic diaries also prompted, or “beeped,” subjects and administered a similar assessment. These assessments captured not only the events associated with lapses, but the flow of mood, behavior, and events in the hours and days before and after lapses.” [234 p. 3]

As I designed the study, I felt that, although many knowledge encounters might be considered discrete, e.g. discussing a radiograph with a colleague, there are others that might seem more continuous, e.g. internal reflections or sense-making after such a discussion, over an extended period. I would now not think of any knowledge encounter as discrete, as the sense-making that goes on after, and the interactions of embodied knowing from previous encounters with others, extends the life of an encounter indefinitely.

However, this was the way I was thinking at the time I designed the study. I toyed with using a similar approach to that taken by Shiffman et al above of asking GPs to record the times they were conscious of an encounter and then randomly prompting them throughout the day, if there was something they had encountered.

I explored alternative ways of generating random prompts for participants to record their knowledge encounters. These included the use of mobile phone applications that randomly remind users to do things, random SMS text reminders and random group

emails. However, at the time, I was expecting to have many more participants than I did and none of these options were feasible for me to set up or manage on a day-to-day basis. For practical reasons, therefore, I had to choose to sample based on GDPs' recall and to non-randomly prompt them over the week when I had time (I was working clinically 3-4 days a week during this period), to record their encounters.

I had initially intended to ask participants to record their knowledge encounters for one week on three separate occasions. My rationale for this, based on my reading of the EMA or real time data collection literature, was that it would improve the chance of gathering a more representative sample of encounters from each participant. For example, if a GDP had attended a conference during the week of collection, this could mean that their encounters were unrepresentatively dominated by encounters that take place in an educational or research setting. If they recorded encounters at other times, they might be expected to gather encounters less influenced by the conference. However, I decided to limit the data collection to one week because the quantitative element became less important relative to the qualitative due to the low recruitment, and because it was hard for some participants to collect the data over one week, yet alone two more.

Once the GDPs had completed the orientation, they were asked to choose a week when they would be able to record their own knowledge encounters. There was no stipulation which day of the week this should begin, so long as it ended seven days later. Each GDP was provided with a link to their own web form. I removed the introductory pages so that, as soon as it was opened by them, they accessed the form to record their encounter. I wanted to minimise the time it took participants to record

their encounters, and after the orientation there was no need to introduce the study each time they wanted to record an encounter.

As well as the web form, the GDPs were offered the form in paper format (see Appendix Q). One participant used this, and one chose to record her encounters in her paper diary using the facet classification guide to code them there. She then uploaded them all onto the web form at the end of the week. The GDPs collected their knowledge encounters for one week.

Descriptions of the knowledge encounters were extracted from the spreadsheet associated with each encounter and collated for use during the interviews.

I arranged a time as soon after completing the allotted week as possible, to interview participants. This was usually one week later. Interviews were conducted in person (n=1), over the telephone (n=1) or using Skype (n=9). My interview guide was limited to asking participants to tell me the story around each of their knowledge encounters (see Appendix R). At the start of the interview consent was confirmed and the participant was reminded that it would be audio recorded.

Wherever possible, narratives were not interrupted. If there was a pause, then I would probe for more reflection or to clarify descriptions or move on to another encounter. Not all knowledge encounters recorded on the spreadsheet were discussed by the participants, due mainly to the restriction on time and the narrative format that allowed participants to talk at length about individual encounters that were of importance or interest to them. Due to the informal nature of the interview there were periods when the interviewee prompted conversation with me, for example, by

asking what I thought about something, or what my experience was of something, they had discussed. This was not resisted but I took care to limit expression of my own views so as not to influence the interviewee's account.

An example of using a recorded knowledge encounter to prompt a participant's narrative is given in Figure 5.8. Interviews were recorded on a digital recorder and transcribed by me. All participants were given fictitious names and identifiable features of their practices, towns or other indicators of where they worked, were removed from transcripts to ensure anonymity.

Knowledge encounter recorded by Jason

"Patient explained to me how she had been shown by the Oral Medicine consultant at the Dental Hospital how to manage her topical steroids for atrophic lichen planus".

Interview transcript

[DH]: so...one of the things you popped in there was how a patient explained how she'd been shown by an oral medicine consultant at the dental hospital to manage her topical steroids. Could you talk... could you talk through that?

JASON: yeah. Well this was a lady who got a spasmodic lichen planus... [more of this narrative is reproduced below]

Figure 5.8 Worked example of using a participant's knowledge encounter to stimulate a narrative

5.3.5 Theoretical framework

I drew on several linked theoretical perspectives, all of which have in common the embodied, tacit and collectively shared nature of professional knowledge, including (in addition to the theory of *mindlines* described above [109]) theories of case-based

reasoning, diffusion of innovations, socio-materiality and the sociology of collaborative routines. These are introduced briefly here and will be discussed in more detail in the results section.

Case-based reasoning theory takes the view that clinical decision-making is neither a science nor an art but a situated, science-informed ethical practice in which the overriding question is “what is the best thing to do for this patient, in these circumstances at this time?” [248, 255]. It involves solving problems by retrieving previously-encountered cases to compare a new case against; reusing solutions from those cases; revising the solutions in the context of the new case; and retaining the solution within a case base [255] using understandings of morality and professional judgement [248]. Case-based reasoning takes a narrative form in clinical practice and enables clinicians to remember and to share learning from experiences, as well as codified knowledge sources.

Innovations were defined by Everett Rogers as ideas, practices or objects that are perceived as new by an individual even if not recently developed per se [256]. Rogers’ diffusion of innovations theory proposes (among other things) that adoption of an innovation by an individual involves development of awareness (often via the mass media) followed – perhaps some time later – by persuasion to change, usually via interpersonal influence when someone of similar professional and social background adopts the innovation [256].

Socio-materiality theory proposes that the social and the material are best conceptualised as interlinked and mutually constituted [257]. Material objects, and

their affordances (potential to “act”), create structure in our worlds and grant significance in arguments and deliberations. Ideas (e.g. rules, policies, guidelines) can be “made material” when they are put into practice (or “performed”). The concept of materiality can be for “those things that are pertinent to the case in hand” [257].

Socio-materiality envisages an ongoing interaction between humans and material phenomena. Associated with this is *bricolage* – the creative, adaptive use of resources at hand, recombination of these resources for new purposes and making do [258]. The *bricoleur*, in contrast to the *ingénieur* (whose knowledge is abstract and generalisable), develops their knowledge through personal encounters with objects, ideas or spaces, develops know-how and is able to cobble things together [259].

Organisational routines theory proposes that much work in organisations (and across organisations) involves repetitive patterns of interdependent actions involving multiple actors. These routines are a source of organisational stability but (since they depend for their execution on the agency and creativity of human agents and are inevitably enacted differently each time) they also contain within them the potential for evolution and change [70]. Routines are made up of two mutually-constituted elements, i.e. ostensive and performative. Ostensive routines are abstract patterns or mental schemas, whilst performative routines are the specific actions taken by actors in a particular situation [70]. Both differ from the routine that is formally codified in a standard operating procedure, guideline or protocol (known as the proxy routine). I took the view that the individual routines (or habits) followed by clinicians also have an ostensive, performative and proxy dimension.

5.3.6 Analysis

The constant comparative method was used to analyse the qualitative data [260]. I read and re-read transcriptions, and themes were generated inductively from the text, drawing on the theoretical perspectives described above. The narratives were rich, and large sections of a given story were sometimes highlighted as a code or sub-theme.

One transcript was independently analysed by my supervisor with an extensive discussion about the initial codes and themes. Further transcripts were analysed in full by me, with my supervisor analysing selections from them. Descriptive themes of how knowledge is used and created were generated from the codes. These were fed back to the participants via email and comments sought regarding the fit of the themes to their concepts of how they use and generate knowledge-in-practice. Where participants suggested greater emphasis on one or more themes, or where greater clarity seemed to be needed, this was incorporated into the thematic analysis.

As the analysis emerged, this prompted me to explore further literature, which in turn fed more theoretical concepts back into the analysis. Examples of the analytic approach are given in the results.

As the quantitative data was intended to provide an overview of the diversity of ways in which knowledge was encountered, it was analysed using simple descriptive statistics. I used an Excel spreadsheet to record all the encounters and their respective categorisation by participants. I then used pivot tables to calculate the percentage of each facet used for each category. From this data, I produced simple pie charts with

the percentages of each encounter. The quantitative data is synthesised with the qualitative in the results section to demonstrate the variety of knowledge encounters.

5.4 Results

5.4.1 Participants

Recruitment of GDPs was more difficult than I had anticipated. 16 participants initially consented to participate in the study but (largely because of time constraints) only 11 went on to record their knowledge encounters and be interviewed. In the protocol I had intended to sample from 100 participants to interview. Due to the low numbers, I interviewed all participants who used the web form.

Table 5.3 Participant characteristics

Gender	Number of participants
Male	5
Female	6
Median number of years in clinical dentistry	14 years (range 1-27 years)
Highest dental qualification	
Bachelor	10
Masters	1
Number of practices worked at	
1	9
2	2
Average maximum number of colleagues they came into contact with in a week	12 (range 1-20)
Dental Foundation Trainee Year 1 practice	
Yes	4
No	7
Hygienist working at practice(s)	
Yes	6
No	5

There was a balance in the number of males and females and distribution of participants to different regions of England, and Scotland (see Table 5.3 above).

To help orientation when reading the quotes presented in the results section, Table 5.4 below lists GDP pseudonyms with a limited set of demographic data.

Table 5.4 GDP pseudonyms and selected individual demographic data

GDP pseudonym	Years in clinical dentistry	Remuneration	UK Region	Average hours of clinical work / week
Aaron	23	Mainly/all NHS	London	28
Anita	1.5	Mixed NHS-Private	West Midlands	16
Annabel	9	Mainly/all private	North West	32
Archie	27	Mixed NHS-Private	North West	30
Claire	14	Mainly/all NHS	South East	38
Gemma	1	Mainly/all private	Scotland	24
Jane	23	Mainly/all NHS	Yorkshire and the Humber	28
Jason	25	Mainly/all NHS	South East	35
Linda	5	Mainly/all NHS	South East	21
Phil	1	Mainly/all private	North West	32
Robert	22	Mainly/all NHS	London	32

5.4.2 Knowledge encounters

A total of 100 knowledge encounters were recorded by the 11 GDPs, a mean of 9 each, over the week (see Appendix S for full list). The depth that each encounter was described in varied depending on the participant. In some cases, the description was minimal and in others extensive. Two examples are shown below:

“Reading Dentist magazine.” (Robert)

“I was due to see a family of paediatric patients that were known to social services. There had been difficulties in contacting the family and trying to get them to attend appointments. I was not sure of the University's Safeguarding Policy so downloaded from the intranet (at work) and familiarised myself with the procedures. After reading the policy document I felt reassured that I knew how to raise any safeguarding issues and to escalate any concerns should the family miss the appointment. Fortunately they all attended.” (Claire)

Encounters recorded were diverse and involved coming across (see Figure 5.9 below):

- Codified knowledge e.g. “Read an article in the BDJ [British Dental Journal] titled “Why are vulnerable children not brought to their dental appointments?” (Claire)
- Codified knowledge in a personalised form e.g. “A dental friend of mine phoned for a catch up. She told me about a patient in which she displaced an apex of their UL6 [upper left first molar tooth] into the maxillary antrum [when extracting the tooth]. She sought advice from the local Oral and Maxillofacial Surgery Dept who advised her to refer the patient in to them.” (Annabel)
- Their own and others’ experiences e.g. “Polishing of composite [a white dental filling material] method alterations - using sofex discs [a type of polishing disc] in combination with polishing points resulted in a better overall finish [compared] to the composite system currently in use in the practice and allowed to introduce better tooth morphology.” (Phil)
- Procedures e.g. “The procedure required for crown lengthening with bone removal.” (Gemma)

- Processes and policy e.g. “Learned what the current referral protocol at the local dental hospital is.” (Aaron)
- Products and services e.g. ““Lunch and learn” at the practice run by [sales] rep from 3M. Explaining about new composites, abrasives and adhesives (and trying to sell them!).” (Jason)

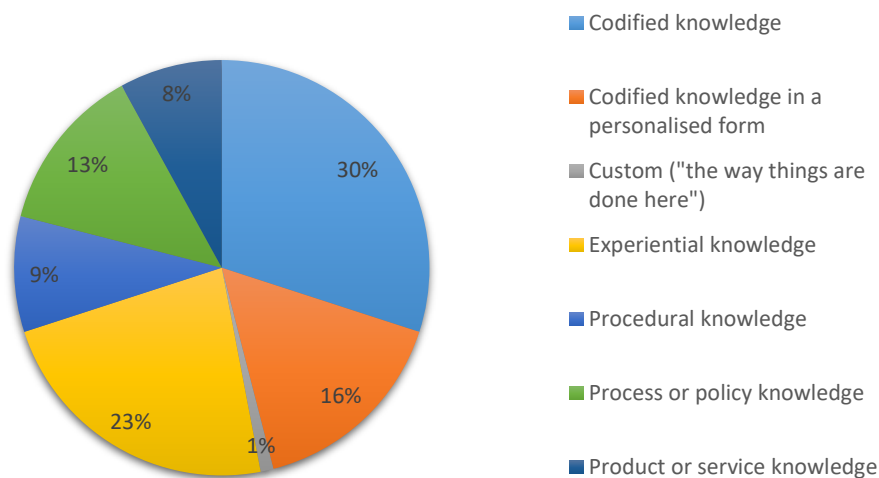


Figure 5.9 What knowledge was encountered?

The encounters were with information and experiences derived from (see Figure 5.10 below):

- Educators, e.g. “ESE [European Society of Endodontics] lectures” (Archie)
- Employers, e.g. “Email received from the trust to say that referrals are now only to be made using online gateway and informing of contact details.” (Jane)
- Non-practitioner colleagues, e.g. “Scared that I am fitting someone else's denture. Support from laboratory required.” (Robert)

- Patients, e.g. “Patient explained to me how she had been shown by the Oral Medicine consultant at the Dental Hospital how to manage her topical steroids for atrophic lichen planus.” (Jason)
- Fellow practitioners, e.g. “A study day was conducted presenting multiple treatment plans and cases each trainee had prepared during their year. It was useful to see what the different cases were and how colleagues went about treating the cases, and in particular photographs of their work.” (Gemma)
- Regulators, e.g. “Read gdc [General Dental Council] bulletin on mobile phone at work. Was emailed and clicked link to read it.” (Jane)
- Researchers, e.g. “Reading a journal on Magnifying loupes Vs microscope in Endodontics surgery in BDJ.” (Linda)
- Salespeople, e.g. “Oral B representative came to the practice for a lunch and learn session in which information about electric toothbrushes and toothpaste was discussed.” (Gemma)

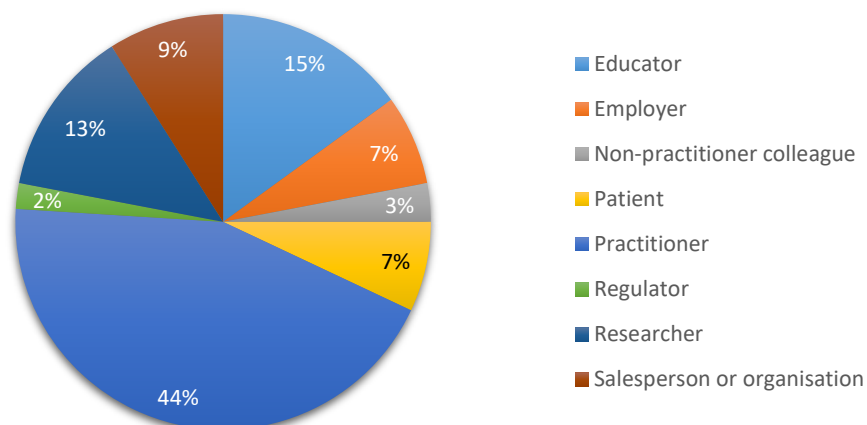


Figure 5.10 Who communicated the knowledge?

These encounters took place in groups, in couples and alone (see Figure 5.11 below) and, whilst most commonly occurring at work, also occurred at home, in educational and social settings (see Figure 5.12 below).

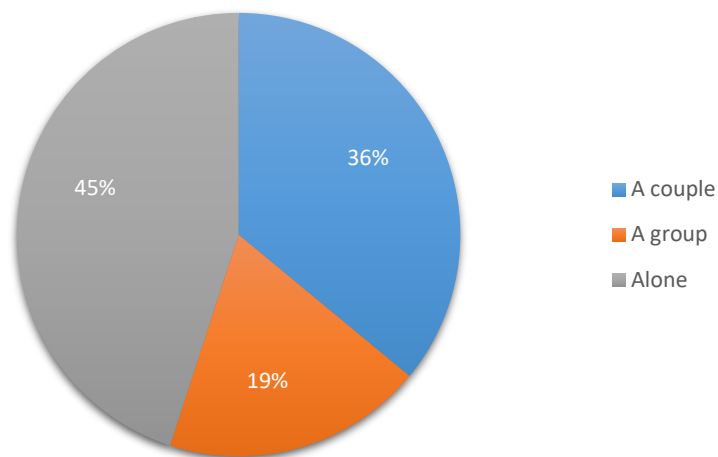


Figure 5.11 How many people?

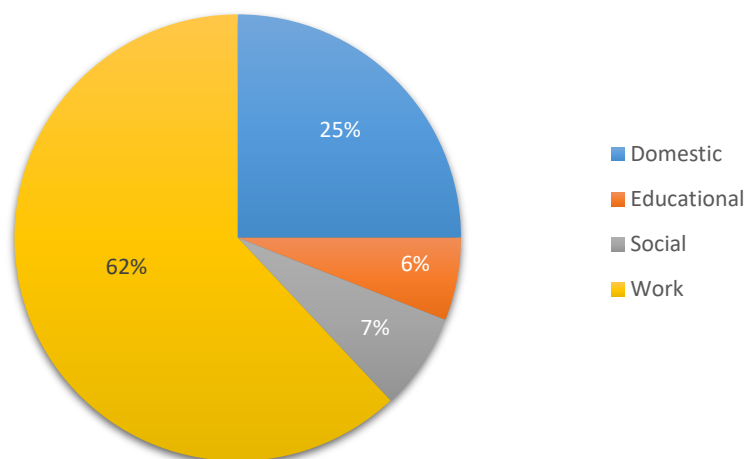


Figure 5.12 What setting?

Encounters occurred verbally, visually, and through writing, touch and internal reflection (see Figure 5.13).

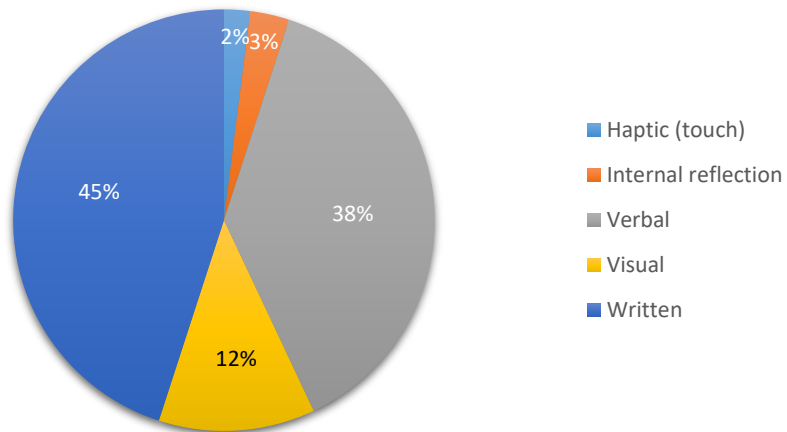


Figure 5.13 How was it communicated?

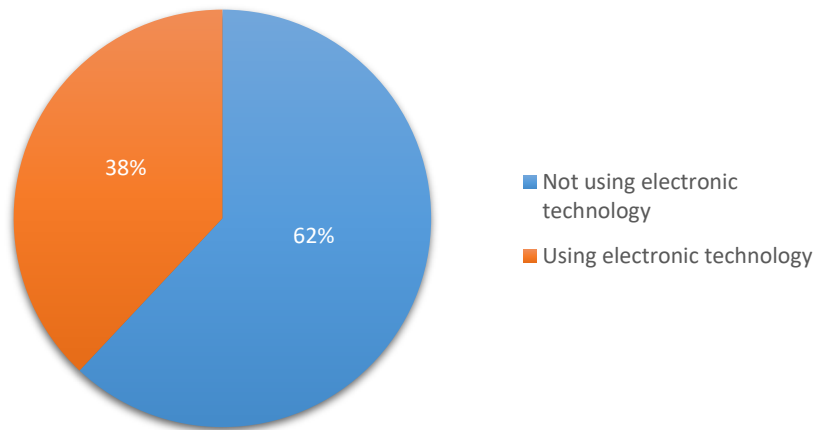


Figure 5.14 What mode?

Approximately 2/3 of encounters were without using electronic technology (see Figure 5.14 above), and GDPs recorded that they would use most of the knowledge they had encountered either instrumentally or conceptually (see Figure 5.15 below).

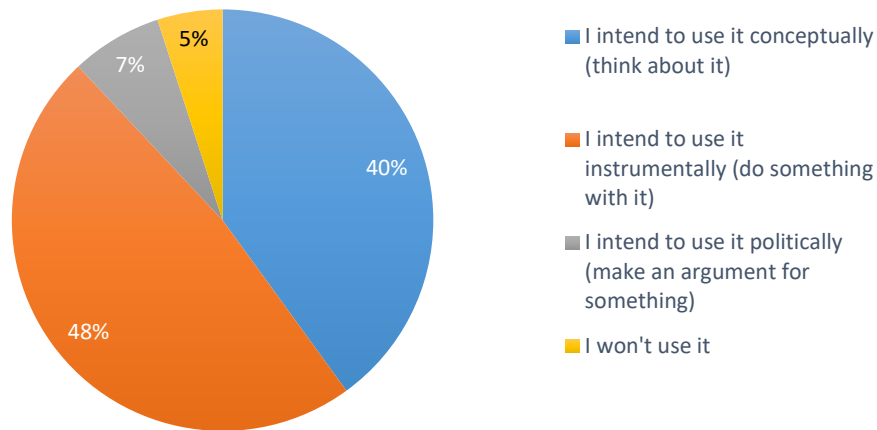


Figure 5.15 Intended use

Together, these recorded facets indicate the range of ways in which the GDPs came across new or confirmatory learning experiences.

5.4.3 Summary of main themes

As I read and re-read the transcripts of interviews to try and understand how GDPs' knowledge developed in practice, I was struck by several recurring themes.

First, knowledge encounters were situated and strongly influenced by the local, moment-by-moment unfolding of events and actions. My follow-up study would allow me to explore this in real time, as I was dependent here on self-reporting.

Second, much GDP learning occurred from cases seen in the past by themselves or their colleagues, which was applied to new cases in the moment of practising.

Third, the application of knowledge to cases was shaped by the physical and material aspects of the case before them and the constraints of time and space.

Fourth, much of clinical work followed well-rehearsed patterns (what might be called professional habits or, if others were involved, collaborative routines), which were sufficiently plastic to accommodate innovation and learning.

In summary, practitioners' case-base understandings and routines appeared to evolve through the interaction of storytelling or narrative, collective sense-making, embodied understandings and the materiality of experiences. Below, I consider each of these themes in more detail.

5.4.4 The situated nature of knowledge encounters

Each dentist encountered the world (and, more specifically, knowledge) from a local, situated perspective. If we take context to be the elements of the wider environment that human actors perceive as salient to a particular here-and-now socio-material situation, recurring elements of context included their experiences of interacting with their patients, staff, colleagues and systems; their perspectives on time in its many manifestations; the material properties and affordances of the tools and materials available to them, and the spaces within which they worked and lived.

"I think it's fair enough to say that me as a dentist can take that tooth out... we have umm... oral – oral-maxillofacial surgery in [town name] in [hospital name] hospital. But the waiting list is quite long. Patient has to go there for a consultation and then come back again to have an INR done and come back the third time to have the tooth out. It's like three visits." (Linda)

“Sometimes at 3:30 / 4 o’clock the nurse is rattling around wanting to go home, the doors are clattering, everyone can see the finish line [chuckles], you’ve got to still stay cool.” (Robert)

“...it’s difficult trying to... yeah you’ve got this policy document of best practice and then trying to transfer that into your personal practice in the NHS or whatever it is... you just try and...do the best you can really.” (Claire)

5.4.5 A practical, case-based reasoning

My data supported previous research on clinical knowledge and reasoning, in that my participants considered each patient as a case which was, consciously or subconsciously, compared against a personal understanding of similar cases or what might be called a case base. That is, an internalised database of previous and comparable cases.

“Then the oral cancer one – that was – that was amazing. I think when I qualified they said you would see one oral cancer in your career and err... I’ve seen about three or four now. And umm... apart from this one last week they were all fairly minor. Well, you know, early stage umm... I think one was a carcinoma-in-situ and that was fine, that was dealt with but this one was like a proper full on fungating growth in the angle of the jaw.” (Aaron)

GDPs’ case base was built up not merely from their own experience of similar cases but also from the narratives (stories) of cases shared by other GDPs. The GDPs generally consulted with colleagues, either face-to-face or virtually, when they faced a

here-and-now problem about what to do with an individual patient. They sought collective problem solving (what to do about this patient, now, given these circumstances) rather than some form of codified knowledge (e.g. a guideline about what to do for patients in general). This was a crucial part of their case-based reasoning.

“[Y]ou know she was a good wee kid and when she was about four she smacked her A [upper central baby incisor tooth] and we managed to... you know... she sat for me to open it out and keep it but it then... it looks like it died... but... you know... it’s sort of... the other one was differential in heights... so I was thinking... now do I actually actively need to take this out now or can I... am I still ok to leave it... sort of thing. So, I had taken a radiograph and chatted to the principal in the practice, you know... Whoever is there at the time will... chat about whatever is going on. So, there is three... three GDPs... because we have a VT [vocational trainee] now as well... yes, so we just put our heads together I suppose... it’s probably... So, it’s probably not like fresh learning but it’s sharing experience of “what do you do in that situation and do you think that’s the right thing to do...” kind of approach...” (Jane)

Cases were multifaceted, contextualised and developed around problems. In other words, in their narrative of a case, the GDPs might refer to different facets such as the system within which the case presented, personal characteristics of the patient, aspects of the problem itself, the perspectives of colleagues consulted about the case, alternative solutions considered, and outcomes of decisions made, and clinical techniques used.

“So there was a case [on a Facebook discussion group which only GDPs were eligible to join] where umm... as in they put photos as well – posted – and he was walking through the steps of umm repairing umm a fractured – I think it was, I don’t know, either a bridge or crown but it was umm porcelain fracture umm on a front tooth. I think she – the patient – had a wedding or something and she was in an emergency so she really wanted a quick repair and he repaired it with some composite. And it looked quite good afterwards, at the end and I...as in I’ve – I’ve had this situation and umm I think it was in my VT year and I asked my trainer and he said that umm it’s quite difficult to bond to umm porcelain.” (Anita)

GDPs tended to seek the perspective of professional colleagues, particularly when the colleague appeared to share a common experience of practice (what Rogers would call homophily [256] and others have called peer opinion leaders [261]) or where they shared a level of practice to which the GDPs aspired (what Rogers called expert influence [256] and others have called expert opinion leaders [261]).

“But I suppose you would only ask people that you would feel comfortable in approaching them as well. Umm... I don’t know if in doing so subconsciously you’re just picking people that you know... is pretty much what... similar practitioners to yourself... umm... I think you know they’ve got the experience. Umm... that they’ve... it’s just that you’ve seen their work as well that you go, they’re probably... they are [a] similar type of practitioner to what I am so maybe you would approach them rather than someone...you probably wouldn’t want... to be treated yourself by.” (Claire)

GDPs' accounts of their knowledge encounters illustrated how they frequently had to find solutions to problems in which there was incomplete information or experience, requiring them to muddle through or not do anything.

"...making an informed judgement about what's safe to do gets more and more difficult. And you know I saw a patient just this morning who has got a terrible psoriasis problem and they've been on big-time immunosuppressants... and... ideally you [the patient] need[s] to have a tooth out or root-filled and I'm really not quite sure what's safe to do... What should – you know – what's gonna be safe?". And the problem is so many of these new immunosuppressants and umm... Cytokine inhibitors... there isn't the body of knowledge... Nobody knows because it's so - it's so new. Nobody will be the first person to do anything will they?" (Jason)

Whilst GDPs frequently discussed such difficult cases with peers either face to face or on social media, it was also clear that they saw themselves in some senses as independent professionals, taking sole professional responsibility for the decisions they made with patients. Such decisions were made within a moral framework and necessitated judgements to be made, both key to case-based reasoning [248].

"So the courses umm...training umm... extra courses – diploma postgraduate studies, all that – and that enhances it [the dentist's skills] but afterwards we're pretty much going to practice, like, just the patient, the dentist and the dental nurse. That's how we work I think." (Linda)

5.4.6 Learning within habits and routines

What Gabbay and Le May call knowledge-in-practice-in-context (the knowledge used as GPs did dentistry) was manifested as performative encounters with patients. In the way that they described them, the personal habits and collective routines of general dental practice were performed in a highly patterned way. However, their activities also varied from case to case as each dentist responded adaptively to individual cases and contexts. This is illustrated by the quote below from Annabel:

“She had it [Bell’s Palsy] on both sides – one of the sides she’d been given [topical] prednisolone and that was the side that didn’t seem to be affected any more. You can’t see anything physically and on the other side... she was pregnant so her GP said “oh, we can’t give you prednisolone” so that was the bit I looked at [in the BNF] – whether it was safe in pregnancy or not. And... And it seemed to be the safest of the corticosteroids to take umm so I don’t know whether she was given that advice because the GP was being extra cautious... I was just doing her medical history with her and stopped and looked at her face properly and I asked her what had happened because one side was clearly a little bit more droopy than the other umm... and she explained she had stopped taking it when she was pregnant however long ago. So yeah that came about by me just talking to her and seeing that one side looked a little bit more paralysed than the other side.” (Annabel)

In the above quote, a knowing arises as Annabel interacts with the patient and the materiality of the medical history form and BNF. The medical history and clinical examination are the routines that Annabel follows, but there are numerous ways in

which knowing develops iteratively as they interact in this encounter. She notices the difference in appearance on one side of the face, which is a form of aesthetic knowing. The patient tells a story that links her prior condition, topical medication, pregnancy and GP. Something does not seem quite right for Annabel, she has a form of intuitive knowledge that the medication withdrawal is not quite right. Her interaction with the BNF and the codified knowledge translated into it, confirm her suspicions.

Thus, the habitual practice of checking a patient's medical history and the opportunity to examine the patient informally (I would presume by sitting in front of her as she asked the questions) provided a framework within which Annabel (and perhaps the patient) was able to learn.

The example illustrates a more general phenomenon in my data that is in keeping with Gabbay and Le May's observations, that the knowing that GDPs come to embody, was acquired from multiple sources and progressively enriched as they sought specific pieces of information to help them solve cases in the here-and-now.

My data also illustrated how the case-based learning that occurred within clinical routines sometimes included a form of technical learning involving trial and error to solve problems or improve solutions (see discussion of *bricolage* below). This sometimes resulted in small innovations – new practices or ideas that the GDPs generated themselves – which then became routinised in a more general way (akin to what organisational sociologists have called *ostensive* routines [70]).

“Under rubber dam. I’ve cleaned the caries out, I’ve got it nice and dry and I’ve done an initial prep [preparation] on the canals but not to length so that it

gives me a little bit of engagement. I cut the GP [gutta percha, a root canal filling material] cones that are “O” 4 taper [04 taper – the size of the cone] down a little bit from the tips so they’ll just fit into the orifices of the canals. Band on [matrix band – used to hold fillings in place as they set] and then I use dual cure composite [white adhesive filling material] filler a bit like Haricore [brand name] and syringe that in around the blanked out [canals]... and fill it right up. Then once it’s set you can just pull the GP cones out and you’ve got however many holes left into the canals. I then countersink them a little bit because I found that having four separate holes was difficult to seal so it was easier to join the tops of them up and put one plug in the top.” (Archie)

These incremental improvements in the technical aspects of dentistry were sometimes initiated when GDPs encountered external information that affirmed the change (e.g. after attending a course or reading guidance) and were more likely to be incorporated into their routines when the changes were relatively small and required relatively little adjustment to an existing pattern of practice – aligning with Rogers’ observation that innovations with high compatibility (with existing practice) and low complexity were more likely to be adopted [256].

“I mean basically he [speaker at endodontic conference] said – he said you need umm... 6% [sodium] hypochlorite. Well most of the stuff that you get – well if you’re using Milton it’s only 2% and err... you know – the sort of commercial ones you buy at a variety of concentrations but we weren’t using 6% and in fact we were using Milton so just changing that has perhaps made a difference.” (Aaron)

What I saw repeatedly was that individual routines interacted with colleagues' routines, both within and between practices or organisations. At times this interaction was a source of frustration. In the example below, Claire, having read a journal article, has developed an ostensive routine for how to manage children who have failed to attend more than two appointments, but this approach may be in contradiction to the performed routines of the receptionists booking appointments.

"...but I think also, I mean, there's a strict policy for adults, you know, that they... 2 DNAs [Does Not Attend] and they umm... you know they're off the books. But I think for children I think we're more flexible with children. It's slightly different with children...it's the adult's responsibility to get them into the clinic umm... but it's just trying to... uhh... get that message out to the reception team because they follow the [reception] protocols and are a bit inflexible, you know, and err... you're trying to explain to them they're actually under 16 and there's got to be a bit of leniency."

At other times, the routines were beneficial to all parties, as in this example, when Robert describes how GDPs in his area send patients to him to have dental panoramic radiographs (OPG) taken:

"What we've found in our practice is that other practices know that we can do that so they send people here for their OPGs... so every week we are taking at least two or three OPGs a day for other people's patients from other practices and emailing the images back out" (Robert)

Individual ostensive routines appeared to be embodied knowing of past experiences of practices. There was an embodied knowing bound up within them that could be translated into performative routines as they interacted with what others enacted. Each participant in a performance attempted to translate their respective ostensive routines. In practice, all routines are collective or collaborative as everyone and everything interact. As can be seen in the two quotes above, some of the collective performed routines worked well for patients and professionals (Robert's quote) and others less so (Claire's quote).

5.4.7 Learning was often unplanned and linked to emerging cases

I found that learning was for the large part unplanned and often serendipitous. The embodied knowing of practice would change because of the interaction with cases as described above. As such, the GDPs did not know what that learning would be before it occurred.

“Well this was a lady who got a spasmodic lichen planus... I hadn't realised – she's – she's seen in the oral medicine department at the dental hospital and they see her about every six months – yeah - but mainly I help her more than anything else and we pretty much got it sussed. But...ummm... She does get the occasional flare-up and when she does they prescribed her Dermovate cream which I suspect is like the equivalent of Betnovate that we used to put on – put on our skin back in the day. And they literally tell her – which I'd never heard of

before - to literally rub Dermovate cream on to her gum and the sore area.

Which I'd never come across before.” (Jason)

Even when learning was not linked to the management of particular cases it often had a somewhat ad hoc characteristic. For example, GDPs’ knowledge encounters included case narratives shared by other GDPs and information that they happened to come across or were referred to by someone else.

“There are obviously good medical reasons for that, I presume umm... but unless you’ve actually come across or – I mean – actually my wife had been on a course and learnt about all these things and she said ‘ooh have you heard about all of this’ you know. So, you pick up that these things are out there and that we need to be aware of it umm...” (Aaron)

GDPs’ development of embodied knowing of practice was often achieved without them being aware of it. This was perhaps not surprising given the dynamic nature of working in practice where GDPs encounter multiple sources of information and experiences daily. Interviewees might say they had not learned anything after talking through several cases, even though it was evident to me that these cases had led to new embodied understandings that they had enacted. Aaron, for example, had discussed (in the above quote and elsewhere) how orthodontists were managing patients differently, how oral cancer referrals had been changed, and the prognosis of a patient seen with a colleague through the latter’s narrative of a similar case she had seen in hospital – all within a week. Despite the evident ongoing learning, Aaron commented:

“And – you know – the thing that surprised me in a way was how little of that [learning] I seem to do now. I mean you will do – you will get confirmation of things all the time but in terms of actually learning new stuff I didn’t really feel that I’m doing that so much. I didn’t want to say that I know it all but you know what I mean – you get to a stage where you do know most of what you’re doing and errr... you know – enough experience – I mean – blimey – I’ve been working nearly 25 years – you know – there’s not that much crops up that’s new and that different.” (Aaron)

5.4.8 Research evidence: brief encounters on the run

As the above examples illustrate, most knowledge encounters by GDPs did not involve a direct, explicit and targeted search for research evidence. When the GDPs did encounter this kind of knowledge, it tended to be brief and somewhat serendipitous.

“Skimmed through an article in the BDJ [British Dental Journal], which looked at effectiveness of articaine buccal infiltrations for lower molars [versus] lidocaine for IDBs [Inferior Dental Blocks – a local anaesthetic technique]”.

(Anita)

When GDPs attended a formal event such as a conference or lecture, they would often encounter (and find useful) new learning that was not the primary focus of the event, e.g. by speaking to colleagues in coffee breaks or browsing at a trade show.

Only a small proportion of the GDPs in this sample seemed to actively seek research evidence or the products of research (e.g. guidelines, evidence-based drug

formularies). In the few instances when they described such searches, it was usually linked to a sense of needing reassurance, especially to confirm a course of action they had already followed or were about to. One GDP was atypical in this regard:

“I always look in the BNF [British National Formulary]. I know what the prescription is but I always have to look in the BNF before I actually write the prescription umm... I find that’s a very useful umm... tone to have, especially when you’re looking at interactions umm... Also there was the... we also have the FGDP [Faculty of General Dental Practitioners] guidelines – the antibiotic prescribing which... it’s usually put in the same place as the prescription pads so I can quickly refer to that whenever I do prescribe anything umm...” (Claire)

More commonly in our sample, codified research-based evidence was viewed as irrelevant to practice because the research had been conducted in a setting or context quite different from theirs.

“So umm... but BDJ [British Dental Journal] is mainly really into umm... research, peer review or umm... random trial, clinical trial, all that. Which, some – I would say – some of them are not maybe not introduced in the practice like in the primary care umm... so we can’t – we can’t really do – as a dentist we may not be able to do that because...that sort of thing.” (Linda)

Regardless of whether the GDPs were encountering new learning through others’ narratives or through more codified sources such as guidelines, I did not detect an interest in exploring the validity of the underpinning research. However, the GDPs did

express caution towards information from sources they viewed as biased, particularly from salespeople or companies with a clear conflict of interest.

“The problem with those articles [in ‘trade’ magazines] is they’re very biased. So, a company might write an article when it’s all promoting their product really and it makes out their product is really good. But I can see that. The first thing to do is look at who’s written it first. And then that changes the perspective of it. Because it might not be the official viewpoint – it’s the manufacturer’s viewpoint really, because they’re trying to sell something. I’ve got to bear that in mind when I’m reading it.” (Robert)

This caution towards some sources of information did not stop the same dentists seeking out, inviting and learning from salespeople.

In summary, GDPs’ encounters with research evidence tended to be fleeting, serendipitous and geared towards sources they felt they could trust. Perhaps because of time pressures they showed no appetite for validating these sources.

5.5 Discussion

5.5.1 Summary of findings

This small study of general dental practitioners has illuminated the nature of embodied clinical knowledge and has also begun to demonstrate how that knowledge develops and consolidates over time. I have shown that not only is clinical knowledge situated, embodied, case-based and emergent but also that clinical learning is closely

tied to the embodied, practical and material nature of GDPs' knowledge and to the sharing of case narratives among professional peers.

My findings have shown that for new learning – innovative ideas, practices or products – to be retained for use as embodied knowledge, it needs to be accommodated within an existing pattern or routine of practice. These routines are plastic rather than rigid mental structures, providing support for understanding individual experiences but also able to adapt in the light of those experiences. There is a requirement in professional practice to stabilise knowledge and practice, according to Fenwick [81], and collective routines appeared here to provide this. Case-based reasoning and bricolage (making do with what is at hand and the knowledge that is available, even if incomplete) leads to small innovations in the moment of practice.

5.5.2 Links with existing theory

Below I explore how my themes interact with existing theory and suggest some new theoretical interpretations of how dentists' embodied knowing of practice develops.

In bringing my themes and existing theory together, I have found it helpful to conceive of the knowing that arises as GDPs practice as interacting bi-directionally between an embodied, abstract or ostensive, realm and a specific, concrete or performative one. Existing and relevant theories refer to these two levels: routines are ostensive and performative [70]; bricolage conceives of a *bricoleur* (a trait of working with concrete experience) and an *ingénieur* (a trait of using generalisable knowledge) [259]; rules (abstract) are made material in practice (specific) in socio-materiality [257]; casuistry,

a means of understanding case-based reasoning, analyses the particular (specific) so as to relate it to general principles (abstract) [108]; and mindlines (abstract, ostensive) guide situated actions (specific) [31].

I theorise that GDPs' embodied knowing of practices develops iteratively from the merging of an abstract, plastic component (reflecting the ostensive routines of clinical mindlines, case-based knowledge and codified knowledge), with a specific, here-and-now component manifested in the performative routine of case-based reasoning and the generation of innovations-in-practice-in-context – the use of new ideas, practices and products to solve the problems that arise as a part of case-based reasoning.

The ostensive component develops through the embodiment of classifications of knowledge that have tended, traditionally, not to be given the attention codified or research knowledge does in the EBM paradigm. The facets chosen by GDPs to classify the knowledge they encountered and which, for the most part, they had an intention to use in some way, was not from codified sources. Figure 5.16 below shows the ways in which the GDPs classified the knowledge and how they intended to use it. The shapes indicate that, proportionately, the encounters they classified as codified and procedural were more likely to be used conceptually than instrumentally. Those they classified as experiential or process or policy, for example, were more likely to be intended to be used instrumentally, i.e. in action. This is perhaps not surprising, given the proximity of the encounter experience to the actions of practice, i.e. the GDPs experience themselves (experiential) or what is of use in their practice (process or policy).

The greater use of practical knowing instrumentally has also been reported elsewhere [239]. The relatively greater intended instrumental use of codified knowledge in a personalised form is consistent with the concept of peer opinion leaders or narratives as means of providing some form of contextual information, that the GDP can relate to and imagine using. This is not something research publications, for example, convey. Even textbooks, which may talk through procedures of how to technically do something, are unable to provide the reassurance, the uncertainty, the emotional, the little tricks, and so on that one practitioner can convey, often using metaphor, to another. In chapter 8 I discuss a small project I carried out with a GDP and, subsequently, a MSc student crafted to explore the role of a narrative to convey an authentic account of changing ostensive routines.

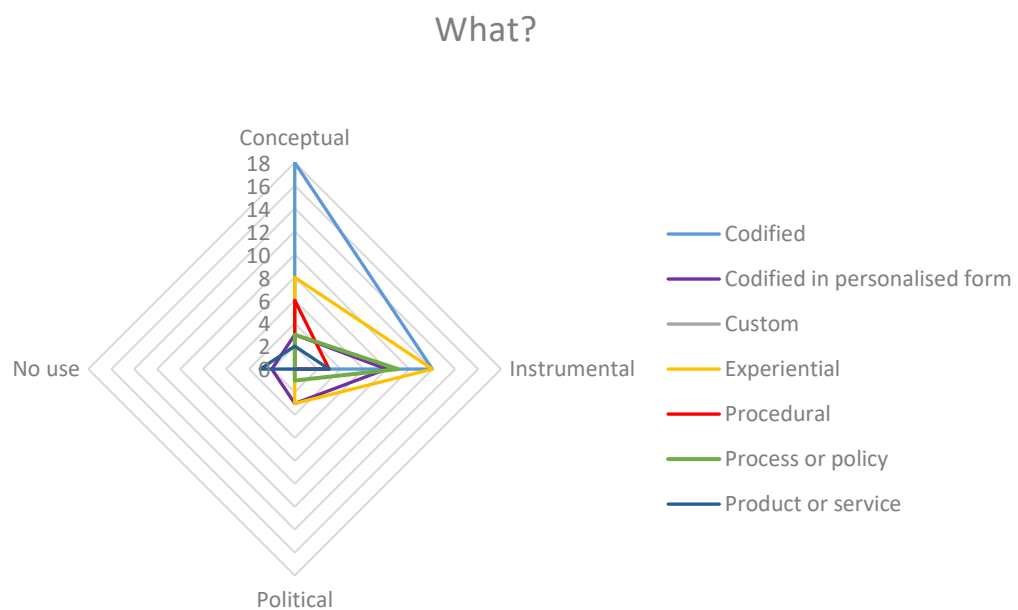


Figure 5.16 Intended use with respect to different knowledge facets

My findings challenge the mainstream literature on evidence-based practice, which assume that a guideline (proxy routine) can be learnt and stored, more or less as is, in the practitioner's head as an ostensive routine and then put directly into practice in the clinical encounter via a performative routine. My data suggests a more complex relationship between codified knowledge, internalised or embodied knowledge and the knowing that translated into practice in interactions with people and things.

Ostensive routines appear as repetitive and interdependent actions stored in GDPs' minds. But ostensive routines are not simple, rigid and linear phenomena like protocols. Instead, they are plastic, changing in response to the real-time interpretation of new information and new experiences.

Ostensive routines may be articulated to some degree when practitioners are asked to describe and justify their actions, but they go deeper than GDPs can verbalise or demonstrate. This is because they are largely embodied, tacit understandings of how the GDP has engaged over time with people, things, other elements of materiality, time and space. It is possible that the components of ostensive routines, that a GDP makes explicit, even to themselves, are quite different from those they embody, and which guide their actions. The translation of embodied knowing into the activity of internal or external speech, like any other translation of embodied knowing, will be dependent on the interactions such an activity is part of. Thus, the explicit is not a pure rendition of the agent, but an intra-active, ephemeral and shared knowing.

However, the embodied ostensive routines, I suggest, are derived in part through embodied sense-making of the interactions after the practice. I use the term embodied here instead of, for example, cognitive, because the structure we call the

brain is, from an anti-cartesian perspective, inseparable from the rest of the body [33]. But as routines are repetitive-looking intra- or interactions between people and other materiality, the ostensive routine is not the possession of an individual GDP but an ephemeral, extra-corporeal phenomenon. What guides the performance does not appear to be ostensive routines centred on the individual GDP's actions, but as dispersed interactions with materiality, time and space. If a GDP sits and envisions a future performance (whether milliseconds or days and weeks in the future or in the past), they are interacting with the materiality of the current moment, including with their own body, their habitus and capital, people and things, space and time. That is, if we consider ostensive routines as something embodied and the body as continually interacting with material phenomena, then the ostensive routine is not something that is embodied wholly by the individual. Ostensive routines, like performative ones, are in constant flux because bodies are in constant flux. The body is always acting and interacting.

In the performative routine, what was mostly but not wholly embodied, is translated through the interactive sayings and doings of the different actors. Each performance is a translation of multiple embodied ostensive actions from the respective actors. The ostensive routines are continually reformed by all actors in relation to the interactions of the practice. The practitioner's embodied relational understanding, a largely tacit understanding of other actors, also described as being with that or being with the other (person) [61], is an important component of developing their understanding of a patient and their family, the other things in and out of the direct interaction, and of adapting their actions in a performance that works for this patient at this time. The

quote from Jane above about the “wee kid” with an injured tooth is a good example of this.

The embodied relational understandings are, perhaps, an important element of what Kemmis describes as “searching for saliences”:

“They [experts] search for ways of understanding and acting that will be appropriate in addressing the practical problems they meet at any particular time, drawing on their life-experience not in a static or rationalistic way, but reflexively: changing their reading of the situation as it unfolds in and through practice, in the light of changing perceptions, observations and ways of seeing the situation, and in the light of changes brought about by seeing how others see it, and how they are reacting and responding to changes as the situation unfolds.” [89 p. 392]

I would suggest being more explicit about the material aspects of practice of which GDPs (and other actors) appear to have embodied relational understandings and about which they become more adept at searching for saliences.

Routines are collective and may develop both within and between dental practices or organisations. A GDP’s actions are interdependent actions arising as they encounter a nurse’s actions and another GDP’s and a hospital consultant’s. Instead of these being organisational routines, as described in the organisational literature, I describe these routines as collective professional routines as they had some sort of order due, not to an organisational structure but, to a mutually constructed one by professionals, whose actions were interdependent, recognisable and apparently repetitive. The repetitive

and interdependent actions within these collective routines store practice knowledge accumulated over many years and decades. That knowledge is of systems, of patients, of colleagues, of costs, of relationships and much more. To articulate all the knowledge that is bound up within a sequence of interdependent actions would be impossible. These routines are never fixed but part of what practice theorists call the structuring of practice [49]. With the learning from the observational study described in chapter 8, I would also suggest that patients and things share in and contribute in structuring the professional collective routines. For example, in the example given above, Robert's practice took radiographs of patients from other local practices. I described this as a professional routine because there were repetitive interdependent actions between practitioners (e.g. referral note / call to Robert's practice followed by taking of radiograph etc.). The routine, though, will be performative only, if other actors play their part. For example, the patient must be willing, and able, to go to the practice; there must be a justifiable need for the radiograph; the radiography equipment needs to function; and so on. Thus, the professional routine is less about professionals and more about what goes on within a professional field.

Each patient interaction is in some sense a new case (even if being seen for ongoing treatment), and GPs constantly create problems to solve. Russel Ackoff, writing about the management of problems in organisations, suggested that problems do not simply appear but are created by managers from messes (quoted in [262]). The generation of problems is a primary feature of the reflective practitioner [262]. In a similar way to Annemarie Mol's description of disease as not a single entity but many different disease phenomena differently enacted by many different people [62],

dental problems are not single defined entities but phenomena that are brought into being by the GDPs. This is illustrated, for example, by Jason's description of an encounter with a patient on immunosuppressants above.

For GDPs, the messes are the complex set of symptoms, signs and other issues a patient presents with, and results of tests, in the present time, in their personal context. From this mess the GDPs (with the patients and, sometimes, others) fashion a more specific problem, framed in a particular way to which they attempt to find a solution through a combination of case-based reasoning and *bricolage* as they revise and reuse solutions from the case base using the resources at hand.

New solutions are generated daily as GDPs develop new ideas and practices around managing patients, usually through small revisions of previous problem-solution scenarios. GDPs worked within the constraints of the context – its materiality, its space, its time and its relations – to fashion their innovations. They were *bricoleurs* who approached cases using multiple perspectives (e.g. technical, ethical, scientific, financial, organisational) and whatever tools that were at hand and which they could make use of [263]. Gabbay and Le May described knowledge-in-practice-in-context [31] as a practical knowledge which is influenced by, and influences, the context within which it occurs. In a similar way, I would describe innovations-in-practice-in-context as the use of new ideas, practices and products to solve the problems that arise from the mess of the patient encounter and therefore both influencing and influenced by the context within which it occurs.

Such innovations, where they seem to provide an advantage over previous ideas and practices, are incorporated into GDPs' ostensive routines. Innovations-in-practice-in-context are best thought of not as the new ideas, practices or products articulated by others and merely adopted by others (as Rogers proposed), but as the GDPs' own new practices which are full of tacit, embodied knowledge, nuanced understandings and knowledge of the dentist-patient encounter within which they occur. I would consider, for example, a guideline that incorporates recommendations for new ways of doing things (to the GDP) as a product with an abstract idea that might be incorporated into an ostensive routine and, should it be accepted as relevant to the case at hand, integrated into the performative routine.

Finally, I wish to suggest that the concept of mindlines explicitly incorporate a motoric representation of practice that arises in interactions between GDPs, other people and objects. This study demonstrated the rich practical mindlines that are internalised, collectively reinforced, tacit and embodied knowledge of skilled practices involving the GDPs' bodies. If, as I argued in chapter 2, the mind and body are inseparable, then so too are mindlines. GDPs do a lot of skilled work with their hands and they learn from others how they do things, whilst internalising and testing out their own representations.

5.5.3 Limitations

The participant sampling was limited in number, and those who participated, were disproportionately recruited through GDP forums. This restricts, potentially, the data

in terms of variety and, therefore, the identification of additional themes. Forums are by their nature social and, therefore, the GDPs recruited to the study may have discussed more than other GDPs occasions of social learning. However, included in this study were GDPs who were not regular forum users.

The method chosen to sample knowledge encounters was designed to elicit these in any setting and at any time of day. However, many knowledge encounters will not have been obvious to the participants, particularly those that were tacit in nature, and will not have been recorded. Thus, by using the knowledge encounters as the stimuli for the interviews my analysis has focused on a narrow reporting of experience. In addition, the GDPs, for practical reasons, only recorded knowledge encounters for one week. Thus, for each GDP the range of knowledge encounters is unlikely to reflect fully the occasions when they encounter new information or experiences that lead to changes in their embodied knowing of practices. I do feel, though, that across the 11 GDPs the range of knowledge encounters was sufficiently diverse to allow me to theorise about their knowing of practice.

As the knowledge encounters were self-documented they could not be objectively verified. This allows for the possibility that GDPs' memory was selective, they may have attributed more positive behaviours to themselves and negative behaviours to others and exaggerated or underplayed certain facets of their knowledge encounters. However, this method has allowed me to capture a broad range of knowledge encounters, particularly those not amenable to observation using conventional methods, e.g. ethnography. For this reason, the next study was planned to triangulate

and further develop these findings using observation, albeit in more restrictive time and space.

Apart from one transcript the remaining interviews were analysed by me alone. Given this, and my relative inexperience in qualitative analysis, it is possible that additional themes may have been identified, if a second, experienced researcher had also analysed all 11 interviews. I tried to ameliorate the impact of this by my supervisor analysing passages of text that I felt were good examples of the themes I identified and through constant discussion of the themes as they arose.

I cannot ignore the lens through which I have looked at my data. I am a GGP by background and, perhaps because of this, have a respect for the ability to make do in often challenging circumstances. I have also been heavily influenced by the concept of mindlines articulated by John Gabbay and Andrée Le May. This has naturally led to a bias towards social learning as a defining factor in how primary care clinicians develop their embodied knowing of practices.

5.5.4 Implications for practice and research

Little empirical work has looked at how GGPs build their embodied knowing of practices. My study suggests that GGPs work within the constraints of space and time using case-based reasoning and bricolage to generate solutions for individual patients in the here and now. I feel that GGPs should be afforded greater recognition for this ability than has so far been acknowledged. Whatever those who seek to change GGPs' practice would have, in the moment of performance it is GGPs who, with their patient

and the things around them, must generate a problem and devise a solution. Case-based reasoning, bricolage and innovation in practice in context guides this process. I suggest that those wishing to influence practice need to find ways of respecting and working with this rather than imposing external guidelines.

My study suggests there could be benefit in seeking ways with dental students and GDPs to surface and explore the complexities associated with developing embodied knowing of practices and then enacting it in interactions with people and things. Given that GDPs' embodied knowing is so influenced by informal ways of learning, I would suggest that it is time to explore ways of supporting students and GDPs in identifying key elements of the information and experiences they encounter and helping them critically evaluate and integrate these into practice.

5.6 Conclusion

This study has added to a previously sparse literature on knowing in practice and made an original contribution by showing that GDPs' embodied knowing of practice is an ever-developing interaction between existing embodied knowing and interactions in practice with other people and things. I have suggested that guidelines, and other formal clinical knowledge, may become incorporated as ostensive routines but that practice as the enactment of this knowledge is responsive to the interactions of the moment.

I have also suggested that a motoric representation be surfaced in the concept of mindlines to reflect the internalised, collectively reinforced, and tacit embodied knowledge of skilled technical work.

We need approaches to clinical education that acknowledge a broader understanding of what knowledge is for the primary care clinician and the central role played by knowing that arises in practice in the professional learning process. Whilst this sample included only dentists, the findings are highly likely to apply to other clinical professionals including doctors, nurses, physiotherapists and veterinarians.

Chapter 6 Knowing in general dental practice: anticipation, constraint and collective bricolage

The work involved in this chapter contributed to the development of a Hands-On Workshop at the IADR Conference, July 2018, London entitled, “How Dental Professionals Use Evidence in Their Practical Decision-making” [264].

A version of this chapter was published as:

Hurst, D. & Greenhalgh, T. Knowing in general dental practice: Anticipation, constraint, and collective bricolage. *Journal of Evaluation in Clinical Practice*, 1-9 (Early View. Online Version of Record before inclusion in an issue), doi:10.1111/jep.13051 (2018). (Contribution from my supervisor Professor Trish Greenhalgh to publication: review of manuscript versions and discussions which contributed to theory development.)

6.1 Abstract

RATIONALE, AIMS AND OBJECTIVES: Much of the literature concerned with healthcare practice tends to focus on a decision-making model in which knowledge sits within the minds and bodies of healthcare workers. Practice theories de-centre knowledge from human actors, instead situating *knowing* in the interactions between all human and non-human actors. The purpose of this study was to explore how practice arises in the moment-to-moment interactions between general dental practitioners (GDPs), patients, nurses and things.

METHOD: Eight GDPs in two dental practices, their respective nurses, 22 patients and material things were video-recorded as they interacted within clinical encounters.

Videos were analysed using a performative approach. Several analytic methods were used: coding of interactions in-video; pencil drawings with transcripts; and dynamic

transcription. These were used pragmatically and in combination. Detailed reflective notes were recorded at all stages of the analysis and, as new insights developed, theory was sought to help inform these.

RESULTS: I theorised that knowing in dental practice arises as actors translate embodied knowing through sayings and doings that anticipate but cannot predict responses, that knowing is constrained by the interactions of the practice but that the interactions at the same time are a collective bricolage – using the actors’ respective embodied knowing to generate and solve problems together.

CONCLUSION: Practices are ongoing ecological accomplishments to which people and things skilfully contribute through translation of their respective embodied knowing of multiple practices. Based on this, I argue that practices are more likely to change, if people and things embody practices of improvement.

6.2 Background

My understanding of knowledge and knowing evolved substantially during this study. Although I had initially planned to explore routines and case-based reasoning performatively, based on the previous study, I took a more inductive approach with a view to developing ground up a more holistic and collective sense of what was going on in practice. The routines and case-based reasoning that I saw in the interview-based study was too dentist-centric for a true practice-theory approach. I, therefore, began to explore more deeply, particularly after gathering the video footage, the writing about knowing in practice from the organisational literature.

I returned to my literature review and reviewed the literature around practice, from Aristotle, through to Marx, Heidegger and on to present day writers.

Efforts to improve outcomes from clinical encounters tend to take a narrow clinician or team-centred approach and focus on propositional knowledge to the exclusion of other ways of knowing [265]. As discussed in earlier chapters, knowledge is a thing to be learned, retained and applied as these actors solve problems in clinical encounters. Much of the academic writing about clinical practice assumes a ‘decision-making’ model – the doctor or dentist is seen as making diagnoses, selecting investigations/treatments and perhaps eliciting patients’ preferences – but underpinning all that is an assumed decision tree into which evidence can be fed (e.g. [266-270]).

Through the deeper reading of practice theory, I had begun to develop my understanding of the alternative ways to explore what goes on as different actors come together in clinical encounters [39]. Practice theory de-centres knowledge from human actors, instead situating knowledge, or knowing, in the interactions between all actors in practice [66].

In these approaches, the knowledge is not an object retained within the boundary of human beings [271]. Rather, knowledge is performative, generated in the moment, situated, interactive, and embedded within unique, ephemeral practices as actors perform [32, 38, 68, 272]. Actors do embody representations of practice [273] that we might call embodied knowledge but knowing happens in the practice. The actions of one actor influence (in an ongoing and reciprocal way) those of one or more other actors. Knowing in practice is ecological, one-off episodes of interaction that involve

people, things and the environment at large [35, 69]. Knowing is not the possession or responsibility of any one individual but is an ongoing, collective accomplishment [272].

I am unaware of any studies that have explored how people and things generate knowing in practice in general dental practice. Thus, the purpose of this study was to explore how practice arises in the moment-to-moment interactions between GDPs, patients, nurses and things within clinical encounters.

6.3 Methodology

I adopted a performative orientation where performativity is the constitution “of actors, meanings and roles through socio-material practices” [274 p. 444].

6.3.1 Setting and sampling frame

To be able to recruit dentists, nurses and patients to my study, I needed first to recruit research sites. Most dental practices are owned by an individual or a partnership of dentists. I developed a recruitment A4-size flier to post on dental forums, send to interested dentists and to distribute at talks and other events I attended (see Appendix U).

I created a single site document with all the documentation associated with the study, including the protocol, information sheets and consent forms, and ethics and Health Research Authority approvals. This was shared with each of the dentists who took on

the role of local Principal Investigators in their respective practices (see Appendix V for a list of contents).

I recruited two large general dental practices, providing predominantly National Health Service (NHS) treatment, as research sites. One was in a suburb of London and the other on the outskirts of a large town near London. The practices were selected because I knew the owners and they were willing to accommodate me. They subsequently agreed for their practices to be sites within which I could then attempt to recruit dentists and nurses in the first instance, and patients in the second.

I made attempts to increase the diversity of the sample by recruiting sites through social media and dental forums. As in my previous study, I used Twitter to try and reach interested GDPs (see Figures 6.1 and 6.2 below). However, as is the nature of Twitter, mostly I had interest from other academics working in the field.



Figure 6.1 Tweet linking to my knowledgeproject.org blog

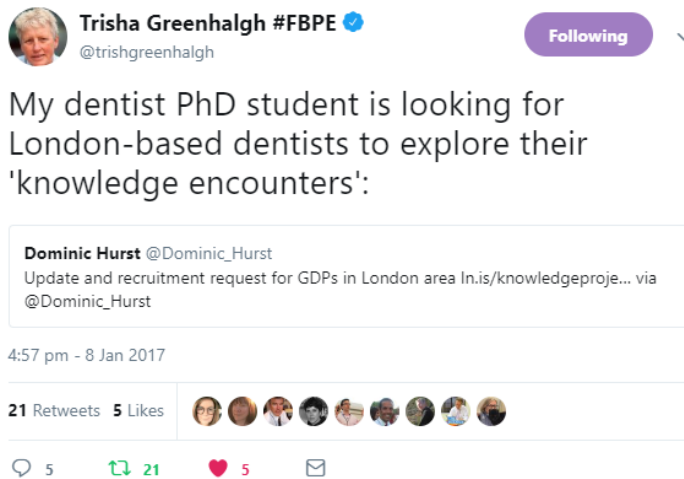


Figure 6.2 Re-tweet by my supervisor extending the reach of the blog post (permission obtained from Trish Greenhalgh for reproduction here).

Using my project website, I blogged about the project (see Figures 6.3 and 6.4 below) and uploaded information sheets and other study documents so that those who wished to, could peruse them.

Although two additional GDPs agreed initially to take part, they both withdrew shortly before the date previously agreed for recording. One cited problems recruiting patients to the agreed date (though we could have arranged another date, he withdrew before I could). The other GDP had recently been visited by the Care Quality Commission and was concerned that, if I were to record him doing something “wrong” (GDP’s words), I might report him to the General Dental Council (GDC). Despite reassurances that raising concerns was in keeping with GDC guidance that it be proportionate and stepped (i.e. raising concerns about practice locally first), he withdrew. After I had completed the data collection I received an email from him saying that he would be happy to take part, if it was still possible, but unfortunately the data collection and analysis phase of the study was already finished.

Unfortunately, I was unable to recruit any other sites. Nevertheless, the resulting convenience sample exhibited a range of features, including years of experience of dentists, patient appointment types and nursing experience.

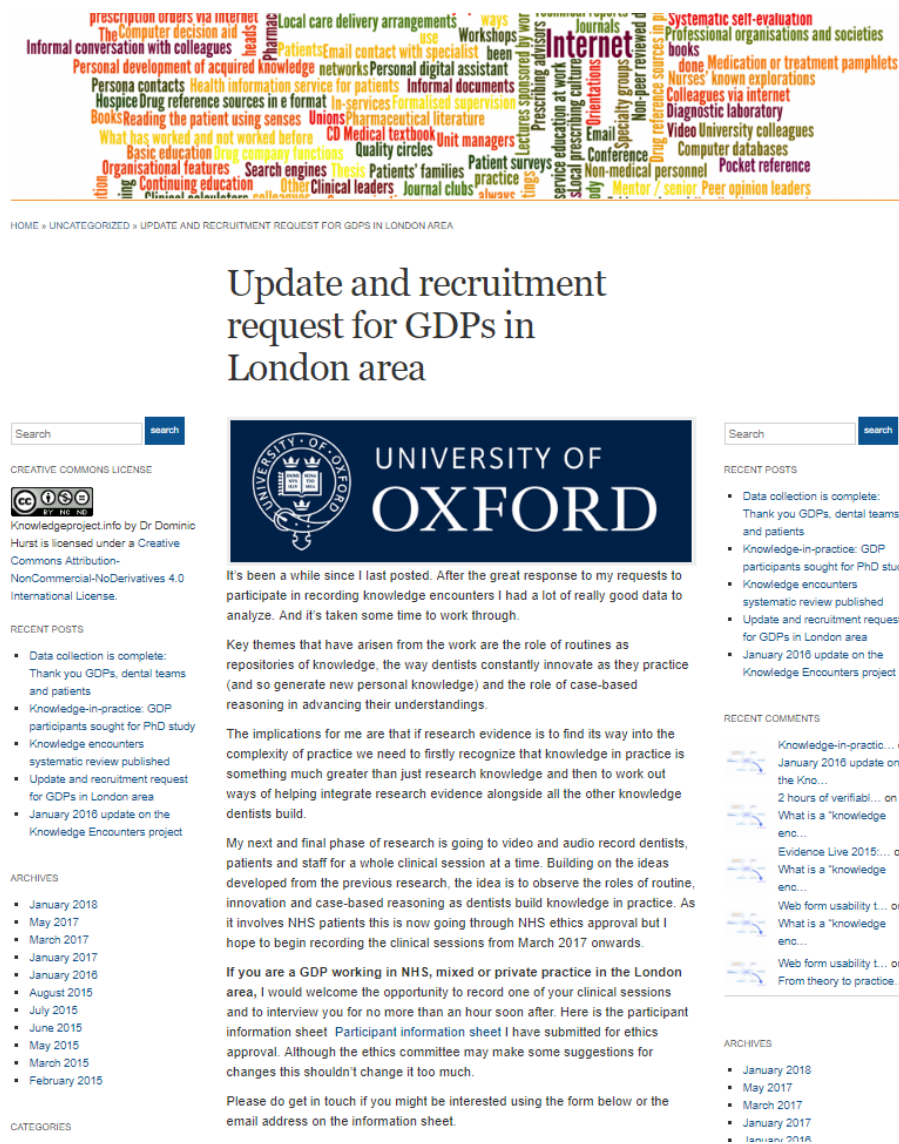


Figure 6.3 Knowledge project blog post. 26th January 2017

HOME » UNCATEGORIZED » KNOWLEDGE-IN-PRACTICE: GDP PARTICIPANTS SOUGHT FOR PhD STUDY

Knowledge-in-practice: GDP participants sought for PhD study

11 GDPs kindly contributed their time and thoughts to help with my first study about knowledge encounters. My supervisor, Trish Greenhalgh, and I identified a number of recurring themes from the interviews that helped to demonstrate how complex knowledge-in-practice is. We have submitted an article describing these for publication to the *Qualitative Health Research Journal* and await reviewer comments.

Whereas the first study used participant records of knowledge encounters followed by interviews, the next study will seek to confirm or develop our findings by observing dentists as they practise and using these observations to stimulate reflection in interviews. We want to be able to characterize further what knowledge-in-practice is for GDPs in the moment of practising.

A couple of weeks ago I received ethics approval to begin the study and so am now hoping to recruit up to 10 GDPs with 5+ years of clinical experience working within 3 hours travel from London to take part. Dentists can be working in NHS, private or mixed practices.

What's involved?

Dentists will choose a clinical session when they are happy to be video and audio recorded as they see their patients. Consent will be sought from patients and any member of staff who might be in the recordings (e.g. a nurse) prior to the clinical session. In this way, only patients and staff who are willing to be recorded will be.



On the chosen day I will set up a video camera and digital audio recorder in the clinic and when patients who have consented arrive I will press record and leave the clinic. The intention is to record everything that goes on and then, at a convenient time with the dentist watching the video, explore what knowledge means in the moment of practising as they interact with patients, staff and information (e.g. letters from specialists or consultants).

To reiterate, the intention is to explore the ways in which dentists' knowledge develops in the moment of practising – not to make any judgement about how GDPs practise clinically.

All documentation relevant to the study, including the protocol, participant information sheets and ethics approval letter, are available in the *Project Documents* section.

Please do get in touch using the form below if you'd like to know more. Even if you live some way from London, where I am based, I am happy to travel some distance to record a willing participant!

All the best,
Dominic
Name (required)

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Figure 6.4 Blogpost about observational study. 12th May 2017

As well as sampling participants, I planned to sample appointment types for maximum diversity. To do this, I hoped that there would be a sufficient number of consenting participants (GDP, nurse and patient) to ensure that for each GDP there was at least one new patient check-up, one recall check-up and one brief (<=30 minutes)

treatment appointment. All appointment types (e.g. check-up, emergency, treatment) were, though, eligible for inclusion.

The reason for the ideal of maximum variation was so that there was a range of different appointment types, that would include among them a range of saying and doing interactions between patients, GPs and things. Different appointment formats or types could involve, for example, the examination of the teeth, the taking of x-rays or other images, the problematising of signs and symptoms into diagnoses, and the discussion of preventive or treatment options. By having a range of appointment types, my intention was to be able to explore and compare how people and things interacted within different practices.

To this end, when choosing sessions, I asked GPs and their teams to include those with patients attending for new patient and recurring check-ups (which often include: discussions, examination, diagnoses, imaging and preventive interventions), and brief treatment appointments (which often include: discussions and treatment and preventive interventions).

Sampling of appointment types was ultimately restricted by the size of, and variation within, the sampling frame. The sampling frame for appointment types was the appointments that patients consented to on the agreed days. Due to difficulties recruiting patients ahead of the study (see procedure below) the sample frame was much smaller, though not lacking in diversity, than I had planned. Ultimately, the whole sample frame was sampled.

6.3.2 Recruitment

NHS ethical approval for this study was provided by the West of Scotland Research Ethics Committee, REC reference 17/WS/0064.

Before I could recruit participants, I needed to recruit research sites. Until the two GDPs withdrew, four sites were recruited. For each I created a personalised site document.

In the first instance, dentists and nurses in the two practices were invited to participate. Participant information sheets (PIS) were developed for dentists (see Appendix W), staff (see Appendix X) and patients (see Appendix Y).

After gaining written consent, a session for video-recording was arranged. All adult patients with appointments to attend these were invited to participate by letter posted two weeks before the appointment with a covering letter from the dental practice and a participant information sheet. Patients were invited to contact me by telephone or email before their appointment to discuss the study and to consent in principle to participate. Written consent was obtained on the day.

6.3.3 Data collection methods

I was interested in how practices unfold in real time, for which video is the optimal method of data collection [275, 276]. The video camera was less obtrusive in small clinical spaces than a person, and the captured video could be watched and listened to repeatedly during analysis, rather than relying on notes captured in the moment. Over four days in August and September 2017, I filmed participants using a fixed digital

video camera (Sony Handycam, HDR-CX405) mounted on a tripod. It was placed in a position that was unobtrusive to patient and dental team, but which allowed the patient, dentist, nurse and computer to be captured in the field of view (see Figure 6.5). I set up the camera before the patient entered the room, pressed record and then left. Once the patient had left the room, I re-entered it and stopped the recording. I transferred video recordings to a password protected computer from the video recorder at the earliest possible moment, deleted the original recordings, and formatted the SD card.

In addition, I informally observed the goings on in the respective dental practices and spoke with staff and patients during the periods of recording. Whilst not a formal part of the data analysis, I made anonymous notes to help situate the encounters recorded in the videos.

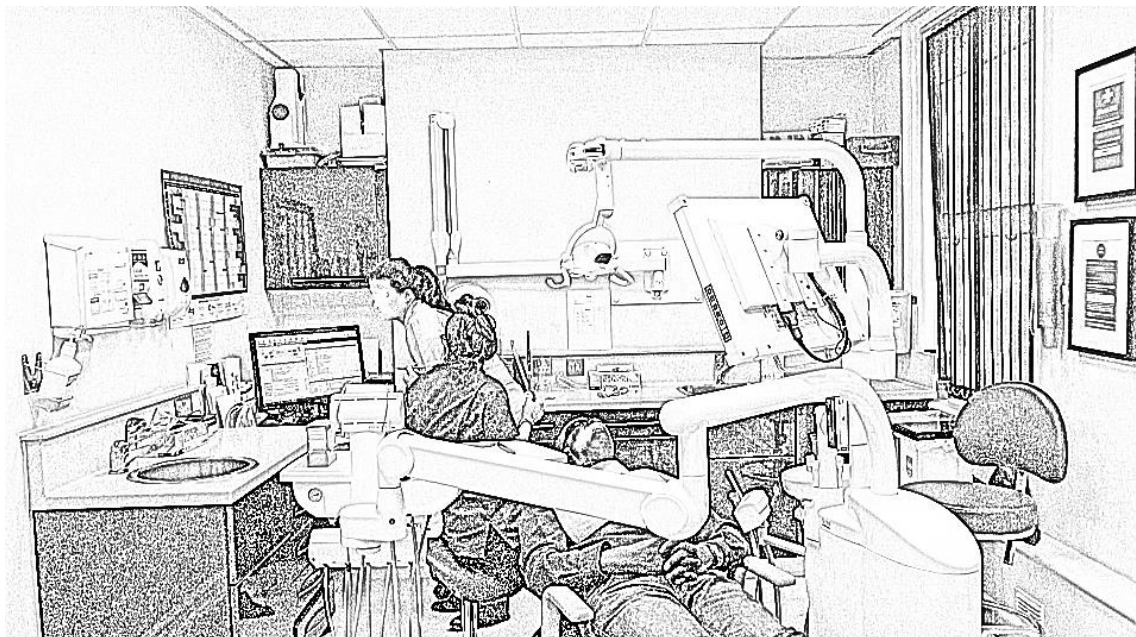


Figure 6.5 Example of view of dental surgery when filming

6.3.4 Units of study

Clinical encounters are often multi-layered and complex phenomena, and so I chose my unit of analysis to be one or more conjunctures within each clinical encounter. Conjunctures are “a critical combination of events or circumstances” and may involve a brief or prolonged episode of interaction between actors [277]. It is through studying very mundane and commonplace aspects of general dental practice within conjunctures that I intended to tease out an understanding of how knowing arose in practice.

6.3.5 Data processing and analysis

Getting in to the video data was difficult. I set out with the intention of exploring the ephemeral phenomenon called knowing in practice, which by its nature, was not visible. I tried several different approaches to try and make sense of what was going on. Before settling on the three methods I describe below, I tried to map all the actions, that people and things did, and how these interacted with others. Some views of mind maps I created at this time can be seen in Appendix Z and Appendix AA.

Informed by texts on the use of video in qualitative research [276, 278, 279], I eventually used three analytic methods. I used these pragmatically and in combination. I recorded detailed reflective notes at all stages of the analysis using electronic note-keeping software (Evernote, Evernote Corporation). An example of a typical note can be seen in Appendix BB. As I developed new insights, I sought new theory to help inform these. After submitting my article for publication, one reviewer alerted me to the work of social anthropologists that was highly relevant to my

analysis but which I had not come across. This literature was incorporated into the re-submitted article and used here to enrich my analysis.

I firstly coded videos to explore the interactions that occurred in the clinical encounters and develop a sense of how much each actor was involved. I imported all videos into qualitative data analysis software (NVivo Version 11, QSR International Pty Ltd). I watched and re-watched each at least four times as I coded the actions of each of the three human (patient, dentist and nurse) and non-human actors (e.g. Electronic Patient Record, EPR). The coding distribution for the ten codes with longest duration from one clinical encounter is shown as an example in Figure 6.6 below.

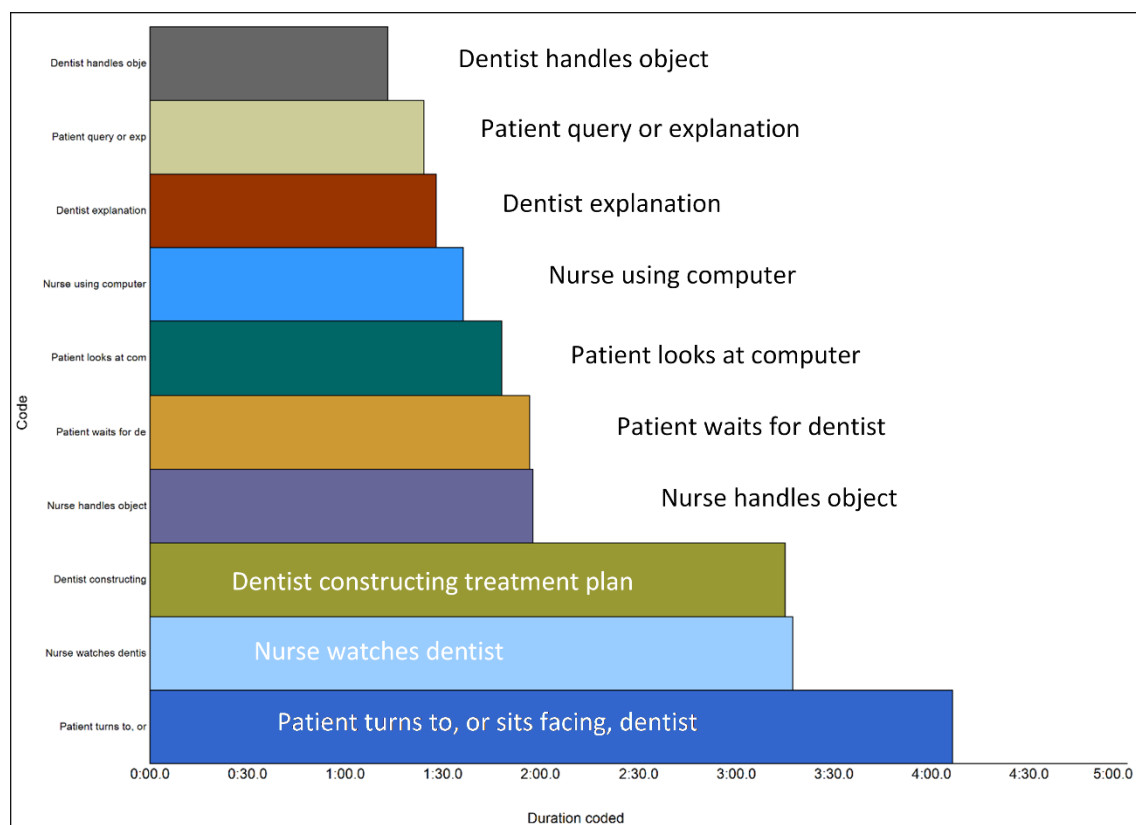


Figure 6.6 An example of coding activities from one clinical encounter. Duration is in minutes, seconds and tenths of a second

Secondly, I was inspired by Mavers' working paper on transcribing a video [280] to create a pictorial and narrative transcription of how humans and material objects interacted in the conjunctures. Goodwin created a drawing from a video still to show three girls at play [281], and Mavers used thick narrative to describe how children interacted with objects as they learned [282].

Developing these approaches, I took stills from one dentist's conjuncture whenever there was a change in physical orientation, e.g. a dentist turning to a patient. The stills were turned into a pencil image using an Android mobile phone application (Photo Sketch Maker, Aero Tools) and, to bring focus to the interactions, all aspects of the image, that were not involved directly, were removed. The images were inserted into vertical consecutive cells in a spreadsheet (Microsoft Excel 2016). A narrative description of what was said and done for that section was inserted in the horizontally adjacent cell. A section from the transcript is shown on the following page (see Figure 6.7) and the transcript of a full conjuncture is captured in Appendix CC. The meticulous and detailed analysis of video data using pencil drawings allowed me to surface and explore in-the-moment interactions as a series of freeze frames, thereby allowing me to develop a highly innovative analysis of knowing in practice.

Finally, as I tried different ways to explore the videos, I kept thinking that the scripted methods, even with the stills above, were too static. The knowing in practice literature talked about knowing as dynamic and as arising in the moment only for new knowing to arise soon after and so on. In putting words and images on paper I turned fleeting activity into something that was concrete. I looked at the text and I could dwell on them in a way that lost the sense of the ephemeral. I felt I needed an analytic method

that in some way represented the brief moments of interaction and the supposed knowing that these interactions gave rise to. Gerhardt and others write about knowing as the alignment of knowledge elements through interaction [69, 249, 272] and I wanted to be able to visualise these elements being shared in the interactions between GDPs, patients, nurses and objects.

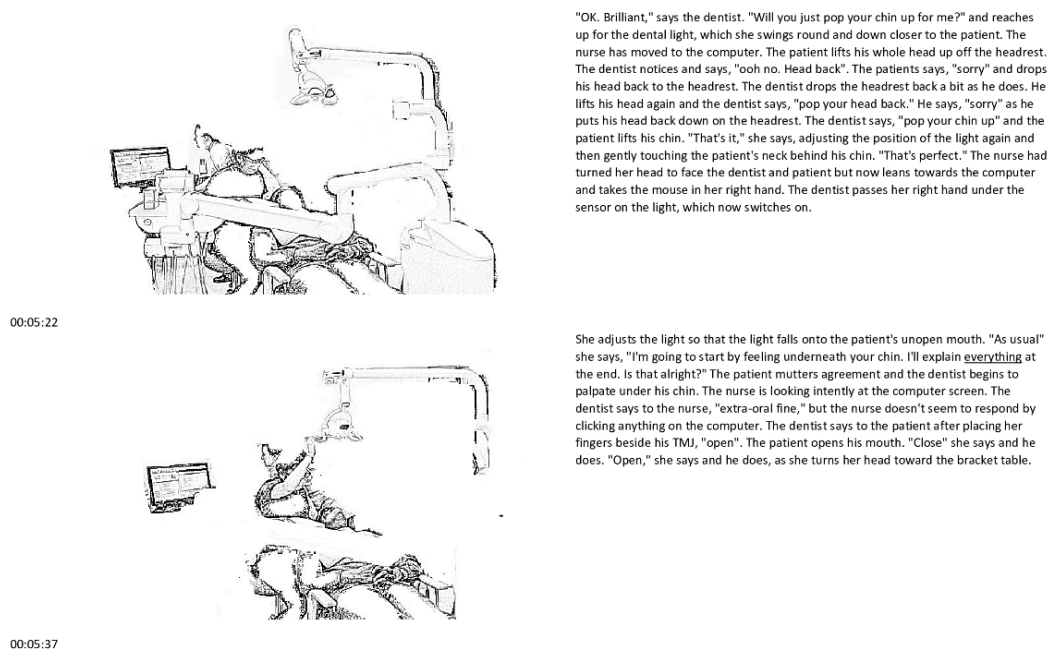


Figure 6.7 Excerpt from transcript of one conjuncture showing time from beginning of video when still was taken, the stills and associated narrative

At around this time, there were advertisements on BBC television for BBC Radio 4's Today Programme that used animated text. In them, recordings of people speaking were played and some of their words appeared momentarily on the screen and then

disappeared shortly afterwards. This gave me the idea of doing something similar with the words and actions of the actors in my videos.

I began to imagine descriptions of the sayings and doings of the various actors dropping onto a computer or television screen and combining in something like Brownian motion when particles collide and disseminate in random motion. However, in this case, as the actors' sayings and doings collided, they would give rise to a unique synthesis of shared knowing held in that space and time.

At this time, I had also come across the concept of actions translating embodied and embedded knowledge. The phenomena we experience are actions. We never know what guides these actions – what mindlines, tacit knowledge, schema or habitus guide them. We can, though, infer what the actors' words and actions might convey. So, I began to experiment with various ways of representing the actions of the actors in a dynamic way and what I inferred they knew (see Figure 6.8 below).

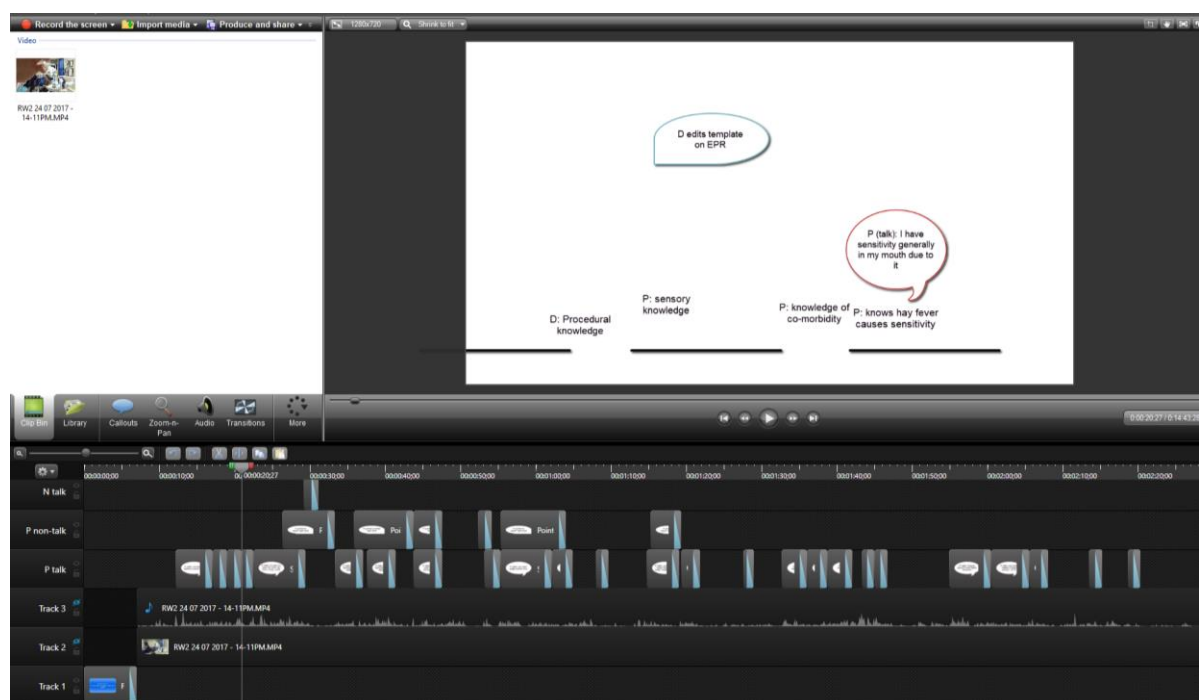


Figure 6.8 Screenshot of early version of creating dynamic coding using Camtasia video editing software.

I had used video editing software (Camtasia Studio 8, Techsmith Corporation) for several years to make educational videos for dental students, and for recruitment to my studies. This software allows one to create videos in which words or images can float in and out of screen. I therefore imported the video of one clinical encounter into the software. As it played, I transcribed what was said and what each actor did. I used different coloured speech bubbles to represent what each person said and a pointy circle to represent human and objects' actions (see Figure 6.8 above) and allowed these to remain on the screen for as long as the words or actions were occurring (though a minimum of one second was maintained to allow the text to be read). The lines at the bottom of this were animated so that they continuously moved to the left and I dropped the knowledge I thought the actions translated onto these. They in turn moved off and disappeared from the screen to the left.

This way of representing the collaborative knowing arising in practice was laborious because of all the movement that had to be incorporated. I therefore simplified it by getting rid of the moving lines and just having the different elements appearing and disappearing from the screen.

Two still images from the final version are shown as examples in Figures 6.9 and 6.10 below. By the time I had got to this version (version 8) I had come to view the translations not of knowledge as knowledge of specific phenomena (e.g. procedural, sensory, illness), as I had first inferred, but as embodied knowledge of practices. The reason for this was that knowing a procedure, for example, cannot be separated from the practices associated with learning that procedure. Those practices are complex socio-material phenomena from which the practitioner will embody much more than a

procedure, even if part of it is recognisable as a procedure. In addition, what a person says, or does as they interact with others will draw on a much broader set of experiences, elements of which they have interpreted, inferred, parsed and embodied.

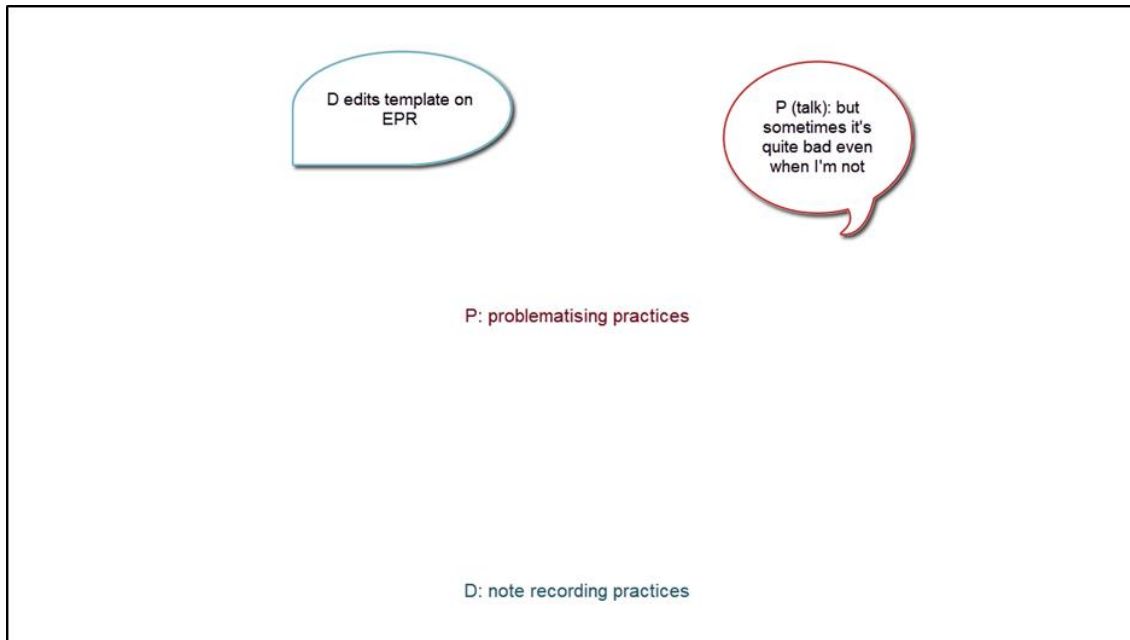


Figure 6.9 Still image 1 from dynamic coding of a conjuncture. Text in bubbles are enactments. Floating text is knowing of practices embodied and translated as inferred from the saying and doing by me.

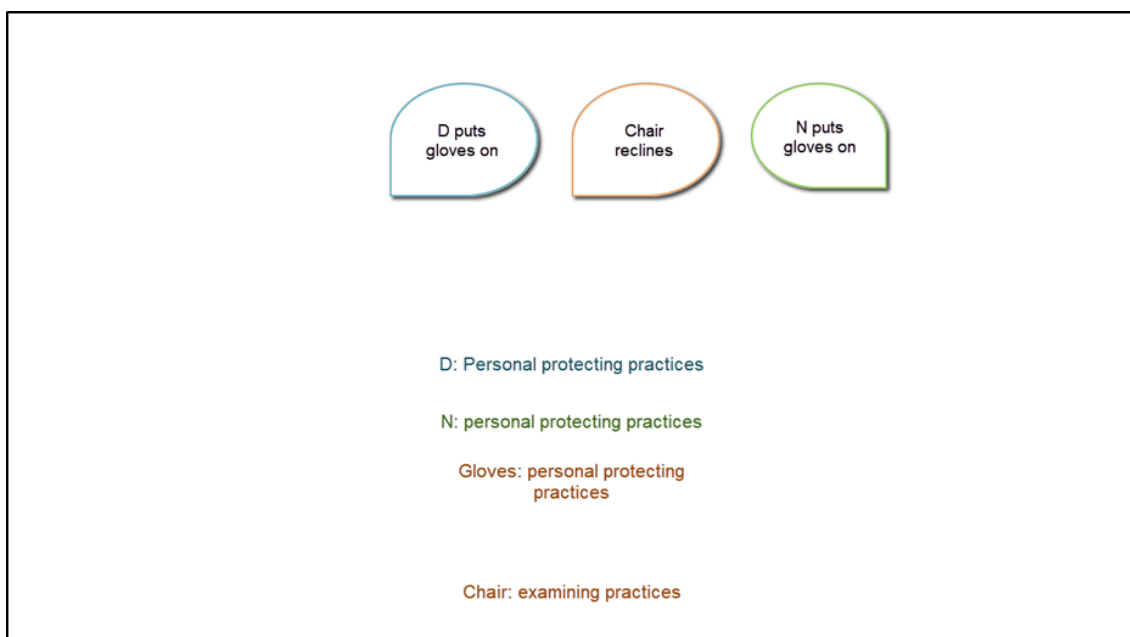


Figure 6.10 Still image 2 from dynamic coding of a conjuncture. Text in bubbles are enactments. Floating text is knowing of practices embodied and translated as inferred from the saying and doing by me.

These will include much tacit knowledge that allows the interaction to go on at all.

Therefore, I used the term knowing of X practice(s) instead of knowledge when inferring what the actions translated into the ongoing practice.

I uploaded a four-minute section of this video to YouTube to share the method with others, once my publication had been accepted. At the time of writing, the video can be accessed at www.youtu.be/33zRuOpUJes.

6.4 Results

6.4.1 Description of data set

The data set included the raw footage of 22 appointments that totalled eight and a half hours, a single clinical encounter transcribed in full, with stills converted into pencil, and another whole encounter transcribed into the video of dynamic coding. I recorded the equivalent of approximately 160 A4 pages using digital note keeping software (Evernote, Evernote Corporation).

Clinical encounters took the following general form: GDPs would check a patient's dental record on a computer in the surgery either prior to asking the nurse to bring the patient into the room or as the nurse was doing so; the patient entered the surgery, there was an exchange of pleasantries and the patient sat on the dental chair; the GDP and patient then established or confirmed the reason for the visit (e.g. to address a problem or to place a filling) followed by a brief or longer discussion about this; the patient would then recline in the dental chair and a degree of interaction between GDP, patient, nurse and instruments would centre around examination or intervention

within the mouth, including the taking of radiographs; the patient would be sat up in the chair, and there would be a brief, or long, discussion relating to the prior phase including diagnoses and possible interventions; the patient would leave; the GDP would write notes into the patient's record as the nurse made the surgery ready for the next patient.

What I focus on in the analysis below is not the embodied learning GDPs develop *per se*, which is often the focus of, for example, anthropological studies of apprenticeship [283], but on the moment-by-moment interactions to which GDPs, other people and things translate their embodied or embedded knowing.

6.4.2 Practice as anticipation

In these encounters, relationships between people and things were established as temporary phenomena through discussion and through prodding and probing, reading and writing, seeing and hearing. That is, as one actor said or did something, the other observed, listened or felt and, in due course, acted or spoke themselves. This might involve listening to a question and responding, or a patient seeing an instrument orientating towards their mouth and opening it.

Bakhtin wrote of the dialogic relationship that was essential to what he called utterances. Utterances are only utterances because there is an anticipation of a responsive understanding by another [284]. In these clinical encounters, in addition to dialogism in utterances, was dialogism in actions. Actors said and did things in anticipation of a responsive understanding by another.

As a GDP picked up a dental mirror and probe to check gum health, for example, the nurse would move to the computer and ready herself to record the results without the GDP saying anything. The GDP would then slide their chair and position themselves behind the supine patient's head. The GDP would raise the probe and dental mirror over the patient's face, and the patient almost always opened their mouth with no verbal prompting. If they did not, then the GDP might place a finger on the lower jaw or, rarely, ask the patient to open their mouth. The GDP, nurse and patient all appeared to be anticipating the other's – and the things' (computer, probe, chairs) – actions and reactions. This is not to say that all the reactions were correctly anticipated. For example, a GDP had asked a patient to lift their chin and the patient lifted his whole head forward, essentially tilting his chin into his chest, the opposite of what the GDP had anticipated. Nonetheless, the GDP had anticipated an action, the patient had acted and, in turn, anticipated a reaction from the GDP (that they would continue with the examination). The GDP, though, reacted with another action to align the patient's head as they needed it before they continued as the patient had anticipated.

The anticipation of others' actions suggested to me that the actors had embodied understandings of how people and things had reacted in their experience of historical practices. That is, they expected that something would happen, if they did something, because they had an embodied knowing of previous interactions in which something had, even if it was not in this or any other clinical space.

Given the speed with which they did so, this was mostly done unconsciously and working skilfully to translate their embodied knowing into this practice. They need not

have had an experience that followed a similar sequence of interactions between people and things. They may have, instead, translated something they had parsed from those previous experiences. Marchand has suggested that apprentices parse components of actions they observe their teachers do into “motor representations” of how to do things themselves, which they attempt to enact [273 p. S104]. It seems that experience of any other practices might be parsed into embodied knowing, even when learning how to act as a patient. This is to say that there will be elements of practices previously experienced (in this space, in another clinical space or somewhere non-clinical) that can be translated in some way into the ongoing practice. For example, no matter which instruments were raised over a patient’s face by the GDP, the patient almost always opened their mouth. From some experience in the past, the patient had come to embody an understanding of how to respond to the appearance of things (including the GDP’s hands) over their face.

Anticipation of others’ actions is common to many aspects of life. In relation to people, I have called this dialogism, but in relation to objects, the anticipation is of how the object might be used, what Heidegger would call being ready at hand [46]. A GDP, for example, picked up a dental mirror, which is normally used to mirror teeth and other tissues that the GDP cannot see directly. On this occasion, though, he anticipated its potential to elicit pain from around a tooth by turning it through 180° and tapping the tooth with a sharp knock with the handle. The patient responded with an “ow!” and the task of the conjuncture came to focus on working out why.

The anticipation of a response and the response (with its anticipated response, and so on), whether mediated through the spoken word, through touch, sight, sound or

smell, through things or not, gave rise to an interaction in which shared knowing appeared to exist for the moment. In the interaction between them, the GDP, patient and dental mirror handle, generated an act of knowing. If the GDP had not anticipated there might be a response from tapping the tooth, he may never have applied the tap to the tooth. If he had not anticipated the patient responding (e.g. if she were under general anaesthesia) the knowing shared in that moment, that something was “wrong” with that tooth, would not have arisen. If the patient anticipated that something terrible would happen if she said “ow” and so did not, then the act of knowing would have been different. Conjunctures, in which knowing arose, went on through multiple actions that anticipated – but could not predict – reactions.

The embodied knowing I inferred could be analytically (and only analytically) separated into that which is closely aligned with the ongoing conjuncture, similar to what Greenhalgh and Stones called conjuncture-specific knowledge [285], and that which is less closely aligned with the conjuncture, but which nonetheless translates into it, which they called general dispositions and Bourdieu called habitus [55].

Whether the embodied knowing was conjuncture-specific or not, the translation almost always was. Each person or thing, in doing or saying something that interacted with others within the conjuncture, translated whatever embodied knowing they had at that time in a way that meant the conjuncture went on.

I illustrate this with Figure 6.11 below. It shows a dentist about to take a photo of a patient’s upper central incisor, which had chipped. Not a word was said by the dentist about taking the photo. He had just finished looking at the tooth, edged the dental chair back a fraction and then reached for the camera. As he brought it over the

patient's mouth the patient bared her upper teeth by raising her lip, the nurse moved her right hand to the computer mouse and, as the dentist did, turned her head to the monitor above the patient. At this moment, each of the people translated their embodied knowing into actions that meant their respective knowing aligned, the photo could be taken, and the conjuncture could go on.



Figure 6.11 A still image showing a dentist about to take a photo of a patient's upper central incisor

6.4.3 Constraint and power

The practice and, therefore, the knowing arising in it, was suffused with power or influence [74, 75] as the different actors attempted to translate their respective embodied knowing (including of influencing others) into the ongoing practice.

People and things did what they could do within the interactions, which were bound by space and time. However, the relationships established through the interaction moment-by-moment constrained the possible translations of knowing that could

occur. For example, at one moment in the conjuncture about dental pain mentioned earlier, the dentist was facing the computer as the patient described her pain. She had not mentioned where it was but pointed to the upper right side of her face. Because the dentist was not looking at her, it meant that the knowing her action attempted to translate failed. The translation of the patient's embodied knowing was constrained by the in-the-moment relationship between her, the GDP and the computer. Similarly, in an encounter involving another GDP and patient, the GDP had set the chair in motion to go supine. The patient had been complaining that a previous filling was too high. He lifted his head from the dental chair rather than lying supine as all other patients did, as he continued protesting. The patient's translation of his discomfort and dissatisfaction was constrained by his interaction with the chair and the GDP. The GDP's translation of the planned activity (restoration of another tooth) was constrained by his interaction with the patient and the high filling in his mouth. A final example was the bodily positioning of a patient who looked at the wall rather than the GDP as she explored his oral hygiene habits. Her confidence in addressing this appeared to wane. This was in stark contrast to the next patient who turned in the chair and attended to her with evident interest as she explored his oral hygiene habits. Most of the time the constraints did not manifest so obviously, but all appointments were constrained by interactions with the other people, the equipment, the space and time. Actors were constrained by their environment. This, I consider to be part of the situatedness of action. Whatever the representations the different actors embodied about these practices, what we could call ostensive practices, were quite different to

the situated performed practice because of these constraints and the reactions of others.

Translation of knowing of practices inscribed in, for example, the computer software could also be constrained by the conjuncture's interactions. Thus, a template of questions from NHS England that was embedded within the check-up page on the computer software prompted some dentists to ask several questions about the patients' habits related to risk of oral diseases, e.g. their sugar, tobacco and alcohol consumption, and oral hygiene regime but did not prompt others. The dentists who read the list out tended to be more focused on the computer than the dentists who did not but who attended more to the patient.

The template from NHS England is an example of an expert system, which is a "disembedding mechanisms because... they remove social relations from the immediacies of context" [286 p. 28]. Through it, members of that and other organisations attempted to constrain the activities of GDPs. Sometimes the interactions allowed this other actor to induce different actions (one in which a dentist asked questions about behaviour) whilst others did not. Through their direct (discursive practices and touch) or indirect actions (via intermediaries such as artefacts) each actor attempted to influence the ongoing interactions, induce different knowing to co-exist and, therefore, to shape the unfolding practice.

6.4.4 Collective bricolage

Practice was accomplished through the adaptive translation of knowing from the different people and the things they interacted with. People and things did what they could, given the interactions between them, and generated actions (e.g. creating a problem, creating a solution) for the conjuncture to go on, to come to an end (at least for now), and for the constellation of actors to disperse. Like the bricoleur who, with their limited skill set and tools, solves problems as best they can [259], together people and things generated and solved problems in a collective bricolage. Patients used the words they knew from non-dental experiences, for example, to describe their dental experiences. They offered focused reflections on experiences they had, such as taking medication when they should not because of a medical diagnosis. They offered up proposals of what could be wrong, of what prior treatment they had received that might be relevant, of their habits and their symptoms. GDPs observed and listened, made suggestions of diagnoses and treatment approaches, used the instruments and materials at hand in different ways (the mirror handle mentioned previously, a probe designed for screening only to make diagnoses), took radiographs. All of them, working together, using their respective capacities, created the practice in that moment.

An example is the way in which a problem was fashioned within a check-up appointment to create a conjuncture related to relieving a denture that was pressing on a patient's palatal mucosa (the skin on the palate). The patient mentioned that there was a sore patch under her denture, which she believed related to the denture. The dentist listened and, as part of a check-up, looked at the denture and the mucosa

under it. After a few moments he suggested that a tooth on the denture was pushing into the mucosa because he could see a red area that related to the position of the underside of the tooth. He explained he would adjust the denture, which the patient acceded to, picked up a handpiece with a bur designed to trim the acrylic from a denture and removed the offending part as the patient watched. When replaced, she said it felt fine. Each of the actions were attempts to translate embodied knowing as best they could so that they could generate the problem and solution collaboratively. The skill was in the respective and ongoing translations of knowing within the interaction by each actor. GDPs did not act alone in their surgeries. They enacted practices with the patient, nurse and things.

6.5 Discussion

This study of eight GDPs interacting with patients has shown that knowing in general dental practice occurs as transitory interactions between humans and things within clinical conjunctures. The relationships between people and things within these interactions allow for a temporary shared knowing to co-exist. Each relationship was soon replaced with another as participants acted and reacted over time and space. The possible translation of embodied or embedded knowing through actions was constrained by the ongoing interaction. Thus, the knowing that could arise was dependent not only on the embodied knowing but on the translation of this in such a way that it could contribute to the collective knowing in practice. Finally, the various participants worked together to solve the problems and create solutions as best they could in a collective bricolage.

In this study I sought to build on previous work that suggested healthcare workers require many more sources of knowledge than that provided by research [287] and are guided by internal, tacit and socially constituted guidelines, or mindlines, and that knowledge in practice is the use of this complex knowledge in the clinical context [31, 109, 225]. The concept of knowledge in practice differs from the social anthropological, organisational and educational literature's knowing in practice [32, 38, 68]. The former seems more concerned with some-*thing*, a practical knowledge used by clinicians *as* they practice. The latter is more concerned with some-*doing* and stresses the socio-material, ephemeral, provisional and collective nature of knowing in the practice. As Marchand writes, "...acts of making knowledge are always and necessarily realised *in* interaction with others and with the world" [37 p. S11]. Practice, and the knowing that arises in it, is ecological. This paper contributes to the literature of clinical practice by suggesting that for conjunctures to go on (i.e. for clinical problems to be generated and, hopefully, solved), multiple temporary relationships between people and things need to be established in such a way that knowing relevant to the conjuncture can align. This shifts the focus from concentrating on what a clinician knows to the knowing they play a part in generating, which is situated in their environment and with the people and things there. Harris, writing from an anthropological perspective, implores us to remember that knowing is bound up with the world and that, "a person does not leave their environment to know, even when she is dealing with the most abstract of propositions" [38 p. 1]. GPs, patients, nurses and things, I suggest, only know in the moment-by-moment unfolding of clinical encounters. They may leave with a representation of this encounter as they may an

encounter elsewhere, with an interpretation they come to embody, but they only know this practice as they interact with each other.

Relevant here, also, is the concept of Habitus. Bourdieu wrote that it is “...embodied history, internalized as a second nature and so forgotten as history - is the active presence of the whole past of which it is the product” [55 p. 56]. Actors acted based on their embodied or embedded knowing of multiple practices across time (or history) and space. I do not think of Habitus as a product but a dynamic embodied phenomenon that generates “practical hypotheses based on past experience” [55 p. 54].

I have intentionally offered a description of practice that makes it complex, even when addressing routine and mundane clinical decisions and interactions. Evidence-based healthcare intended to bring research, clinical expertise and patient values and aspirations together but has tended to focus on getting practitioners to change their actions, or patients to change their behaviours, to be more aligned with what researchers suggests will improve patients’ wellbeing, the efficiency of care or some other outcome of interest. I think, based on my findings and the epistemology of practice to which I contribute, that there is a need to pay much more attention to the complexity of practices, and to recognise that what people translate into ongoing practices is not propositional knowledge but embodied knowing of practices they have either experienced personally, observed or, as the previous chapter suggested, through vicarious experiences, i.e. others’ stories of their practices.

The role of the GDP in practice is one of several who together shape the conjuncture, in contrast to traditional decision-making models in which the professional is often the

only one conceived as bringing (a usually scientific) knowledge to an encounter so that they can diagnose and treat problems. Several authors have suggested ways of thinking about professional knowing that are an alternative to this. Montgomery, in *How doctors think*, wrote that whilst scientific information can help reduce uncertainty, ultimately medicine is still a practice [248]. Mol, in *The body multiple: Ontology in medical practice*, wrote that the doctor's knowing of a disease was but one of several. The patient, the pathologist and others with a stake in living with, diagnosing or managing a disease each had their own knowing of that disease [62]. Billett, argued that knowing in practice is the construction of knowing in a social world rather than knowledge as a cognitive thing. Practice in a given situation requires knowing that arises in the situation that can influence the way in which skills are enacted [68]. I want to emphasise that whilst the dentist brings an embodied knowing to the encounter, so too does the patient, other people and material things. Professional knowing is more than that which is embodied by the professional. It is instead a dynamic, reflexive and ongoing activity to which the patient, other people and many things, each translating their respective knowing, contribute. Professional knowing cannot exist out of the performance of professional practice or without the patients and other actors that are central to that practice.

If we are concerned with the quality of clinical care, we need to think beyond propositional knowledge, which takes the form of research publications, systematic reviews and guidance. The care that arises (or not) in practice is one that arises from an embodied knowledge or knowing and is translated into interactions that constrain it, on the one hand, and generate other knowing, on the other. Whilst communication

is an important component of the interaction between people and things, there are other interactions that interfere with or promote the translation of actors' knowing. Practice is ecological – it takes place in an environment where people and things interact through restricting, touching, pushing, prodding, smelling, marking (instruments), images and sounds. And people learn to act within practice much as apprentices do, “through observation, mimesis and repeated exercise” [36 p. 247]. Clinical care arises through the non-propositional translation of knowledge embodied or embedded in bodies and things. The embodiment of learning from multiple practices, each in their own environment and with all the parsed learning they take from that, is what GPs, patients and nurses draw on to act and react in ways that are relevant to the ongoing conjuncture. If the practice of clinicians and teams is to be evaluated, this needs to be done in relation to their respective ecology. A clinician's activities cannot be evaluated out of relation to their environment. If we want to help improve practice, rather than focusing on disseminating propositional knowledge in the form of guidelines, we should focus on finding ways to allow dental teams, patients and things to take part in and contribute to practices as they improve. Or at the very least, offer vicarious experiences in the form of narratives of how others practicing in similar ecologies improved their practices [288]. They may then come to embody knowing of practices not as accomplished good practice but as the active phenomena they are. As others have shown with apprenticeship, we learn to embody knowing of practices by observing, having a go, and correcting what we do. I suggest that practices are more likely to improve if we embody knowing of practices of improving.

During this research into how knowing in practice manifests, I have reflected on how mindfulness meditation has, as one of its intentions, the development of the ability to be present in the moment [289], to develop awareness of what is happening now.

Over the last three years, I have been meditating and cultivating a mindful awareness for personal well-being. Part of this ongoing work has been a greater intention to be mindfully present in my interactions with patients, students, other staff and the objects we all interact with, when I am on the clinic. However, I think that the greater awareness of the contributions we are all making to the ongoing, moment by moment practice, has surfaced from my reading and the analysis presented in this chapter.

There is a potential for mindfulness to help clinicians be attentive to their interactions with patients [290]. Ronald Epstein wrote:

“Mindfulness informs all types of professionally relevant knowledge, including propositional facts, personal experiences, processes, and know-how, each of which may be tacit or explicit. Explicit knowledge is readily taught, accessible to awareness, quantifiable and easily translated into evidence-based guidelines. Tacit knowledge is usually learned during observation and practice, includes prior experiences, theories-in-action, and deeply held values, and is usually applied more inductively. Mindful practitioners use a variety of means to enhance their ability to engage in moment-to-moment self-monitoring, bring to consciousness their tacit personal knowledge and deeply held values, use peripheral vision and subsidiary awareness to become aware of new information and perspectives, and adopt curiosity in both ordinary and novel situations.” [291 p. 833]

It seems to me that, if those involved in a practice are to do so in a way that is in some way optimal for them, then they may benefit from developing a greater awareness of their own and others' sayings and doings, and their reactions to these in-the-moment.

I observed that clinicians, patients and nurses were apparently attentive to the sayings and doings of the others much of the time. However, the interactions were frequently interrupted, and the actors distracted, or the actions of one suggested they had not really been present to the knowing the other was attempting to translate into the interaction. This meant there were missed opportunities for knowing to be shared and, as an ephemeral phenomenon, the opportunity then passed for a richer practice to arise.

Julie Connelly wrote that awareness is "wakefulness and mindfulness of the happenings of the moment; it involves thoughts, ideas, images, emotions, sensations, and movements" [290 p. 420]. I think there is an opportunity from my perspectives as educator and clinician to explore systematically how or whether mindful awareness could improve the shared practices this thesis has been concerned with.

6.5.1 Limitations

I was the only person to analyse the data in depth. Sections of video were analysed with my supervisor and interpretations of what was happening discussed regularly throughout the analysis. The concept of practices taking place within a nexus of other practices and the translation of an embodied knowing into an ongoing practice, means that the practice of interacting with the data involved translating into it an embodied

knowing of other practices. I, as a dentist, had an embodied knowing of some dental practices that were very similar to those being observed, whereas my supervisor, as a non-dentist, embodied a lifetime of GP practices and of theoretical writings relevant to practice. Thus, the detailed analysis and interpretation of the data was appropriate for me to do alone, with my supervisor bringing a critical perspective to the findings based on her theoretical and GP experience.

6.6 Conclusion

This chapter reports how I went about attempting to explore the phenomenon of knowing in practice. As an ephemeral phenomenon, how to represent, analyse and articulate it proved very challenging. I found it frustrating at times to get into the videos so that I could analyse how knowing arose in this collaborative space, but this frustration gave rise to two novel ways of representing knowing in practice for analysis.

I theorised that knowing in practice arises as anticipation of the sayings and doings of others, that it arises in constraints imposed by the interaction and shifting power within them, and that practice is an ongoing accomplishment that arises through a collective bricolage. As such, I have suggested that, rather than focus solely on what clinicians know, we should attend to the knowing that they play a part in generating. I have suggested that there is a need to pay much more attention to the complexity of practices and the translation of embodied knowing of practices, rather than propositional knowledge, that the actors attempt.

Given the in-the-moment nature of practices, I have drawn parallels to the stated intention of mindfulness and suggested that development of a greater ability to be present in the moment by all actors, could help improve the quality of practices.

Chapter 7 Discussion and Conclusions

Content from this chapter influenced the design of this study:

Papakostopoulou M, Hurst D. Disseminating research evidence: what matters to general dental practitioners? *British Dental Journal*. 2018;225:413. (The first author was a student of mine. My contribution consisted of: guidance on development of protocol, development and recording of a narrative of change with a GDP and editing of article.)

An invited opinion article I wrote based on the discussion about complexity and evidence-based practice in this chapter was published in the *British Dental Journal*:

Hurst D. Practice, complexity and evidence-based practice. *British Dental Journal*. 2019;227(1):12-4.

7.1 Summary and Synthesis of Findings

This thesis has explored the many ways in which GDPs encounter new or confirmatory knowing from information and experiences, how knowing used in practice manifests and how knowing in practice arises through socio-material bricolage. It also describes and critically evaluates my understanding of EBD, practice, knowledge and knowing at different stages of my studies.

I began by introducing the rationale for undertaking this work, which was to gain a more nuanced understanding of the practice that we seek to make evidence-based. As a clinician and teacher, I appreciated the argument that research can help improve decision-making but was also aware of the large gaps in research and the many sources of knowledge derived from other sources on which I drew. I then described the personal, professional, educational and regulatory contexts within which I undertook the research. We teach and work in an environment in which evidence-

based practice is promulgated by our professional regulators, amongst others, but there is relatively little written about how research evidence is to be aligned with all the other types of evidence and knowing that clinicians draw on as they interact with patients and other people and things. I described how I struggled to adopt the top-down concept of implementation, and how I discovered Gabbay and Le May's ethnographic study that led them to describe mindlines. This articulated so well my personal experience that it acted as both reassurance and as a guide for the DPhil.

Chapter 2 presents a review of the literature pertaining to knowing and practice. The literature spans the clinical, organisational and anthropological fields, which have all contributed to a concept of knowing as being in-the-moment, embodied and transitory. Thinkers such as Aristotle, Marx, Dewey and Heidegger, Wittgenstein, Bourdieu, Schatzki and Orlikowski have argued that knowing and doing are not separable but that knowing is in, and generated through, action. More recent thinkers have tended to emphasise the interactional nature of knowing as existing in temporary relationships between people and things. As my understanding of practice morphed over the period of the DPhil, I came to appreciate much more this socio-material perspective of knowing and to draw on it in my final study.

In chapter 3 I reported on a mixed studies systematic review that I undertook to explore the range of sources of information that healthcare professionals encounter, so that I could design a classification for GDPs to use with their own encounters. This research arose directly from my reading of Gabbay and Le May's work leading to mindlines and my interest in exploring how GDPs tend to come across new information and experiences from which they might learn. Conducting the review and

developing the classification meant exploring facet classifications that, whilst common in the information technology world to classify complex phenomena, have found little application so far in classifying complex healthcare phenomena. The facet classification, though unable to capture the depth of qualitative methods, was a novel use of the method. Whether, ultimately it proves useful in this or a developed form to describe contextual elements of how information and experiences are encountered, it provides an example of how other complex phenomena might be classified in healthcare and professional learning.

To use the classification developed in chapter 3 with GDPs, I developed a web tool using this in combination with free-text so that I could capture quantitative and qualitative data that described their information and experience encounters. My hope at the time was that I could use such a tool with many dozens of GDPs and, in doing so, gain greater insight into the many informal, as well as formal, ways in which GDPs come across new or confirmatory learning. I learned much at this time about real time data collection and, through experience, how to test such tools with the intended users. This preparatory work enabled me to improve on the design of the tool, gain experience of administering the tool and get a sense of how GDPs would get on with it in the empirical study to follow.

Chapter 5 describes the study I had initially conceived of before working backwards to develop the classification and web tool. 11 GDPs gathered 100 knowledge encounters between them over a week, respectively, and demonstrated that professional learning is acquired from encounters with complex knowledge types in diverse contexts. The qualitative component built on this by exploring the narratives GDPs told of those and

related encounters. From these interviews and the qualitative descriptions of the encounters, I theorised that the knowing in practice, for GDPs, arises from the situated interaction of ostensive and performative knowing (see Figure 7.1 below).

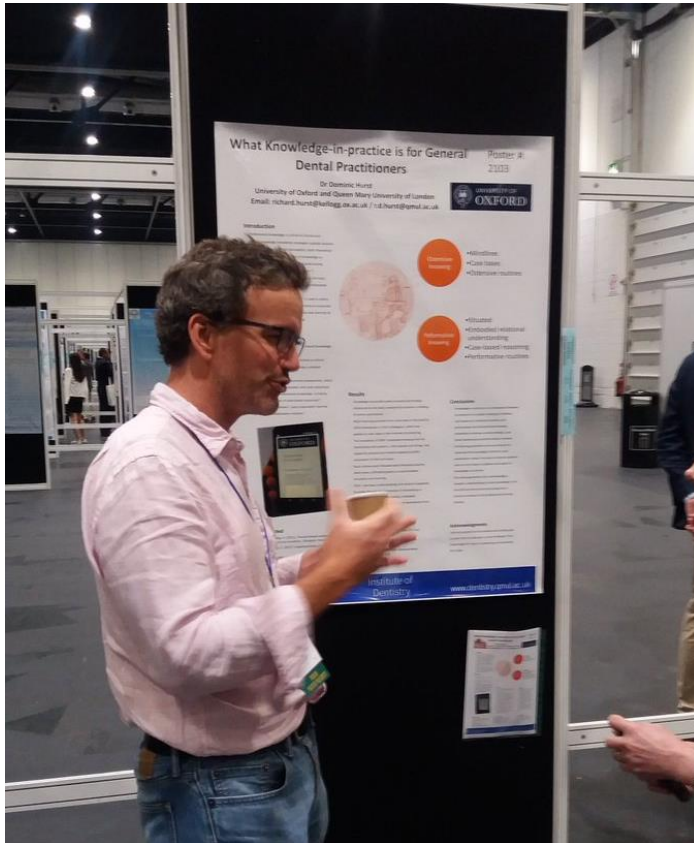


Figure 7.1 Discussing my findings from Chapter 5 at the IADR conference 2018

As my first primary study, I learned how difficult it was to recruit and retain participants. On the other hand, from the analysis of the qualitative data, I developed a deep appreciation for the practice the participants were engaged in. As my first qualitative analysis of other practitioners' experiences, I was privileged to seeing practice from others' perspectives.

Chapter 6 reports on the study that was designed to triangulate the findings from the mixed methods study with those from an observational, ethnographically-informed

study. By this stage, I had shifted from wanting to map where GDPs acquired their new learning to exploring in greater detail the concept of knowing in practice. What did this phenomenon look like in action?

The analysis of 21 clinical encounters involving eight dentists, was a complex and challenging exercise. However, using novel methods that I developed for the purpose, I was able to show how knowing in practice arises from the dialogic of multiple knowing entities, is constrained through the shifting power relations that arise within it, and that practice is accomplished through a socio-material bricolage. As well as these theoretical proposals, the description of novel methods of analysis has broadened the methods available to those who wish to explore interactions in practice using video.

The implications of this thesis are to show that GDPs' practice, which implementation science or quality improvement interventions try to change, is a complex, situated and ephemeral phenomenon. I began this study thinking that research evidence could be inserted into general dental practice in a direct and uncomplicated way. My empirical findings suggest that such thinking was naive.

The research presented in this thesis contributes in several ways to the developing field of practice theory. This theory is broad and includes thinkers and researchers from several disciplines including, but not exclusively, from organisational, social anthropological, social psychological and healthcare fields. The emphasis of this vein of theoretical and empirical research has been to shift the focus of action from single agents to that which arises through social and material interactions. This field, in

Bourdieu's terms, is one to which my habitus and capital has naturally aligned as a dental practitioner.

I think, though, that this research has demonstrated that the field is much more than social, which is what Bourdieu emphasised. The field is material too. In keeping with writers such as Tim Ingold [35] the studies presented here show that the social and the material are inseparable. GDPs, patients, nurses, dental chairs, mirrors and dental handpieces interact or, as Barad suggests, intra-act and, in some senses at least, generate each other through the practice (see examples in the pencil stills in Figure 7.2 below). The human players in this field have embodied expertise, and the material players have inscribed expertise, but this expertise becomes knowing when, and to the extent that, there is an ongoing interaction on which it can be brought to bear. The person who articulates sensations in response to questions from another demonstrates an embodied knowing of these phenomena for them. The questioner demonstrates an embodied knowing of asking. Each interacts with materiality, for example, with the lighting that allows them to see each other or the surfaces on which they sit, and which constrain their physical alignments with each other. And materiality embeds its own ability to act – to be agents. A computer that does not allow a GDP to bring up her patients' records acts on the encounter to limit the information to hand. Instead the GDP improvises through interactions with the nurse, pen and paper to record the interactions she makes with a probe, the patient as a whole (i.e. as a being that coordinates their actions, feels and bleeds) and their gums.

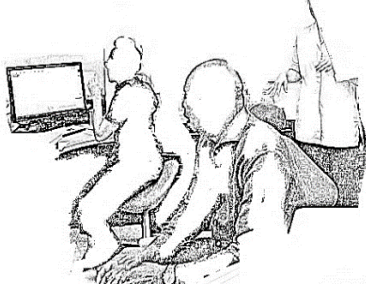
	The dentist, still at her computer, says “can you just turn this way for me please [patient]?”.
	The patient says, “sorry” and turns so that he is sitting side-on on the dental chair.

Figure 7.2 Two pencil still images from a conjuncture showing the GDP and patient interacting with materiality e.g. the computer and the dental chair

7.2 Implications for evidence-based practice

This thesis has proposed that the knowing people and things embody arises from their engagement in practices. In some manner or other they translate this into other practices through their sayings and doings. Knowing in practice is the knowing in the actions and reactions between people and things. Gabbay and Le May suggested that we find ways to work with the grain of practice to bring research evidence into it. This thesis arose from this pragmatic suggestion. I have come to embody a sense of practice being much more complex than the one that I imagined and the grain with which to work, more difficult to identify.

Although I did not realise it at the time of developing my facet classification (chapter 3), when I introduced a verbal element into my exploration of sources of information

and expertise that healthcare workers encountered, I suspect I was beginning to conceive of them as practices. Healthcare workers interacted with different sources of information and experience, whether this was at drug company functions or from patients' experiences of illness. Each of these were complex socio-material practices that, mostly surveys, had reduced to a thing. The faceted classification recognised that people and things interacted in the encounters. Healthcare workers interacted with a person whose knowing was translated through words, actions and so on. The interactions were sometimes mediated through artefacts. The interactions might involve other people and occur in different spaces.

Gabbay and Le May's work had shown the diverse practices that doctors and nurses in medical practices engage with and how these became embodied as mindlines [31, 109]. The systematic review built on this to suggest that there could be many more practices that GPs might be interpreting and embodying. With hindsight, I think that we do not encounter information and experiences but only experiences. We sometimes experience a practice that involves someone or something saying or doing something that has the potential to be interpreted by us as new or confirmatory information. In any case, we experience a practice that conveys, tacitly, more than just information. In listening to another person speak, for example, we will have experienced how they do so, our response to it, the things we and they interacted with, and so on.

The implication for evidence-based practice is that clinicians' instinctive feeling that they cannot draw directly, solely and unproblematically on research evidence when they're holding the drill and negotiating the practice of dentistry has been confirmed.

Dentists' knowing includes, but is certainly not limited to, their knowledge of relevant research evidence.

Another implication for evidence-based practice is that the application of research evidence to GDP needs to be studied (in the words of Michael Green) "where the rubber meets the road", i.e. at the bedside and in the clinic, not in abstract classroom settings [292 p. 134]. This means that a key area for new-paradigm research is through direct observation and video recording of real-world encounters. We need to study EBD or EBM in its context of application.

Publications of research and knowledge products derived from them [239, 293] are not dissimilar to protocols as proxy routines [70, 79]. As people and things interact in a general dental practice some actions may bear resemblance to these routines to an outside observer. However, the performed practice arises because people and things are translating knowing of innumerable other practices into it. The nexus of performed practices are both concurrent as the actions arising from one practice interact with people and things in this practice, and historical as embodied or embedded practices are translated into this practice.

My detailed analysis of moment-by-moment interactions between patients and clinicians has challenged the popular depiction of clinical practice as a linear sequence of events punctuated by more-or-less algorithmic decisions. Instead, clinical practice has been revealed as a highly complex and non-linear socio-material interaction. Not only does practice respond to complexities, it also generates complexities.

The interactions that I have described as arising in practice are not chaotic but nor are they ordered in the way of protocols or plans. Instead, I have argued, they involve deep and rich embodied knowing of innumerable historical practices translated into the ongoing practice. They go on with a large amount of ignorance – of the others involved, of ourselves, of the consequences of our interactions. They include great variety – of symptoms and signs, of values and wishes, of dexterity and cooperation, of medical histories and medications, of characters and attitudes, of responses and responsiveness [294]. Quantity, ignorance and variety of interactions are often associated with descriptions of complexity, a commonly used, though much-contested and difficult-to-define, term [295]. In addition, complexity tends to be associated with decentralised power, even if there is a nominal authority [296]. As I noted in my third study, power and influence constantly shift, dispersed among the people and things interacting with the GDP, the nominal authority. Practices also cannot be decomposed. They arise from the interaction of these people and things at this time in this place: “Neglecting any part of [a complex system] or severing any connection usually irretrievably destroys essential aspects of the system's behavior or structure” [296 p. 149]. When practice is reduced to simple or complex linear models, most of the essential components of practice are left out.

Using Casti’s definition of complexity as a basis, [296] we could define complexity in dental practice as ongoing, contingent practices arising from the interactions between people and things. From this perspective, complexity is not a substantive thing, e.g. a complex root canal treatment, a complex medical history. Instead, it arises and disappears within interactions and with each participant perceiving the complexity in

their own way. In this way, complexity is not something out there but, like beauty, is in the eye of the beholder [296].

In complexity science, the term system is used to denote anything from a cell to the universe. Humans, therefore, are systems that involve ongoing physiological, emotional, or psychological interactions. As systems, we interact with other systems [297] – patients, colleagues and non-human systems like computers, wheel chairs, handpieces and medications. Practices share several common properties articulated by complexity science authors, which include [298]:

- Their non-linearity, e.g. we interact with other people and things in ways we cannot predict we will at the start
- Their lack of a single measure that will give a true answer of what happened, e.g. there is no single measure of success within a clinical encounter
- Their sensitivity to the initial states of the parts of the system as they interact, e.g. clinical encounters are sensitive to the states of us, our patients and other staff, plus the states of our equipment and other objects when we begin the encounter
- Because these parts cannot be controlled perfectly, they tend to become unpredictable, e.g. whether we and the patient cooperate sufficiently to do treatment

- Their continuous feed-back loops and as a result, systematic behaviour arising from innumerable interactions, e.g. we and the other people and things respond in the moment to what the others say or do.

Whilst some aspects of an encounter may seem linear and even simple, e.g. the administration of local anaesthetic infiltration, and some linear but more complicated, e.g. anaesthesia followed by surgical removal of root, suture placement and analgesia prescription, [299] these interactions are situated within ongoing practices that are complex and unpredictable. Procedures, even when presented in complicated linear steps such as surgical protocols, do not exist outside of a practice that is complex.

The reason for this exposition of practice as complex is to foreground complexity in this discussion about evidence-based practice (EBP). EBP is a paradigm that has adopted a simple linear model of practice: research gets generated, practitioners identify research, appraise it, put it into practice and evaluate it [300]. However, for me there is a paradox: the research, and the guidelines it informs, usually conclude with simple or complicated linear models of practice, sometimes called knowledge products, [239, 293] that are best represented by order in Figure 7.3 below.

Practice, as I have described it above though, is anything but ordered. The linear models generally follow an “if X then Y” structure. Here are some examples: if a child patient is at high risk of caries, apply fluoride varnish 3-monthly [301]; if a patient has a BPE of four, do a full mouth six-point pocket chart [302]; if a patient is taking warfarin, actively consider pack and suture following extraction [303]. As propositional statements, these recommendations are based on research, but they do not represent

the unfolding, contingent, paradox-laden practices they are intended to be enacted within. They are not situated in the time or history of the practices, not sensitive to the states of people and things as they interact, do not include the variety of phenomena or actions of an unfolding practice. They are not complex.



Figure 7.3 My representation of order, complexity and chaos

Mindlines [31], I think, guide varied, non-linear, unpredictable and sometimes paradoxical interactions. Actions also appear to be interpreted and guided by the actors' general dispositions or habitus [55], e.g. a clinician's sense of themselves as caring, or a patient's sense of their physical or intellectual ability [285, 294].

The practices, in which patients and dental teams engage, are always contingent on the events that precede them, by history, the space in which they occur, and the other people and things involved. How do we deal with the paradox that the output of research is linear and practice is complex?

Gabbay and Le May showed that the linear actions, that research suggests lead to better outcomes, can be incorporated into practices in some way, despite the complexity of the practices. By focusing on interactions, I think this thesis brings the focus on what a clinician and the patient can accomplish together at this time and in this place, given their respective experiences of other practices. I called this collective bricolage in chapter 7 – the various people and things interacting in a space and a time to generate and solve problems in the best way they can [294]. This will involve paradoxical interactions when what seems right to do here in this situation is at odds with what the guidelines recommend we do. But that, I think, is OK. Practice is complex, and paradoxes are expected in complexity.

This is not to suggest that practice cannot be systematically evaluated. Instead, I suggest, that although practices involve paradoxical interactions, they still need to be open to external scrutiny. That external scrutiny, though, should not evaluate the practice on the basis that it is ordered, but complex.

The ways in which clinicians care for patients will need to improve in some contexts. To find ways of adopting, in some way, the findings of research may help with that improvement. But, as this thesis and others have shown, the practice will need to also draw on non-scientific evidence to improve. Just because practice is complex does not mean we should not ask whether we could improve it in some way. But, as I argued in my discussion in chapter 6, the evaluation and improvement should be situated in practices and include exploration of the values, meanings and other phenomena that arise as people and things interact. To some degree, GPs do this informally through

discussions with colleagues about cases, when observing each other and with the norms that develop implicitly in different practising spaces.

Stories, or narratives, involve plots and, importantly, meaning, with the narrator attempting to make sense of the complexity of events [298]. However subjective this is, the narration articulates the attempt of the narrator to make sense of complexity and is made available to others to interpret and to learn from, given their experiences [31, 304-306]. Chapter 5 suggests that narratives provide vicarious experiences that, as well as practical tips of how to do, also convey meaning and value. They engage with the emotional and the imaginal that Heron described (see Section 7.3.1), not just the conceptual and practical. The work that my MSc student conducted with GDPs suggested that narratives may allow for a richer, ecological form of knowing to become embodied by others working in similar contexts [288]. Other formats, such as applied, or forum, theatre [307] may help to bring into the open the ways in which people and things interact so that they can be felt, meaning made of them and, potentially, challenged in a constructive way. These forms of exploration, unlike those usually involved in scientific research, offer the potential to explore the complexity of aligning the knowing from research with other knowing in ongoing collective accomplishments of practice.

Peer observation of clinical practices, which usually involves individuals observing and being observed and the provision of feedback, may be the basis for a critical reflection of how research and other forms of knowing are translated into practices. I would propose that the actions research suggest are held as an equal alongside the actions other knowing suggests, and for the observed and the observer to explore how these

do or do not align in their respective practices. This is like the concept of the critical friend [308]. Neither, as far as I am aware, has been incorporated formally into the continuing professional development options for qualified dentists. And yet, as a teacher, I am required to be observed and receive feedback from a peer annually to help improve my teaching.

7.3 Personal development

In conducting the reading and research to complete this thesis I have journeyed from a positivist assumption about knowledge and the ability to somehow measure where it comes from, to a practice-based view of knowledge in which knowledge is knowing, a much more ephemeral, transient, collective and interactional phenomenon. Aside from contributing in a small way to the development of our understanding of how knowing develops, and what it looks like in general dental practice, I have been able to apply my learning to my practice, to my clinical teaching and to discussions within the dental school where I teach about what knowing we are helping our students to develop, and how we facilitate this.

The activity and the interactions involved in the collective practice of DPhil-ing, has given rise to embodied understandings of much more than the content of the research, which I have been able to make explicit in this thesis and associated publications.

The DPhil allowed me to explore many fields that, as a general dental practitioner and even as a clinical teacher, I had not had the opportunity to explore. As clinicians and

clinical teachers, we are very focused on the practical, on what is best to do for the patients we or our students are managing. There is, of course, a wealth of knowing that we acquire as we do this but what I had not appreciated until reading and researching for this thesis, was how much we do. Thus, my knowledge development has not just been about the literature relating to practice and knowing, or the methods used to research. Instead, my knowledge is of engaging in a collective practice with other researchers, with research participants, with patients, with technologies and artefacts, with distant ethics committees, other bureaucracies and with family, friends and colleagues. Each of these are engaged in other practices and have translated into those with me what they could, given the situation in which we interacted.

My conceptual and practical learning has, as I will describe in another context below, been underpinned by imaginal and emotional learning [309]. My emotional states have influenced my ability to imagine, which has influenced my ability to learn conceptually and, in turn, practically. The embodiment of a sense that, whatever other people's perspectives of me or my work is, they can never invalidate my intrinsic worth, for example, has meant that rather than restrict my imagination, I have been able to expand it and to imagine new ways to explore data. But the emotional and the imaginal learning, whilst embodied by me, have nonetheless arisen through collective socio-material accomplishments with other people and with things.

As I near the end of the DPhil and see the ways in which I can now speak to others about practice and knowing or write articles that suggest new ways of imagining

practice and disseminating research, I realise how more effective this process has allowed me to become.

Preparing the article that reported on my final study, I was asked to give a very brief three-slide presentation about feedback to colleagues. In doing this, I realised how much I had learned about knowing, practice and how we might help students develop their embodied knowing. Feedback in clinical education, which I focused on, is feedback on practice, on this ephemeral phenomenon that goes on as students interact with patients they are seeing. If we feedback on a socio-material practice, we need to help students develop an awareness of their actions within it, and those of the other people and things who take part. What is the context in terms of time and space and what is going on emotionally and imaginary as well as conceptually and practically as they perform in this context? Most of this we cannot articulate. Thus, we must recognise that we, as tutors, need to find ways to help students relive their bodily experiences as they acted and reacted, and to help them develop their own embodied sense of what is more likely to result in a recognisable set of actions we call competent. Feedback, I think, is about how to help an individual to develop their ostensive and performative knowing so that as they interact with people and things together they accomplish social and material outcomes that resemble increasing competence.

7.3.1 My related activities influenced by this work

In 2014 I was asked to run an Evidence-Based Dentistry (EBD) course for Foundation Dentists (FDs) in North East London. I initially refused, because the plan was to have a single day of instruction in how to do EBD. I had run Continuing Professional Development (CPD) courses like this for several years with members of the dental team and concluded they were a waste of time because they were too abstract from *practice*.

However, Health Education England (HEE) was persistent. I explained that for the FDs to learn how to improve practice using research, they needed to *do* improvement practice over the course of their FD year, and this was accepted enthusiastically.

I initially drew up a detailed proposal for a comprehensive hybrid of traditional EBD content including epidemiological study designs, critical appraisal and implementation models, and application through the quality improvement projects in their own practices (see Appendix DD). This was a bit too ambitious and, instead, we agreed to do the following over the course of a year:

1. Run a seminar-based study day that covered the basics of EBD with the FDs at the beginning (September)
2. Run three seminar-based days with their trainers as I felt the trainees would need support (September – December)
3. Support the FDs using Google Hangout discussions and email contact to explore their ideas for QI projects
4. Have the FDs conduct and evaluate their QI project

5. Get them to present their results in poster format to give them this experience (June the following year)

In 2018 the 4th cohort of FDs presented their results and, at the time of writing, we are about to begin the 5th.

The focus in this programme was to embrace practice and the embodiment of the non-propositional, situational knowing that is crucial to learning. Denis Postle wrote:

“Learning from experience generates knowledge. Attending to the whole experience appears to lead to the generation of realistic, useful and relevant knowledge directly supportive of human flourishing.” [309 p. 33]

The experiential knowing that the FDs developed in interacting with people and things as they attempted to shape them, I hoped, would enable them to attend to the whole tacit, emotional and creative knowing that is needed to flourish.

Postle described the emotional and imaginal underpinning that John Heron, as part of his model of multi-model learning, thought necessary for conceptual and practical learning (see Figure 7.4 below). Practice as a complex unfolding of interactions between people and things is also, fundamentally, underpinned by the emotions and the imaginations of those involved. It was common in the discussions with the FDs for them to surface some of their emotions as they engaged with the projects, e.g. of frustration when a trainer did not support them, for example, or a sense of excitement at a new computer template created to improve diabetes referrals. The projects also encouraged the FDs to imagine and generate theories about how to change actions and what will happen if they do. If Heron’s hierarchy is a good model, then the

learning about the conceptual and practical learning from these experiences will be supported by the emotional and imaginal.

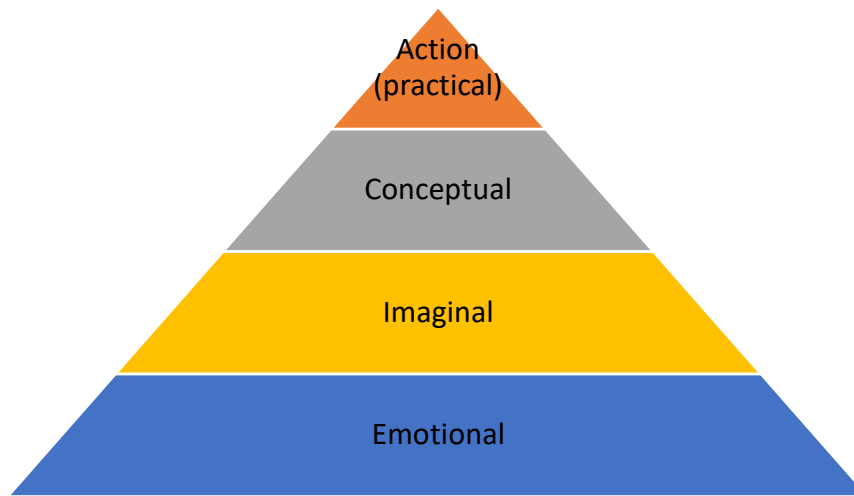


Figure 7.4 Heron's model of multi-model learning

The work in chapter 6 showed me how important narratives are in enabling GDPs to influence the performative routines of practice. I hold back now from suggesting the narratives can change the GDPs' routines, as I do not see routines as a personal phenomenon. However, there are routine-looking interactions with other people and things, which they may influence through their translation of embodied knowing. I had been wondering how one could combine narratives with research or best practice information and the effect this might have on practitioner behaviour. That is, I wanted to add context to guidance, to take some of the nuances that get relayed when practitioners discuss their management of cases and experiences and combine it with information from codified sources so that it was more understandable, feasible and practical to embody and enact. I wanted to produce an account of practice that was authentic and trustworthy.

In October 2016, I came across the following post on a GDP discussion forum:

“I'm looking to introduce blood glucose screening particularly for perio cases and have bought a kit with strips/lancers etc. Does anyone have any tips/protocols over how this best works?”

“I have heard from someone at the BSP that blood obtained from gingival inflammation has been found to be just as effective as finger prick.

“I'm no expert on diabetes but I am led to believe that periodontitis and diabetes has a bi-directional relationship (i.e. treating one makes it easier to treat the other). Accordingly, the plan is to use it as a screening measure [sic] with onward referral to GP to investigate any unusual findings and of course inform the patient of the links.”

This was a GDP just about to try and bring about change in the way he interacted with a group of patients. He was naive to at least some of the actions this would entail – both his and those of the people and things he interacted with – and was seeking others’ experiences from which he could learn. He selected not a group of experts in diabetes care, but those who are expert in the field (to use Bourdieu’s term) in which he played.

The forum offered a lot of discussion about the role of GDPs in screening for diabetes. Despite some sharing of experiences by those who are diabetic themselves, nobody appeared to be doing testing routinely with patients and, therefore, could not offer any of the experiential knowing that the GDP was seeking.

On the forum I expressed my interest in how the GDP might operationalise the testing, and we ended up discussing this using the private messaging function. We spoke on the phone and I asked, if I could keep in touch and ask him questions periodically as he began to offer to test patients. He was very happy to do this. We also agreed that we would write up his story in due course as a way of sharing his practice.

After a month I emailed with the following questions, intended to explore his interactions between people (the GDP, patients and staff) and things (TePe interdental brushes, the blood glucose meter):

- Have you been able to sample blood from the TePe brushes?
- How do patients respond to your suggestion to test?
- Roughly what proportion of people you would want to test, do you test?
- What do you do when you get a high test?
- What does “high” mean to you?
- How do you choose who to test?
- How do other members of staff react? Do they respond to patient questions about it?

Between us, the GDP and I crafted a narrative from what he had said but also added references to the NICE guidance and other information that had been shared in the dental forum (see Appendix EE). The information we incorporated had informed the GDP, even if he could not recite it all in a narrative. We also added a graphic of blood test being conducted and a video that he had watched about how to do it.

At this time, I was supervising a MSc student, who wanted to explore what affects the way GDPs interact with research [288]. With the GDP's consent, my student used an audio recording of the story made by me as one of several artefacts in her interview-based study. The response to the narrative was very positive. Although some of the participants would have liked to see the GDP who was narrating too, the format seemed to be attractive. I quote from the published paper:

“‘It’s easier not only to remember it [the narrative] but also to understand it, it’s more pleasant to hear it because it’s like a story.’” [288 p. 415]

The audio-narrated story, we concluded, was perceived as more relevant than an (audio) podcast that recounted research findings with participants more engaged with this artefact than others and finding themselves sharing common ground with the narrator. The quote from the paper below speaks to their shared field and similar habitus.

“‘I feel quite positive about storytelling [...] you know the person who’s giving the talk is someone who’s also in your shoes.’” [288 p. 415]

A detailed analysis of the use of narrative in postgraduate GDP education is beyond the scope of this thesis. However, the example above illustrates that at least some aspects of embodied practice may be successfully narrativised and usefully shared with peers. In my current teaching practice, I am also taking this work further by recording narratives of practice change as FDs go about improving various aspects of their respective practices.

7.4 Conclusion

Practice is a much more complex phenomenon than I had imagined when I began this thesis. Through my studies, both literary and empirical, I have come to embody a different understanding of what it means to be doing clinical practice. I have come to view practice not as something that a GDP does but as unfolding interactions between people and things in complex, unpredictable and non-linear ways. Practice is not ordered, and neither is it chaos. Instead, ostensive practices or mindlines, generated through previous interactions with historical practices, and the participants' respective habituses, guide complex performances of the moment. If EBM or EBD is to fulfil its goals of incorporating research with patient and clinician expertise and experiences, then more attention needs to be given to that other knowing and ways found to help GDPs align these multiple sources in their moment-by-moment interactions with patients, other people and things each of whom is engaged in other practices. The actions each performs are momentary translations of an embodied knowing of these practices at this moment. Practice does not arise from the GDP but is a collective bricolage – a socio-material accomplishment, in which they play but one part. We need to think of many more innovative ways to help students, inexperienced and experienced clinicians, develop awareness of the knowing they are partaking in generating, and to find useful ways to distil and share this with others.

References

1. Straus SE, Glasziou P, Richardson WS, Haynes B. Introduction. Evidence-Based Medicine: How to Practice and Teach it. 4th ed. Edinburgh, UK: Elsevier Churchill Livingstone; 2011. p. 1-12.
2. Sackett DL, Rosenberg WM, Gray JA, Haynes RB, Richardson WS. Evidence based medicine: what it is and what it isn't. *British Medical Journal*. 1996;312(7023):71-2.
3. Loftus S. Embodiment in the practice and education of health professionals. In: Green B, Hopwood N, editors. *The Body in Professional Practice, Learning and Education: Body/Practice*. Cham, Switzerland: Springer International Publishing; 2015. p. 139-56.
4. Lomas J. The in-between world of knowledge brokering. *British Medical Journal*. 2007;334(7585):129-32.
5. Straus SE, Tetroe J, Graham ID. *Knowledge Translation in Health Care: Moving from Evidence to Practice*. Second edition. ed. Oxford, UK: Wiley Blackwell; 2013.
6. General Dental Council. *Preparing for Practice. Dental Team Learning Outcomes for Registration* London, UK: General Dental Council; 2015.
7. Commission on Dental Accreditation. *Accreditation Standards for Advanced Education Programs in General Practice Residency*. Chicago, USA: American Dental Association; 2017.
8. Forrest JL, Miller SA, Newman MG. Teaching evidence-based decision-making versus experience-based dentistry. *The Alpha omegan*. 2004;97(2):35-41.
9. Marshall TA, Straub-Morarend CL, Handoo N, Solow CM, Cunningham-Ford MA, Finkelstein MW. Integrating critical thinking and evidence-based dentistry across a four-year dental curriculum: a model for independent learning. *Journal of Dental Education*. 2014;78(3):359-67.
10. Rugh JD, Sever N, Glass BJ, Matteson SR. Transferring evidence-based information from dental school to practitioners: a pilot "academic detailing" program involving dental students. *Journal of Dental Education*. 2011;75(10):1316-22.
11. Jones DL, Hinton RJ, Dechow PC, Abdellatif H, McCann AL, Schneiderman ED, et al. The evidence-based dentistry initiative at Baylor College of Dentistry. *Texas dental journal*. 2011;128(2):177-80.
12. American Dental Association. *Policy on Evidence-Based Dentistry*: American Dental Association; 2013 [Available from: <https://www.ada.org/en/about-the-ada/ada-positions-policies-and-statements/policy-on-evidence-based-dentistry> (Archived by WebCite® at <http://www.webcitation.org/750QQ4s4P>).
13. World Dental Federation. *Evidence-Based Dentistry (EBD)*: World Dental Federation; 2016 [Available from: <https://www.fdiworldddental.org/resources/policy-statements-and-resolutions/evidence-based-dentistry-ebd> (Archived by WebCite® at <http://www.webcitation.org/70yuxk498>).
14. Finance Commercial and NHS Directorate. *Dental Quality and Outcomes Framework for 2016-17*. London, UK: Department of Health; 2016.
15. Hurst D. Primary Dental Care [Internet]: Blogger. 2012. [cited 2018 10/03/2013]. Available from: <http://primarydentalcare.blogspot.co.uk/2012/12/dental-journal-access-ha-ha-ha.html> (Archived by WebCite® at <http://www.webcitation.org/70yuTcG2U>).
16. OpenAthens. *OpenAthens Eligibility*: NICE: National Institute for Health and Care Excellence; 2018 [Available from: <https://www.nice.org.uk/about/what-we-do/evidence->

services/journals-and-databases/openathens/openathens-eligibility (Archived by WebCite® at <http://www.webcitation.org/70yul57D3>).

17. Bonetti DL. Evidence not practised: the underutilisation of preventive fissure sealants. *British Dental Journal*. 2014;216(7):409-13.
18. Cope AL, Francis NA, Wood F, Chestnutt IG. Antibiotic prescribing in UK general dental practice: a cross-sectional study. *Community dentistry and oral epidemiology*. 2016;44(2):145-53.
19. Schwendicke F, Göstemeyer G. Understanding dentists' management of deep carious lesions in permanent teeth: a systematic review and meta-analysis. *Implementation Science*. 2016;11(1):142.
20. Hannes K, Norre D, Goedhuys J, Naert I, Aertgeerts B. Obstacles to implementing evidence-based dentistry: a focus group-based study. *Journal of Dental Education*. 2008;72(6):736-44.
21. Haron IM, Sabti MY, Omar R. Awareness, knowledge and practice of evidence-based dentistry amongst dentists in Kuwait. *European Journal of Dental Education*. 2012;16(1):e47-52.
22. Hurst D. Indirect or direct restorations for heavily restored posterior adult teeth? *Evidence-Based Dentistry*. 2010;11(4):116-7.
23. Hurst D. What is the best way to restore the worn dentition? *Evidence-Based Dentistry*. 2011;12(2):55-6.
24. Manresa C, Sanz-Miralles EC, Twigg J, Bravo M. Supportive periodontal therapy (SPT) for maintaining the dentition in adults treated for periodontitis. *Cochrane Database of Systematic Reviews*. 2018(1).
25. Del Fabbro M, Corbella S, Sequeira-Byron P, Tsisis I, Rosen E, Lolato A, et al. Endodontic procedures for retreatment of periapical lesions. *Cochrane Database of Systematic Reviews*. 2016(10).
26. Ghaeminia H, Perry J, Nienhuijs MEL, Toedtling V, Tummers M, Hoppenreijts TJM, et al. Surgical removal versus retention for the management of asymptomatic disease-free impacted wisdom teeth. *Cochrane Database of Systematic Reviews*. 2016(8).
27. Sequeira-Byron P, Fedorowicz Z, Carter B, Nasser M, Alrowaili EF. Single crowns versus conventional fillings for the restoration of root-filled teeth. *Cochrane Database of Systematic Reviews*. 2015(9).
28. Riley P, Worthington HV, Clarkson JE, Beirne PV. Recall intervals for oral health in primary care patients. *Cochrane Database of Systematic Reviews*. 2013(12).
29. Worthington HV, Clarkson JE, Bryan G, Beirne PV. Routine scale and polish for periodontal health in adults. *Cochrane Database of Systematic Reviews*. 2013(11).
30. Cook SD, Brown JS. Bridging epistemologies: the generative dance between organizational knowledge and organizational knowing. *Organization Science*. 1999;10(4):381-400.
31. Gabbay J, Le May A. *Practice-Based Evidence for Healthcare: Clinical Mindlines*. Abingdon, UK: Routledge; 2011.
32. Orlikowski WJ. Knowing in practice: enacting a collective capability in distributed organizing. *Organization Science*. 2002;13(3):249-73.
33. Dreyfus HL. *Being-in-the-world : A Commentary on Heidegger's Being and Time*, Division I. Cambridge, USA: MIT Press; 1991.
34. Feldman MS, Orlikowski WJ. Theorizing practice and practicing theory. *Organization Science*. 2011;22(5):1240-53.
35. Ingold T. Situating action VI: a comment on the distinction between the material and the social. *Ecological Psychology*. 1996;8(2):183-7.
36. Marchand THJ. Muscles, morals and mind: craft apprenticeship and the formation of person. *British Journal of Educational Studies*. 2008;56(3):245-71.

37. Marchand THJ. Making knowledge: explorations of the indissoluble relation between minds, bodies, and environment. *Journal of the Royal Anthropological Institute*. 2010;16(s1):S1-S21.
38. Harris M. Ways of knowing. In: Harris M, editor. *Ways of Knowing: Anthropological Approaches to Crafting Experience and Knowledge*. Oxford, UK: Berghahn Books.; 2007. p. 1-24.
39. Nicolini D. Praxis and practice theory: a brief historical overview. In: Nicolini D, editor. *Practice Theory, Work, and Organization: an Introduction*. Oxford, UK: Oxford University Press; 2013. p. 23-43.
40. Margolis J. The novelty of Marx's Theory of Praxis. *Journal for the Theory of Social Behaviour*. 1989;19(4):367-88.
41. Aristotle. *Aristotle: Nicomachean Ethics, Books II-IV*. Taylor CCW, editor. Oxford, UK: Oxford University Press; 2006.
42. Hunter K. "Don't think zebras": uncertainty, interpretation, and the place of paradox in clinical education. *Theoretical Medicine*. 1996;17(3):225-41.
43. Andrew E. A note on the unity of theory and practice in Marx and Nietzsche. *Political Theory*. 1975;3(3):305-16.
44. Marx K, Engels F. *The Marx-Engels reader*. Second ed. Tucker RC, editor. New York, USA: W.W. Norton; 1978.
45. Blattner WD. The primacy of practice and assertoric truth: Dewey and Heidegger. In: Malpas JE, Wrathall MA, Dreyfus HL, editors. *Heidegger, authenticity, and modernity: Essays in honor of Hubert L Dreyfus*. Cambridge, Mass, USA: MIT Press; 2000. p. 231-49.
46. Heidegger M. *Being and Time*. Translated by John Macquarrie & Edward Robinson. Oxford, UK: Blackwell; 1962. Reprinted 2001.
47. Bloor D. Wittgenstein and the priority of practice. In: Schatzki T, Cetina K, von Savigny E, editors. *The Practice Turn in Contemporary Theory*. London, UK: Routledge; 2001. p. 95-106.
48. Johannessen KS. The concept of practice in Wittgenstein's later philosophy. *Inquiry*. 1988;31(3):357-69.
49. Schatzki TR. Introduction: practice theory. In: Knorr-Cetina KD, von Savigny E, editors. *The Practice Turn in Contemporary Theory*. London, UK: Routledge; 2001. p. 10-23.
50. Reckwitz A. Practices and their affects. In: Hui A, Schatzki T, Shove E, editors. *The Nexus of Practices: Connections, Constellations, Practitioners*. Oxon, UK: Routledge; 2017. p. 126-37.
51. Giddens A. Elements of the theory of structuration. *The Constitution of Society: Outline of the Theory of Structuration*. Cambridge, UK: Polity; 1984. p. 1-40.
52. Polanyi M. *The Tacit Dimension*. London, UK: University of Chicago Press; 2009.
53. Nicolini D. *Practice Theory, Work, and Organization: An Introduction*. Oxford, UK: Oxford University Press; 2013.
54. Callinicos A. Anthony Giddens. *Theory and Society*. 1985;14(2):133-66.
55. Bourdieu P. Structures, Habitus, Practices. *The Logic of Practice*. Cambridge, UK: Polity; 1990. p. 52-65.
56. Maton K. Habitus. In: Grenfell M, editor. *Pierre Bourdieu: Key Concepts*. Abingdon, UK: Routledge; 2014. p. 48-64.
57. Bourdieu P. Belief and the Body. *The Logic of Practice*. Cambridge, UK: Polity; 1990. p. 66-79.
58. Polanyi M. *Personal Knowledge. Towards a Post-Critical Philosophy*. London, UK: Routledge & Kegan Paul; 1958.
59. Strati A. Knowing in practice: aesthetic understanding and tacit knowledge. In: Nicolini D, Gherardi S, Yanow D, editors. *Knowing in Organizations: A Practice-Based Approach*. Abingdon, UK: Routledge; 2015.

60. Bryman A. *Social Research Methods*. Fourth ed. Oxford, UK: Oxford University Press; 2012.
61. Todres L. Being with that: the relevance of embodied understanding for practice. *Qualitative Health Research*. 2008;18(11):1566-73.
62. Mol A. *The body Multiple: Ontology in Medical Practice*. Durham, NC, USA: Duke University Press; 2002.
63. Schatzki TR. Practices and actions: a Wittgensteinian critique of Bourdieu and Giddens. *Philosophy of the Social Sciences*. 1997;27(3):283-308.
64. Hui A, Schatzki T, Shove E. *The Nexus of Practices: Connections, Constellations, Practitioners*. London, UK: Routledge; 2016.
65. Lave J, Wenger E. *Situated Learning: Legitimate Peripheral Participation*. Cambridge, UK: Cambridge University Press; 1991.
66. Schmidt R. Reflexive knowledge in practices. In: Hui A, Schatzki T, Shove E, editors. *The Nexus of Practices: Connections, Constellations, Practitioners*. Oxon, UK: Routledge; 2017. p. 141-54.
67. Nicolini D, Gherardi S, Yanow D. *Knowing in Organizations: A Practice-Based Approach*. Abingdon, UK: Routledge; 2015.
68. Billett S. Knowing in practice: re-conceptualising vocational expertise. *Learning and Instruction*. 2001;11(6):431-52.
69. Nicolini D, Gherardi S, Yanow D. Introduction: toward a practice-based view of knowing and learning in organizations. In: Nicolini D, Gherardi S, Yanow D, editors. *Knowing in Organizations: A Practice-Based Approach*. Abingdon, UK: Routledge; 2015. p. 3-31.
70. Feldman MS, Pentland BT. Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly*. 2003;48(1):94-118.
71. Wenger E. Communities of Practice and Social Learning Systems. *Organization*. 2000;7(2):225-46.
72. Eraut M. The acquisition and use of theory by beginning teachers. *Developing Professional Knowledge and Competence*. London, UK: Falmer; 1994. p. 59-74.
73. Wenger E. *Communities of Practice: Learning, Meaning, and Identity*. Cambridge, UK: Cambridge University Press; 1998.
74. Foucault M. The subject and power. *Critical Inquiry*. 1982;8(4):777-95.
75. Watson M. Placing power in practice theory. In: Hui A, Schatzki T, Shove E, editors. *The Nexus of Practices: Connections, Constellations, Practitioners*. Oxon, UK: Routledge; 2017. p. 169-82.
76. Costall A, Leudar I. Situating action I: truth in the situation. *Ecological Psychology*. 1996;8(2):101-10.
77. Suchman LA. *Plans and Situated Actions: The Problem of Human-Machine Communication*. Cambridge, UK: Cambridge University Press; 1987.
78. Suchman L. Response to Vera and Simon's situated action: a symbolic interpretation. *Cognitive Science*. 1993;17(1):71-5.
79. Swinglehurst D, Greenhalgh T, Myall M, Russell J. Ethnographic study of ICT-supported collaborative work routines in general practice. *BMC Health Services Research*. 2010;10(1):348.
80. Boud D, Cohen R, Walker D. Introduction: understanding learning from experience. In: Boud D, Cohen R, Walker D, editors. *Using Experience for Learning*. Buckingham, UK: Society for Research into Higher Education & Open University Press; 1993. p. 1-18.
81. Fenwick T. Co-production in professional practice: a sociomaterial analysis. *Professions and Professionalism*. 2012;2(2):322.
82. Bennett J. Preface. *Vibrant Matter: A Political Ecology of Things*. Durham, NC, USA: Duke University Press; 2010. p. vii-xix.

83. Barad K. Posthumanist performativity: toward an understanding of how matter comes to matter. *Signs: Journal of Women in Culture and Society*. 2003;28(3):801-31.
84. Thomson P. Field. In: Grenfell M, editor. *Pierre Bourdieu: Key Concepts*. Abingdon, UK: Routledge; 2014. p. 65-80.
85. Jensen CB. An amodern disposition: on performativity, practical ontology, and intervention. In: Hunsinger J, Nolan J, editors. *Ontologies for Developing Things: Making Health Care Futures Through Technology*. Transdisciplinary Studies. 3. Rotterdam, The Netherlands: Sense Publishers; 2010. p. 1-18.
86. Carper B. Fundamental patterns of knowing in nursing. *Advances in Nursing Science*. 1978;1(1):13-23.
87. Higgs J, Titchen A. Propositional, professional and personal knowledge in clinical reasoning. In: Higgs J, Jones M, editors. *Clinical Reasoning in the Health Professions*. Oxford, UK: Butterworth-Heinemann; 1995. p. 129-46.
88. Eraut M. Non-formal learning and tacit knowledge in professional work. *British Journal of Educational Psychology*. 2000;70:113-36.
89. Kemmis S. Knowing practice: searching for saliences. *Pedagogy, Culture and Society*. 2005;13(3):391-426.
90. Fugill M. Tacit knowledge in dental clinical teaching. *European Journal of Dental Education*. 2012;16(1):2-5.
91. Theresa W, Barbel P, Heather F, S. DE. Practice-based learning: emerging professional characteristics, self-concepts and patterns of knowing in dental training. *European Journal of Dental Education*. 2002;6(1):9-15.
92. Hindmarsh J. Peripherality, participation and communities of practice: examining the patient in dental training. In: Hindmarsh J, Llewellyn N, editors. *Organisation, Interaction and Practice*. Cambridge, UK: Cambridge University Press; 2010. p. 218-40.
93. Heneghan C, Perera R, Mant D, Glasziou P. Hypertension guideline recommendations in general practice: awareness, agreement, adoption, and adherence. *British Journal of General Practice*. 2007;57(545):948-52.
94. Tellez M, Gray SL, Gray S, Lim S, Ismail AI. Sealants and dental caries: dentists' perspectives on evidence-based recommendations. *Journal of the American Dental Association*. 2011;142(9):1033-40.
95. Bansal R, Bolin KA, Abdellatif HM, Shulman JD. Knowledge, attitude and use of fluorides among dentists in Texas. *Journal of Contemporary Dental Practice*. 2012;13(3):371-5.
96. Bhattacharyya N, Kepnes LJ. Patterns of care before and after the adult sinusitis clinical practice guideline. *The Laryngoscope*. 2013;123(7):1588-91.
97. Pathman DE, Konrad TR, Freed GL, Freeman VA, Koch GG. The awareness-to-adherence model of the steps to clinical guideline compliance: the case of pediatric vaccine recommendations. *Medical care*. 1996;34(9):873-89.
98. Perkins RB, Anderson BL, Gorin SS, Schulkin JA. Challenges in cervical cancer prevention: a survey of US obstetrician-gynecologists. *American Journal of Preventive Medicine*. 2013;45(2):175-81.
99. Widyahening IS, van der Graaf Y, Soewondo P, Glasziou P, van der Heijden GJ. Awareness, agreement, adoption and adherence to type 2 diabetes mellitus guidelines: a survey of Indonesian primary care physicians. *BMC family practice*. 2014;15(1):1.
100. Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud PA, et al. Why don't physicians follow clinical practice guidelines? A framework for improvement. *Journal of the American Medical Association*. 1999;282(15):1458-65.
101. Grol R, Wensing M. What drives change? Barriers to and incentives for achieving evidence-based practice. *Medical Journal of Australia*. 2004;180(6 Suppl):S57-60.

102. Zwolsman S, te Pas E, Hooft L, Wieringa-de Waard M, van Dijk N. Barriers to GPs' use of evidence-based medicine: a systematic review. *The British Journal of General Practice*. 2012;62(600):511-21.
103. van Dijk N, Hooft L, Wieringa-de Waard M. What are the barriers to residents' practicing evidence-based medicine? A systematic review. *Acad Med*. 2010;85(7):1163-70.
104. Baker R, Camosso-Stepinovic J, Gillies C, Shaw EJ, Cheater F, Flottorp S, et al. Tailored interventions to address determinants of practice. *Cochrane Database of Systematic Reviews*. 2015(4):CD005470.
105. Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, et al. Audit and feedback: effects on professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews*. 2012;6:CD000259.
106. O'Brien MA, Rogers S, Jamtvedt G, Oxman AD, Odgaard-Jensen J, Kristoffersen DT, et al. Educational outreach visits: effects on professional practice and health care outcomes. *Cochrane Database of Systematic Reviews*. 2007(4):CD000409.
107. Eccles MP, Mittman BS. Welcome to Implementation Science. *Implementation Science*. 2006;1(1):1.
108. Montgomery-Hunter K. A science of individuals: medicine and casuistry. *Journal of Medicine and Philosophy*. 1989;14(2):193-212.
109. Gabbay J, le May A. Evidence based guidelines or collectively constructed "mindlines?" Ethnographic study of knowledge management in primary care. *British Medical Journal*. 2004;329:1013.
110. Wieringa S, Greenhalgh T. 10 years of mindlines: a systematic review and commentary. *Implementation Science*. 2015;10:45.
111. Davies K. The information-seeking behaviour of doctors: a review of the evidence. *Health Information and Libraries Journal*. 2007;24(2):78-94.
112. Dawes M, Sampson U. Knowledge management in clinical practice: a systematic review of information seeking behavior in physicians. *International journal of medical informatics*. 2003;71(1):9-15.
113. Isham A, Bettiol S, Hoang H, Crocombe L. A Systematic Literature Review of the Information-Seeking Behavior of Dentists in Developed Countries. *Journal of dental education*. 2016;80(5):569-77.
114. Spenceley SM, O'Leary KA, Chizawsky LLK, Ross AJ, Estabrooks CA. Sources of information used by nurses to inform practice: an integrative review. *International journal of nursing studies*. 2008;45(6):954-70.
115. Osiobe SA. Use of information resources by health professionals: a review of the literature. *Social Science and Medicine*. 1985;21(9):965-73.
116. Dorsch JL. Information needs of rural health professionals: a review of the literature. *Bulletin of the Medical Library Association*. 2000;88(4):346-54.
117. Coumou HC, Meijman FJ. How do primary care physicians seek answers to clinical questions? A literature review. *Journal of the Medical Library Association*. 2006;94(1):55-60.
118. Oxford Dictionaries. Encounter 2015 [cited 2015. Available from: <http://www.oxforddictionaries.com/definition/english/encounter> (Archived by WebCite® at <http://www.webcitation.org/70yvK5iVO>).
119. Dictionary.com. Encounter: Random House Inc.,; 2015 [Available from: <http://dictionary.reference.com/browse/encounter> (Archived by WebCite® at <http://www.webcitation.org/70yvTd6qn>).
120. Merriam-Webster. Encounter 2015 [Available from: <http://www.learnersdictionary.com/definition/encounter> (Archived by WebCite® at <http://www.webcitation.org/70yvUNn9g>).
121. Roget PM, Kirkpatrick B. Roget's Thesaurus. Kirkpatrick B, editor. London, UK: Penguin Books Ltd.; 1998.

122. Thesaurus.com Roget's 21st Century Thesaurus. Encounter 2009 [Third:[Available from: <http://www.thesaurus.com/browse/encounter/1> (Archived by WebCite® at <http://www.webcitation.org/72ckq7UhT>).
123. Greene MG, Adelman RD, Charon R, Friedmann E. Concordance between physicians and their older and younger patients in the primary care medical encounter. *The Gerontologist*. 1989;29(6):808-13.
124. Moumjid N, Gafni A, Bremond A, Carrere MO. Shared decision making in the medical encounter: are we all talking about the same thing? *Medical Decision Making*. 2007;27(5):539-46.
125. Lazare A. Shame and humiliation in the medical encounter. *Archives of Internal Medicine*. 1987;147(9):1653-8.
126. Tsoukas H, Vladimirou E. What is organizational knowledge? *Journal of Management Studies*. 2001;38(7):973-93.
127. Stenmark D. The relationship between information and knowledge. *Proceedings of IRIS (Information Systems Research Seminar in Scandinavia)*; Ulvik, Norway: Department of Information Science, University of Bergen; 2001. p. 11-4.
128. Estabrooks CA, Rutakumwa W, O'Leary KA, Profetto-McGrath J, Milner M, Levers MJ, et al. Sources of practice knowledge among nurses. *Qualitative Health Research*. 2005;15(4):460-76.
129. Weick KE, Sutcliffe KM, Obstfeld D. Organizing and the process of sensemaking. *Organization Science*. 2005;16(4):409-21.
130. Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal*. 2009;26(2):91-108.
131. Pluye P, Hong QN. Combining the power of stories and the power of numbers: mixed methods research and mixed studies reviews. *Annual review of public health*. 2013.
132. National Center for Biotechnology Information. Health Occupations - MeSH term PubMed: National Center for Biotechnology Information; 1968 [Available from: <https://www.ncbi.nlm.nih.gov/mesh/68006281> (Archived by WebCite® at <http://www.webcitation.org/72cZhmdkQ>).
133. Estabrooks CA, Chong H, Brigidear K, Profetto-McGrath J. Profiling Canadian nurses' preferred knowledge sources for clinical practice. *Canadian Journal of Nursing Research*. 2005;37(2):118-40.
134. Cook DA, Levinson AJ, Garside S, Dupras DM, Erwin PJ, Montori VM. Internet-based learning in the health professions: a meta-analysis. *Journal of the American Medical Association*. 2008;300(10):1181-96.
135. Haug JD. Physicians' preferences for information sources: a meta-analytic study. *Bulletin of the Medical Library Association*. 1997;85(3):223-32.
136. Househ MS, Kushniruk A, Carleton B, Cloutier-Fisher D. A literature review on distance knowledge exchange in healthcare groups: what can we learn from the ICT literature? *Journal of Medical Systems*. 2011;35(4):639-46.
137. Pentland D, Forsyth K, Maciver D, Walsh M, Murray R, Irvine L, et al. Key characteristics of knowledge transfer and exchange in healthcare: integrative literature review. *Journal of advanced nursing*. 2011;67(7):1408-25.
138. Hurst D. Describing knowledge encounters in healthcare: a mixed studies systematic review and development of a classification. Knowledge sources and influences data extraction - final data set 2016 [Available from: https://figshare.com/articles/Describing_knowledge_encounters_in_healthcare_a_mixed_studies_systematic_review_and_development_of_a_classification_Knowledge_sources_and_influences_data_extraction_-_final_data_set/3494201 (Archived by WebCite® at <http://www.webcitation.org/72cqpo1ao>).

139. Pluye P, Robert E, Cargo M, Bartlett G, O'Cathain A, Griffiths F, et al. Proposal: a mixed methods appraisal tool for systematic mixed studies reviews. 2011 [Available from: <http://mixedmethodsappraisaltoolpublic.pbworks.com> (Archived at WebCite® at <http://www.webcitation.org/5tTRTc9yJ>)].
140. Kwasnik BH. The role of classification in knowledge representation and discovery. *Library Trends*. 1999;48(1):22-47.
141. Ellis D, Vasconcelos A. Ranganathan and the Net: using facet analysis to search and organise the World Wide Web. *Aslib Proceedings*. 1999;51(1):3-10.
142. Li Y, Belkin NJ. A faceted approach to conceptualizing tasks in information seeking. *Information Processing and Management*. 2008;44(6):1822-37.
143. Broughton V. Faceted classification as a basis for knowledge organization in a digital environment: the Bliss Bibliographic Classification as a model for vocabulary management and the creation of multidimensional knowledge structures. *New Review of Hypermedia and Multimedia*. 2001;7(1):67-102.
144. Broughton V. The need for a faceted classification as the basis of all methods of information retrieval. *Aslib Proceedings*. 2006;58(1/2):49-72.
145. Al-Ghabeesh SH, Abu-Moghli F, Salsali M, Saleh M. Exploring sources of knowledge utilized in practice among Jordanian registered nurses. *Journal of Evaluation in Clinical Practice*. 2013;19(5):889-94.
146. Ammary-Risch N, Kwon HT, Scarbrough W, Higginbotham E, Heath-Watson S. Minority primary care physicians' knowledge, attitudes, and practices on eye health and preferred sources of information. *Journal of the National Medical Association*. 2009;101(12):1247-53.
147. Andrews JE, Pearce KA, Ireson C, Love MM. Information-seeking behaviors of practitioners in a primary care practice-based research network (PBRN). *Journal of the Medical Library Association*. 2005;93(2):206-12.
148. Ankem K. Influence of information sources on the adoption of uterine fibroid embolization by interventional radiologists. *Journal of the Medical Library Association*. 2003;91(4):450-9.
149. Apalayine GB, Ehikhamenor FA. The information needs and sources of primary health care workers in the Upper East Region of Ghana. *Journal of Information Science*. 1996;22(5):367-73.
150. Arroll B, Pandit S, Kerins D, Tracey J, Kerse N. Use of information sources among New Zealand family physicians with high access to computers. *Journal of Family Practice*. 2002;51(8).
151. Asefzadeh S, Rafati M. How do physicians and dentists update their information after graduation. The 4th International Scientific Conference: E-learning And Software For Education; Bucharest, Romania 2008.
152. Barley M, Pope C, Chilvers R, Sipos A, Harrison G. Guidelines or mindlines? A qualitative study exploring what knowledge informs psychiatrists decisions about antipsychotic prescribing. *Journal of Mental Health*. 2008;17(1):9-17.
153. Beaulieu M-D, Proulx M, Jobin G, Kugler M, Gossard F, Denis J-L, et al. When is knowledge ripe for primary care? An exploratory study on the meaning of evidence. *Evaluation and the Health Professions*. 2008;31(1):22-42.
154. Bennett NL, Casebeer LL, Kristofco R, Collins BC. Family physicians' information seeking behaviors: a survey comparison with other specialties. *BMC medical informatics and decision making*. 2005;5:9.
155. Bennett NL, Casebeer LL, Zheng S, Kristofco R. Information-seeking behaviors and reflective practice. *Journal of Continuing Education in the Health Professions*. 2006;26(2):120-7.

156. Bernard E, Arnould M, Saint-Lary O, Duhot D, Hebbrecht G. Internet use for information seeking in clinical practice: a cross-sectional survey among French general practitioners. *International journal of medical informatics*. 2012;81(7):493-9.
157. Bonner A, Lloyd A. What information counts at the moment of practice? Information practices of renal nurses. *Journal of advanced nursing*. 2011;67(6):1213-21.
158. Botello-Harbaum MT, Demko CA, Curro FA, Rindal DB, Collie D, Gilbert GH, et al. Information-seeking behaviors of dental practitioners in three practice-based research networks. *Journal of Dental Education*. 2013;77(2):152-60.
159. Bryant SL. The information needs and information seeking behaviour of family doctors. *Health Information and Libraries Journal*. 2004;21(2):84-93.
160. Butzlaff M, Koneczny N, Floer B, Vollmar HC, Lange S, Kunstmann W, et al. Family physicians, the internet and new knowledge. Utilization and judgment of efficiency of continuing education media by general physicians and internists in family practice. *Medizinische Klinik*. 2002;97(7):383-8.
161. Callen JL, Buyankhishig B, McIntosh JH. Clinical information sources used by hospital doctors in Mongolia. *International journal of medical informatics*. 2008;77(4):249-55.
162. Chang J, Kim HY, Cho BH, Lee IB, Son HH. Information resources and material selection in bonded restorations among Korean dentists. *Journal of Adhesive Dentistry*. 2009;11(6):439-46.
163. Chew-Graham CA, Cahill G, Dowrick C, Wearden A, Peters S. Using multiple sources of knowledge to reach clinical understanding of chronic fatigue syndrome. *Annals of Family Medicine*. 2008;6(4):340-8.
164. Clarke CL, Wilcockson J. Seeing need and developing care: exploring knowledge for and from practice. *International journal of nursing studies*. 2002;39(4):397-406.
165. Cogdill KW. Information needs and information seeking in primary care: a study of nurse practitioners. *Journal of the Medical Library Association*. 2003;91(2):203-15.
166. Curley SP, Connelly DP, Rich EC. Physicians' use of medical knowledge resources - preliminary theoretical framework and findings. *Medical Decision Making*. 1990;10(4):231-41.
167. Dee C, Blazek R. Information needs of the rural physician - a descriptive study. *Bulletin of the Medical Library Association*. 1993;81(3):259-64.
168. Elliott TE, Elliott BA. Physician acquisition of cancer pain management knowledge. *Journal of Pain and Symptom Management*. 1991;6(4):224-9.
169. Estabrooks CA. Will evidence-based nursing practice make practice perfect? *Canadian Journal of Nursing Research*. 1998;30(1):15-36.
170. Fairhurst K, Huby G. From trial data to practical knowledge: qualitative study of how general practitioners have accessed and used evidence about statin drugs in their management of hypercholesterolaemia. *British Medical Journal*. 1998;317(7166):1130-4.
171. Gagliardi AR, Wright FC, Davis D, McLeod RS, Urbach DR. Challenges in multidisciplinary cancer care among general surgeons in Canada. *BMC medical informatics and decision making*. 2008;8:59.
172. Gavino AI, Ho BLC, Wee PAA, Marcelo AB, Fontelo P. Information-seeking trends of medical professionals and students from middle-income countries: a focus on the Philippines. *Health Information and Libraries Journal*. 2013;30(4):303-17.
173. Gerrish K, Ashworth P, Lacey A, Bailey J. Developing evidence-based practice: experiences of senior and junior clinical nurses. *Journal of advanced nursing*. 2008;62(1):62-73.
174. Gonzalez-Gonzalez AI, Dawes M, Sanchez-Mateos J, Riesgo-Fuertes R, Escortell-Mayor E, Sanz-Cuesta T, et al. Information needs and information-seeking behavior of primary care physicians. *Annals of family medicine*. 2007;5(4):345-52.
175. Gravois SL, Bowen DM, Fisher W, Patrick SC. Dental hygienists' information seeking and computer application behavior. *Journal of Dental Education*. 1995;59(11):1027-33.

176. Jackson R, Baird W, Davis-Reynolds L, Smith C, Blackburn S, Allsebrook J. The information requirements and information-seeking behaviours of health and social care professionals providing care to children with health care needs: a pilot study. *Health Information and Libraries Journal*. 2007;24(2):95-102.
177. James I, Andershed B, Gustavsson B, Ternestedt BM. Knowledge constructions in nursing practice: understanding and integrating different forms of knowledge. *Qualitative Health Research*. 2010;20(11):1500-18.
178. Kosteniuk JG, D'Arcy C, Stewart N, Smith B. Central and peripheral information source use among rural and remote registered nurses. *Journal of advanced nursing*. 2006;55(1):100-14.
179. Kosteniuk JG, Morgan DG, D'Arcy CK. Use and perceptions of information among family physicians: sources considered accessible, relevant, and reliable. *Journal of the Medical Library Association*. 2013;101(1):32-7.
180. Martinez-Silveira MS, Oddone N. Information-seeking behavior of medical residents in clinical practice in Bahia, Brazil. *Journal of the Medical Library Association*. 2008;96(4):381-4.
181. McCord G, Smucker WD, Selius BA, Hannan S, Davidson E, Schrop SL, et al. Answering questions at the point of care: Do residents practice EBM or manage information sources? *Acad Med*. 2007;82(3):298-303.
182. McGettigan P, Golden J, Fryer J, Chan R, Feely J. Prescribers prefer people: the sources of information used by doctors for prescribing suggest that the medium is more important than the message. *Br J Clin Pharmacol*. 2001;51(2):184-9.
183. McKnight M. The information seeking of on-duty critical care nurses: evidence from participant observation and in-context interviews RMP. *Journal of the Medical Library Association*. 2006;94(2):145-51.
184. Mills J, Field J, Cant R. The place of knowledge and evidence in the context of Australian general practice nursing. *Worldviews on Evidence-Based Nursing*. 2009;6(4):219-28.
185. Nail-Chiwetalu B, Ratner NB. An assessment of the information-seeking abilities and needs of practicing speech-language pathologists. *Journal of the Medical Library Association*. 2007;95(2):182-8.
186. Nichols A, Badger B. An investigation of the division between espoused and actual practice in infection control and of the knowledge sources that may underpin this division. *British Journal of Infection Control*. 2008;9(4):11-5.
187. Nieri M, Mauro S. Continuing professional development of dental practitioners in Prato, Italy. *Journal of Dental Education*. 2008;72(5):616-25.
188. Norbert GL, Lwoga ET. Information seeking behaviour of physicians in Tanzania. *Information Development*. 2013;29(2):172-82.
189. Northup DE, Moore-West M, Skipper B, Teaf SR. Characteristics of clinical information-searching: investigation using critical incident technique. *Acad Med*. 1983;58(11):873-81.
190. Nylenna M, Aasland OG. Primary care physicians and then information-seeking behaviour. *Scandinavian Journal of Primary Health Care*. 2000;18(1):9-13.
191. O'Leary DF, Ni Mhaolrunaigh S. Information-seeking behaviour of nurses: where is information sought and what processes are followed? *Journal of advanced nursing*. 2012;68(2):379-90.
192. Oliveri RS, Gluud C, Wille-Jørgensen PA. Hospital doctors' self-rated skills in and use of evidence-based medicine – a questionnaire survey. *Journal of Evaluation in Clinical Practice*. 2004;10(2):219-26.
193. Ozsoy SA, Ardahan M. Research on knowledge sources used in nursing practices. *Nurse education today*. 2008;28(5):602-9.
194. Papp KK, Penrod CE, Strohl KP. Knowledge and attitudes of primary care physicians toward sleep and sleep disorders. *Sleep and Breathing*. 2002;6(3):103-9.

195. Peay MY, Peay ER. Differences among practitioners in patterns of preference for information-sources in the adoption of new drugs. *Social Science and Medicine*. 1984;18(12):1019-25.
196. Pelzer NL, Leysen JM. Use of information resources by veterinary practitioners. *Bulletin of the Medical Library Association*. 1991;79(1):10.
197. Perzeski DM. Information-seeking behaviors of podiatric physicians. *Journal of the American Podiatric Medical Association*. 2012;102(6):451-62.
198. Ramos K, Linscheld R, Schafer S. Real-time information-seeking behavior of residency physicians. *Family medicine*. 2003;35(4):257-60.
199. Rappolt S, Tassone M. How rehabilitation therapists gather, evaluate, and implement new knowledge. *Journal of Continuing Education in the Health Professions*. 2002;22(3):170-80.
200. Robertson J, Moxey AJ, Newby DA, Gillies MB, Williamson M, Pearson S-A. Electronic information and clinical decision support for prescribing: state of play in Australian general practice. *Family Practice*. 2011;28(1):93-101.
201. Secco ML, Woodgate RL, Hodgson A, Kowalski S, Plouffe J, Rothney PR, et al. A survey study of pediatric nurses' use of information sources. *Computers Informatics Nursing*. 2006;24(2):105-12.
202. Selvi F, Ozerkan AG. Information-seeking patterns of dentists in Istanbul, Turkey. *Journal of Dental Education*. 2002;66(8):977-80.
203. Shelstad KR, Clevenger FW. Information retrieval patterns and needs among practicing general surgeons: a statewide experience. *Bulletin of the Medical Library Association*. 1996;84(4):490-7.
204. Sibbald SL, Wathen CN, Kothari A, Day AM. Knowledge flow and exchange in interdisciplinary primary health care teams (PHCTs): an exploratory study. *Journal of the Medical Library Association*. 2013;101(2):128-37.
205. Stetler CB, DiMaggio G. Research utilization among clinical nurse specialists. *Clinical Nurse Specialist*. 1991;5(3):151-5.
206. Straub-Morarend CL, Marshall TA, Holmes DC, Finkelstein MW. Informational resources utilized in clinical decision making: common practices in dentistry. *Journal of dental education*. 2011;75(4):441-52.
207. Strother EA, Lancaster DM, Gardiner J. Information needs of practicing dentists. *Bulletin of the Medical Library Association*. 1986;74(3):227-30.
208. Tabatabaei-Malazy O, Nedjat S, Majdzadeh R. Which information resources are used by general practitioners for updating knowledge regarding diabetes? *Archives of Iranian Medicine*. 2012;15(4):223-7.
209. Thompson C, McCaughan D, Cullum N, Sheldon TA, Mulhall A, Thompson DR. Research information in nurses' clinical decision-making: what is useful? *Journal of Advanced Nursing*. 2001;36(3):376-88.
210. Timpka T, Ekstrom M, Bjurulf P. Information needs and information seeking behaviour in primary health care. *Scandinavian Journal of Primary Health Care*. 1989;7(2):105-9.
211. Urquhart C, Crane S. Nurses' information-seeking skills and perceptions of information sources: assessment using vignettes. *Journal of Information Science*. 1994;20(4):237-46.
212. Vollmar HC, Rieger MA, Butzlaff ME, Ostermann T. General Practitioners' preferences and use of educational media: a German perspective. *BMC Health Services Research*. 2009;9:31.
213. Wardh I, Axelsson S, Tegelberg A. Which evidence has an impact on dentists' willingness to change their behavior? *Journal of Evidence-Based Dental Practice*. 2009;9(4):197-205.
214. Warren-Findlow J, Price AE, Hochhalter AK, Laditka JN. Primary care providers' sources and preferences for cognitive health information in the United States. *Health Promotion International*. 2010;25(4):464-73.

215. Weng YH, Kuo KN, Yang CY, Lo HL, Shih YH, Chiu YW. Information-searching behaviors of main and allied health professionals: a nationwide survey in Taiwan. *Journal of Evaluation in Clinical Practice*. 2013;19(5):902-8.
216. Yadav BL, Fealy GM. Irish psychiatric nurses' self-reported sources of knowledge for practice. *Journal of psychiatric and mental health nursing*. 2012;19(1):40-6.
217. Yousefi-Nooraie R, Shakiba B, Mortaz-Hedjri S, Soroush AR. Sources of knowledge in clinical practice in postgraduate medical students and faculty members: a conceptual map. *Journal of Evaluation in Clinical Practice*. 2007;13(4):564-8.
218. Bringsvor HB, Bentsen SB, Berland A. Sources of knowledge used by intensive care nurses in Norway: an exploratory study. *Intensive and Critical Care Nursing*. 2014;30(3):159-66.
219. Buckley T, Stasa H, Cashin A, Stuart M, Dunn SV. Sources of information used to support quality use of medicines: findings from a national survey of nurse practitioners in Australia. *Journal of the American Association of Nurse Practitioners*. 2015;27(2):87-94.
220. Neher M, Stahl C, Ellstrom PE, Nilsen P. Knowledge sources for evidence-based practice in rheumatology nursing. *Clinical nursing research*. 2015;24(6):661-79.
221. Sarbaz M, Kimiafar K, Sheikhtaheri A, Taherzadeh Z, Eslami S. Nurses' information seeking behavior for clinical practice: a case study in a developing country. *Studies in Health Technology and Informatics*. 2016;225:23-7.
222. Lambe P. *Organizing Knowledge: Taxonomies, Knowledge and Organization Effectiveness*. Oxford, UK: Chandos; 2007.
223. Lambe P. Taxonomies can take many forms. In: Lambe P, editor. *Organising Knowledge*. Oxford, UK: Chandos Publishing; 2007. p. 13-48.
224. Oborn E, Barrett M, Racko G. Knowledge translation in healthcare: incorporating theories of learning and knowledge from the management literature. *Journal of health organization and management*. 2013;27(4):412-31.
225. Higgs J, Titchen A. *Practice Knowledge and Expertise in the Health Professions*. Oxford, UK: Butterworth-Heinemann; 2001.
226. Bradburn NM, Rips LJ, Shevell SK. Answering autobiographical questions: the impact of memory and inference on surveys. *Science*. 1987;236(4798):157-61.
227. Mays N, Pope C. Assessing quality in qualitative research. *British Medical Journal*. 2000;320(7226):50.
228. Stone A, Shiffman S, Atienza A. *Science of Real-Time Data Capture: Self-Reports in Health Research*. Cary, NC, USA: Oxford University Press, USA; 2007.
229. Freedman MJ, Lester KM, McNamara C, Milby JB, Schumacher JE. Cell phones for ecological momentary assessment with cocaine-addicted homeless patients in treatment. *Journal of substance abuse treatment*. 2006;30(2):105-11.
230. Gaggioli A, Pioggia G, Tartarisco G, Baldus G, Corda D, Cipresso P, et al. A mobile data collection platform for mental health research. *Personal and Ubiquitous Computing*. 2013;17(2):241-51.
231. Jamison RN, Raymond SA, Levine JG, Slawsby EA, Nedeljkovic SS, Katz NP. Electronic diaries for monitoring chronic pain: 1-year validation study. *Pain*. 2001;91(3):277-85.
232. Morren M, van Dulmen S, Ouwerkerk J, Bensing J. Compliance with momentary pain measurement using electronic diaries: a systematic review. *European journal of pain*. 2009;13(4):354-65.
233. Kwasnik BH. The role of classification structures in reflecting and building theory. *Advances in Classification Research Online*. 1992;3(1):63-82.
234. Shiffman S, Stone AA, Hufford MR. Ecological momentary assessment. *Annual review of clinical psychology*. 2008;4:1-32.
235. Mermelstein R, Hedeker D, Flay B, Shiffman S. Real-time data capture and adolescent cigarette smoking: moods and smoking. In: Stone A, Shiffman S, Atienza A, Nebeling L, editors.

- The science of real-time data capture: Self-report in health research. New York, USA: Oxford University Press; 2007. p. 117-35.
236. Hurst D, Mikan S. Describing knowledge encounters in healthcare: a mixed studies systematic review and development of a classification. *Implementation Science*. 2017;12(1):35.
 237. Reynolds A. The UX Factor [Internet]: Wordpress. 2014. [cited 2014]. Available from: <https://uxfactor.wordpress.com/2014/02/11/ethnographic-research-on-football-betting-with-ethos-app/> (Archived by WebCite® at <http://www.webcitation.org/70yw1of4R>).
 238. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research Electronic Data Capture (REDCap) - a metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics*. 2009;42(2):377-81.
 239. Graham ID, Logan J, Harrison MB, Straus SE, Tetroe J, Caswell W, et al. Lost in knowledge translation: time for a map? *Journal of Continuing Education in the Health Professions*. 2006;26(1):13-24.
 240. Billett S. Lifelong learning and self: work, subjectivity and learning. *Studies in Continuing Education*. 2010;32(1):1-16.
 241. Collins LM, Graham JW. The effect of the timing and spacing of observations in longitudinal studies of tobacco and other drug use: temporal design considerations. *Drug and alcohol dependence*. 2002;68 Suppl 1:S85-96.
 242. Hurst D. What knowledge-in-practice is for general dental practitioners. Poster session presented at the International Association for Dental Research Conference; 27/07/2018; London, UK2018.
 243. Ward V, House A, Hamer S. Developing a framework for transferring knowledge into action: a thematic analysis of the literature. *Journal of Health Services and Research Policy*. 2009;14(3):156-64.
 244. Thompson DS, Estabrooks CA, Scott-Findlay S, Moore K, Wallin L. Interventions aimed at increasing research use in nursing: a systematic review. *Implementation Science*. 2007;2:15.
 245. Straus SE, Tetroe J, Graham ID, Zwarenstein M, Bhattacharyya O, Shepperd S. Monitoring use of knowledge and evaluating outcomes. *Canadian Medical Association Journal*. 2010;182(2):E94-8.
 246. Perrier L, Mrklas K, Shepperd S, Dobbins M, McKibbon KA, Straus SE. Interventions encouraging the use of systematic reviews in clinical decision-making: a systematic review. *Journal of General Internal Medicine*. 2011;26(4):419-26.
 247. Greenhalgh T. What is this knowledge that we seek to "exchange"? *Milbank Quarterly*. 2010;88(4):492-9.
 248. Montgomery K. *How Doctors Think: Clinical Judgment and the Practice of Medicine*. Oxford, UK: Oxford University Press; 2006.
 249. Gherardi S. Docta ignorantia: professional knowing at the core and at the margins of a practice. *Journal of Education and Work*. 2012;25(1):15-38.
 250. Nicolini D. Practice as the site of knowing: insights from the field of telemedicine. *Organization Science*. 2011;22(3):602-20.
 251. Creswell JW. *A Concise Introduction to Mixed Methods Research*. London, UK: SAGE Publications; 2014.
 252. Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*. 2015;42(5):533-44.
 253. Richards D. News. *Evidence-Based Dentistry*. 2015;16:61.
 254. Armstrong D, Gosling A, Weinman J, Marteau T. The place of inter-rater reliability in qualitative research: an empirical study. *Sociology*. 1997;31(3):597-606.

255. Aamodt A, Plaza E. Case-based reasoning: foundational issues, methodological variations, and system approaches. *Artificial Intelligence Communications*. 1994;7(1):39-59.
256. Rogers EM. The innovation-decision process. In: Rogers EM, editor. *Diffusion of Innovations*. 5th ed. ed. New York, USA: Simon & Schuster; 2003. p. 551 p.
257. Carlile PR, Nicolini D, Langley A, Tsoukas H. *How Matter Matters: Objects, Artifacts, and Materiality in Organization Studies*. Oxford, UK: Oxford University Press; 2013.
258. Baker T, Nelson RE. Creating something from nothing: resource construction through entrepreneurial bricolage. *Administrative Science Quarterly*. 2005;50(3):329-66.
259. Duymedjian R, Rüling C-C. Towards a foundation of bricolage in organization and management theory. *Organization Studies*. 2010;31(2):133-51.
260. Glaser B, Straus A. The constant comparative method of qualitative analysis. In: Glaser B, Straus A, editors. *The Discovery of Grounded Theory*. Abingdon, UK: Routledge; 2017.
261. Flodgren G, Parmelli E, Doumit G, Gattellari M, O'Brien MA, Grimshaw J, et al. Local opinion leaders: effects on professional practice and health care outcomes. *Cochrane Database of Systematic Reviews*. 2011(8):CD000125.
262. Schön DA. *The Reflective Practitioner: How Professionals Think in Action*. USA: Basic Books, Inc.; 1991.
263. Shaw JA, DeForge RT. Physiotherapy as bricolage: theorizing expert practice. *Physiotherapy Theory and Practice*. 2012;28(6):420-7.
264. Hurst D. How dental professionals use evidence in their practical decision-making. *International Association for Dental Research*; 26/07/2018; London, UK2018.
265. Porter S. Fundamental patterns of knowing in nursing: the challenge of evidence-based practice. *Advances in Nursing Science*. 2010;33(1):3-14.
266. Downs SM, Johns LK. Clinical decision-making. In: Finnell JT, Dixon BE, editors. *Clinical Informatics Study Guide: Text and Review*. Cham, Switzerland: Springer International Publishing; 2016. p. 69-99.
267. Soumerai SB, Avorn J. Principles of educational outreach to improve clinical decision making. *Journal of the American Medical Association*. 1990;263(4):549-56.
268. Zadik Y, Levin L. Clinical decision making in restorative dentistry, endodontics, and antibiotic prescription. *Journal of Dental Education*. 2008;72(1):81-6.
269. Murthy L, Shepperd S, Clarke MJ, Garner SE, Lavis JN, Perrier L, et al. Interventions to improve the use of systematic reviews in decision-making by health system managers, policy makers and clinicians. *Cochrane Database of Systematic Reviews*. 2012(9):Cd009401.
270. Arditi C, Rège-Walther M, Durieux P, Burnand B. Computer-generated reminders delivered on paper to healthcare professionals: effects on professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews*. 2017(7).
271. Wertsch JV. A sociocultural approach to socially shared cognition. In: Resnick LB, Levine JM, Teasley SD, editors. *Perspectives on Socially Shared Cognition*. Washington, DC, USA: American Psychological Association; 1991. p. 85-100.
272. Bruni A, Gherardi S, Parolin LL. Knowing in a system of fragmented knowledge. *Mind, Culture and Activity*. 2007;14(1-2):83-102.
273. Marchand THJ. Embodied cognition and communication: studies with British fine woodworkers. *Journal of the Royal Anthropological Institute*. 2010;16(s1):S100-S20.
274. Gond J-P, Cabantous L, Harding N, Learmonth M. What do we mean by performativity in organizational and management theory? The uses and abuses of performativity. *International Journal of Management Reviews*. 2016;18(4):440-63.
275. Hindmarsh J, Llewellyn N. Video in sociomaterial investigations: a solution to the problem of relevance for organizational research. *Organizational Research Methods*. 2016;21(2):412-37.
276. Jewitt C. *An introduction to using video for research* London, UK: National Centre for Research Methods; 2012.

277. Stones R. Structuration Theory. London, UK: Macmillan Education UK; 2005.
278. Heath C, Hindmarsh J, Luff P. Video in Qualitative Research: Analysing Social Interaction in Everyday Life. London, UK: SAGE Publications; 2010.
279. Harris AM. Video As Method. Oxford, UK: Oxford University Press; 2016. 208 p.
280. Mavers D. Transcribing video: NCRM working paper. London, UK: National Centre for Research Methods; 2012.
281. Goodwin C. Action and embodiment within situated human interaction. *Journal of Pragmatics*. 2000;32(10):1489-522.
282. Mavers D. The remarkable in the unremarkable: Children's drawing and writing. New York, USA: Routledge; 2011.
283. Marchand THJ. Making knowledge: explorations of the indissoluble relation between mind, body and environment. Oxford, UK: Wiley-Blackwell; 2010.
284. Bakhtin MM. Speech Genres and Other Late Essays. Emerson C, Holquist M, editors. Austin, USA: University of Texas Press; 1986.
285. Greenhalgh T, Stones R. Theorising big IT programmes in healthcare: strong structuration theory meets actor-network theory. *Social Science and Medicine*. 2010;70(9):1285-94.
286. Giddens A. The Consequences of Modernity. Cambridge, UK: Polity, 1991; 1990.
287. Hutchison KJ, Rogers WA. Challenging the epistemological foundations of EBM: what kind of knowledge does clinical practice require? *Journal of Evaluation in Clinical Practice*. 2012;18(5):984-91.
288. Papakostopoulou M, Hurst D. Disseminating research evidence: what matters to general dental practitioners? *British Dental Journal*. 2018;225:413.
289. Ludwig DS, Kabat-Zinn J. Mindfulness in medicine. *Journal of the American Medical Association*. 2008;300(11):1350-2.
290. Connelly J. Being in the present moment: developing the capacity for mindfulness in medicine. *Acad Med*. 1999;74(4):420-4.
291. Epstein RM. Mindful practice. *Journal of the American Medical Association*. 1999;282(9):833-9.
292. Green ML. Evidence-based medicine training in graduate medical education: past, present and future. *Journal of Evaluation in Clinical Practice*. 2000;6(2):121-38.
293. Brouwers M, Stacey D, O'Connor A. Knowledge creation: synthesis, tools and products. *Canadian Medical Association Journal*. 2010;182(2):E68-E72.
294. Hurst D, Greenhalgh T. Knowing in general dental practice: anticipation, constraint, and collective bricolage. *Journal of Evaluation in Clinical Practice*. 2018;1-9 (Early View. Online Version of Record before inclusion in an issue).
295. Edmonds B. What is complexity? The philosophy of complexity per se with application to some examples in evolution. *The Evolution of Complexity*. Dordrecht, The Netherlands: Kluwer Academic Publishers; 1995.
296. Casti JL. On system complexity: Identification, measurement, and management. In: Casti JL, Karlqvist A, editors. *Complexity, Language and Life: Mathematical Approaches*. Berlin, Germany: Springer; 1986.
297. Plsek PE, Greenhalgh T. The challenge of complexity in health care. *British Medical Journal*. 2001;323(7313):625-8.
298. Tsoukas H, Hatch MJ. Complex thinking, complex practice: the case for a narrative approach to organizational complexity. *Human Relations*. 2001;54(8):979-1013.
299. Enkin MW, Glouberman S, Groff P, Jadad AR, Stern A. Beyond evidence: the complexity of maternity care. *Birth*. 2006;33(4):265-9.
300. Dawes M, Summerskill W, Glasziou P, Cartabellotta A, Martin J, Hopayian K, et al. Sicily statement on evidence-based practice. *BMC Medical Education*. 2005;5(1):1.

301. Public Health England. Delivering better oral health: an evidence-based toolkit for prevention. London, UK: Department of Health; 2014.
302. British Society of Periodontology. Basic Periodontal Examination (BPE) 2018 [Available from: http://www.bsperio.org.uk/publications/downloads/94_154250_bpe-2016-po-v5-final-002.pdf (Archived by WebCite® at <http://www.webcitation.org/73G9oylbH>).
303. Scottish Dental Clinical Effectiveness Programme. Management of dental patients taking anticoagulants or antiplatelet drugs: NHS Education for Scotland; 2015 [Available from: <http://www.sdcep.org.uk/wp-content/uploads/2015/09/SDCEP-Anticoagulants-Quick-Reference-Guide.pdf> (Archived by WebCite® at <http://www.webcitation.org/73GA5rIoI>).
304. Elwyn G, Gwyn R. Stories we hear and stories we tell: analysing talk in clinical practice. *British Medical Journal*. 1999;318(7177):186-8.
305. Campion-Smith C, Austin H, Criswick S, Dowling B, Francis G. Can sharing stories change practice? A qualitative study of an interprofessional narrative-based palliative care course. *Journal of interprofessional care*. 2011;25(2):105-11.
306. Currie G, Humpreys M, Waring J, Rowley E. Narratives of professional regulation and patient safety: the case of medical devices in anaesthetics. *Health, Risk and Society*. 2009;11(2):117-35.
307. Baldwin A. Applied theatre: performing the future. *Australasian Psychiatry*. 2009;17(sup1):S133-S6.
308. Carlson E, Nygren F, Wennick A. Critical friends: health professionals' experiences of collegial feedback in a clinical setting. *Journal of Continuing Education in the Health Professions*. 2018;38(3):179-83.
309. Postle D. Putting the heart back into learning. In: Boud D, Cohen R, Walker D, editors. *Using Experience for Learning*. Buckingham, UK: Society for Research into Higher Education & Open University Press; 1993. p. 33-45.

Appendices

Appendix A Original proposal for DPhil programme (Chapter 1)

DPhil research proposal

Designing a multi-faceted intervention to increase the search for and application of evidence in general dental practice

Background

The need to systematically search for, critique and apply the results from high quality clinical research to our clinical practice forms the basis of an evidence-based (EB) approach to helping patients improve their clinical outcomes (1) and has been advocated for persistently in dentistry since its earliest days (2). The vast majority of dental patients are managed in general practice. However, it is well recognised that there are numerous factors that influence the use of EB principles in this setting and unless interventions are designed to overcome these, EB principles may never become part of routine dental practice(3). These factors include lack of understanding of the principles of evidence-based practice, ambiguous, irrelevant or conflicting research, the ethos of a practice towards research and the practice environment, the relative weight of opinion of colleagues and personal experience versus that of clinical research, a heavy workload, patient demands and lack of finances to support changes to EB practices (3-8).

UK undergraduate dental curricula must now incorporate a knowledge and understanding of EB practice(9), something US dental schools have already made some headway on (10-12). Most graduates will work initially in vocational training in general dental practice. I conceive the dental practice to be an organisation and as such, as the new graduate enters it they will not be an independent agent. Within the practice there will be other dentists, hygienists, nurses and administrative staff, as well as patients. There will be systems and procedures and attitudes. All these will influence their use of EB principles.

What really interests me is how this environment can be modified so that EB principles can be adopted (not just guidelines). I am conscious that the organisation is complex and that in trying to bring about change this complexity needs to be considered if change is to be successful.

Stages of proposed DPhil research project

The first piece of work for my DPhil will assess current use of EB principles (ask, search, appraise, apply, evaluate) in vocational and non-vocational dental practices:

- How do clinicians currently use evidence according to self-report?
- Is there a difference between vocational and non-vocational practices?
- What barriers and enablers do the same clinicians believe affect this?
- What are the perceptions of patients in these practices about the use of evidence in their care?

I would anticipate using surveys or interviews with the participants but would ideally also find some way of assessing whether they do or don't more objectively. This could include auditing patient notes for outcomes but some means of monitoring the decision flow would be ideal. Later on, when

designing an intervention to overcome barriers, I will need such a measure to be able to assess its effectiveness.

I include patients here because I think it would be very interesting to explore whether patients could in some way affect the uptake of EB principles by the clinical care team. And this could branch off into other work looking at patients as drivers of change in this area.

The second piece of work for the DPhil would be around interventions to help promote the use of the EB principles. This could involve:

- A systematic review of interventions to improve uptake of EB principles in general dental and medical practice. I distinguish this from the uptake of specific guidelines, for example. I want to know if the philosophy of the practice could be changed so that it as an organisation seeks evidence to answer clinical problems rather than whether or not they can be persuaded to accept guidelines from above.
- Based on the findings of the systematic review, a piece of qualitative work around the interventions that clinicians and patients think could alter the way they behave so as to improve use of EB principles. The idea here would be to consider the way multiple stakeholders could contribute to this process, rather than just depending on the clinicians. Furthermore, I think it is important to have potential recipients of interventions involved in designing them, so as to increase acceptability.
- Another piece of work using the Delphi method to come to a consensus on the interventions that the participants perceive would be most likely to change their behaviour towards more EB practice.

Finally, the interventions would be combined into a pragmatic whole. This would then require work to examine the feasibility of using it in the same practices and other practices to get a sense of its internal and external validity. Part of this work would involve developing a reliable and reproducible means to measure the 5 stage process as mentioned earlier. In particular I want to be able to go further than just measuring knowledge or attitudes and assess behaviour change where new knowledge has been encountered or the conscious decision not to change where practice is consistent with best evidence.

By the end of the DPhil I would want to be in a position to apply for funding to support a randomised controlled trial of the multifaceted intervention versus teaching EB principles alone and its impact on application of EB principles in general dental practice.

My background and suitability for this research project

I have been a vocational trainee, worked in general dental practice, community dentistry and, now, am a clinical lecturer in a primary care outreach clinic for undergraduate dental students. I am completing the Masters in Evidence-Based Healthcare and now lead on EBD at Barts and The London School of Medicine and Dentistry. I have taught evidence-based dentistry courses for the London Deanery and intend to use links within the Deanery to recruit vocational practices to this project and, ultimately, to the RCT that would follow. I also have colleagues working as vocational trainers and in general dental practice. I am engaged with the local clinical research network and would seek to use contacts there to identify suitable practices.

I have already conducted systematic reviews and done the systematic review module as part of the MSc. I need to develop my skills in survey, qualitative and Delphi methodology.

References

1. Rosenberg WM, Sackett DL. On the need for evidence-based medicine. *Therapie*. 1996;51(3):212-7. Epub 1996/05/01.
2. Richards D, Lawrence A. Evidence based dentistry. *Br Dent J*. 1995;179(7):270-3. Epub 1995/10/07.
3. McGlone P, Watt R, Sheiham A. Evidence-based dentistry: an overview of the challenges in changing professional practice. *Br Dent J*. 2001;190(12):636-9. Epub 2001/07/17.
4. Hopper L, Morris L, Tickle M. How primary care dentists perceive and are influenced by research. *Community dentistry and oral epidemiology*. 2011;39(2):97-104. Epub 2010/11/26.
5. Madhavji A, Araujo EA, Kim KB, Buschang PH. Attitudes, awareness, and barriers toward evidence-based practice in orthodontics. *American Journal of Orthodontics and Dentofacial Orthopedics*. 2011;140(3):309-U106.
6. Sbaraini A, Carter SM, Evans RW. How do dentists understand evidence and adopt it in practice? *Health Education Journal*. 2012;71(2):195-204.
7. Hannes K, Norre D, Goedhuys J, Naert I, Aertgeerts B. Obstacles to implementing evidence-based dentistry: A focus group-based study. *Journal of Dental Education*. 2008;72(6):736-44.
8. Dopson S, FitzGerald L, Ferlie E, Gabbay J, Locock L. No magic targets! Changing clinical practice to become more evidence based. *Health care management review*. 2010;35(1):2-12. Epub 2009/12/17.
9. General Dental Council. Outcome for registration. 2011; Available from: <http://www.gdc-uk.org/governanceandcorporate/thecouncil/documents/item%2012%20enc%2011%20%28%29%20learning%20outcomes%20publication.pdf>.
10. Jones DL, Hinton RJ, Dechow PC, Abdellatif H, McCann AL, Schneiderman ED, et al. The evidence-based dentistry initiative at Baylor College of Dentistry. *Texas dental journal*. 2011;128(2):177-80. Epub 2011/04/09.
11. Rugh JD, Hendricson WD, Glass BJ, Hatch JP, Deahl ST, 2nd, Guest G, et al. Teaching evidence-based practice at the University of Texas Health Science Center at San Antonio dental school. *Texas dental journal*. 2011;128(2):187-90. Epub 2011/04/09.
12. Bebermeyer RD. Teaching evidence-based practice at the University of Texas Dental Branch at Houston. *Texas dental journal*. 2011;128(2):183-5. Epub 2011/04/09.

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 What is a "knowledge encounter"? « knowledge project

I was recently challenged by my supervisor to explain why I use the term "knowledge encounter" in my work. The story of how I arrived at it was actually one of frustration perhaps 12-18 months ago as I searched for terms in the literature that would best describe the experiences clinicians have of discovering new knowledge. Here is a draft of my explanation that will in due course find its way into my thesis. It may also help those who participate in the study to understand what it is I am trying to get them to capture.

Encounter

The word *encounter* is used throughout this thesis as a means to describe the occasions when clinicians happen upon or discover new information or experience something new or in a new way. The intention is to reflect the way in which *mindlines* [1] appear to be formed, with experiences and information often happened upon in non-linear and unexpected ways, in various contexts, as well as through so-called "knowledge transfer" attempts.

The more familiar terms in the literature around knowledge transfer, translation, exchange and sharing were not sufficient to allow description of the totality of the experiences clinicians were reported to have in coming across new information and experiences [unpublished systematic review]. Elements of these may surface in some of the occasions when clinicians come across new information e.g. as a part of a "knowledge translation" project they may read some guidelines; they may happen across information or an experience as someone shares it with them; they may indeed exchange information or experiences with a colleague. But none of these terms alone were able to incorporate the multitude of ways in which clinicians come across new information and experiences that were identified in the systematic review. Encounter was a word that kept surfacing in my mind to describe what I was seeing.

Encounter is defined as "An unexpected or casual meeting with someone or something" in the Oxford Dictionaries [2]. The Random House Dictionary (accessed via Dictionary.com) the word is defined as "To come upon or meet

knowledge-encounter/

What is a "knowledge encounter"? « knowledge project

with, especially unexpectedly" [3]. Merriam-Webster defines an encounter as "a usually brief experience with another person" or "an occasion when you deal with or experience something" [4]. Although these suggest that the encounter is an unexpected event the second definition does not suggest that it is *always* unexpected. And although it may *usually* be brief it isn't always. Furthermore an encounter may be with a person or *something* allowing for that thing to be a journal article, a procedure or internal thought process.

The word encounter also has numerous synonyms or related words that help to clarify what I intend in using the word. Gathered from Roget's print and online thesauri [5, 6] these include:

- discover
- meet
- meeting
- experience
- find
- detect
- bump into (happen upon)
- come upon
- stumble (happen upon)
- detect
- feel
- find
- talk (discussion)
- turn up (be discovered)

Encounter is of course commonly used in the context of a *medical* encounter [7-9], which is often a planned event even if the actual content of the event is perhaps uncertain. Thus encounter seems appropriate as a way to describe the many ways in which clinicians come across, happen upon, or plan to discover new information or experiences. This is, I believe, in keeping with the type of learning that Gabbay and Le May suggest is taking place as clinicians form their *mindlines*.

s-a-knowledge-encounter/

What is a "knowledge encounter"? « knowledge project

"Knowledge" versus "information or experience" encounter

But why "knowledge" rather than "information or experience" encounters?

Quoting Bell, Tsoukas and Vladimouri give the following distinction between information and knowledge:

*"Information is a context-based arrangement of items whereby relations between them are shown (e.g. the subject index of a book). And knowledge is the **judgement of the significance of events and items**, which comes from a particular context and/or theory (e.g. the construction of a thematic index by a reader of a book)." [10]*

I recognise that clinicians will encounter information or their own experiences by this definition. But within the encounter they will make a judgement of the significance of the information or experience and therein turn the encounter into one of knowledge. Thus "knowledge" does not refer to the object of the encounter but to what happens to the object within the encounter.

I would therefore define a knowledge encounter as: an expected or unexpected circumstance in which an individual comes across new information, or experiences something new, and in doing so makes a judgement (consciously or not) about the significance of that information or experience.

References

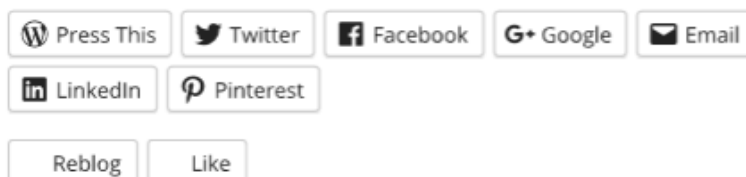
1. Gabbay J, Le May Ae. Practice-based evidence for healthcare : clinical mindlines. Abingdon: Routledge; 2011.
2. Oxford Dictionaries. Encounter. 2015.
<http://www.oxforddictionaries.com/definition/english/encounter>. Accessed 07/02/2015 2015.
3. Random House Inc. Encounter. 2015.
<http://dictionary.reference.com/browse/encounter>. Accessed 07/02/2015 2015.

-knowledge-encounter/

What is a "knowledge encounter"? « knowledge project

4. Merriam-Webster. Encounter. 2015.
<http://www.learnersdictionary.com/definition/encounter>. Accessed 07/02/2015 2015.
5. Roget PM, Kirkpatrick EM, Roget PMRstoEw, phrases. Roget's thesaurus. New ed. / prepared by Betty Kirkpatrick. ed. London: Penguin; 1998.
6. Thesaurus.com Roget's 21st Century Thesaurus. Encounter. 2009.
<http://www.thesaurus.com/browse/encounter/1>.
7. Greene MG, Adelman RD, Charon R, Friedmann E. Concordance between physicians and their older and younger patients in the primary care medical encounter. *The Gerontologist*. 1989;29(6):808-13.
8. Moumjid N, Gafni A, Bremond A, Carrere M-O. Shared decision making in the medical encounter: are we all talking about the same thing? *Medical Decision Making*. 2007.
9. Lazare A. Shame and humiliation in the medical encounter. *Archives of Internal Medicine*. 1987;147(9):1653-8.
10. Tsoukas H, Vladimirou E. What is organizational knowledge? *Journal of management studies*. 2001;38(7):973-93.

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Appendix C Search strategy (Chapter 3)

OVID Medline and OVID Embase were searched together using the following strategy:

#	Searches	Results
1	(seek or seeking).mp.	162033
2	(search or searching).mp.	402232
3	(utilization or utilisation).mp.	403017
4	exchange.mp.	476370
5	(share or sharing).mp.	228699
6	resource\$.mp.	441850
7	source\$.mp.	959411
8	doctor\$.mp.	274357
9	(nursing or nurse\$).mp.	1169812
10	(dental or dentist\$).mp.	738455
11	(veterinary or vet or vets).mp.	115311
12	(podiatry or podiatrist\$).mp.	5685
13	(therapy or therapist\$).mp.	5024767
14	(physiotherapy or physiotherapist\$).mp.	80958
15	psychologist\$.mp.	26774
16	surgeon\$.mp.	346420
17	evidence.mp.	2449208
18	knowledge.mp.	902214
19	information.mp.	1938096
20	17 or 18 or 19	4886998
21	1 or 2 or 3 or 4 or 5 or 6 or 7	2840999
22	8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16	7427020
23	((evidence or knowledge or information) adj1 (seek or seeking or (search or searching) or (utilization or utilisation) or exchange or (share or sharing) or resource\$ or source\$)).mp.	32705
24	22 and 23	8168
25	limit 24 to english language	7579
26	limit 25 to human	6553

Note: mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, nm, kf, px, rx, ui

Subject headings (sh above) are included in the search along with keywords.

Appendix D Data extraction form (Chapter 3)

Study details	
1st Author	Surname
Year	YYYY
Citation	Vancouver format
Author contact details	Email address; postal address
Questions for author(s)	Anything arising from the text that needs clarification with the author(s)
Potentially relevant references	Potentially eligible studies referenced
Terms from title / abstract	Prominent terms that may have helped identify this paper
Design	
Study method(s)	Survey, observation, ethnography, cohort, etc.
Description of tool(s)	As appropriate e.g. questionnaires, apps, diaries, video
Validation of tool(s)	Whether / how this has been done and to what level. Include reference to relevant other papers
Qual / Quant / Mixed	Qualitative, Quantitative or Mixed Methods study?
Closed / open	Did the data collection method allow for a limited or unlimited set of sources?
Cross-sectional / Longitudinal	Also include if, for example, there are two or more cross-sectional studies over a period of time and whether this is the same group or different groups
Study period if longitudinal	Months and years
Country	
Setting	Hospital / general dental or medical practice / etc.
Participant healthcare group	Doctors / Dentists / Vets / Therapists / Nurses / Allied health professionals / etc.
Participant numbers	Indicate if this is an approximation e.g. for an ethnographic study that doesn't specify but from the text you can estimate
Sources	
Types of knowledge eligible	Explicit? Tacit? Experiential?
Sources of knowledge (raw)	Listed as they appear
Definitions / descriptions of knowledge sources	If there are definitions or descriptions of the sources include beside the source term
Categories of knowledge (if developed)	If the sources have been grouped together, what these groups are. Category, included terms
Influences	
Other contextual data	This is in preparation for the influential factors review e.g. communities of practice, research group, journal club, online forum - apart from the general setting is there some other contextual data to describe where the knowledge source is being encountered?
Influences on use of different knowledge sources	Influential factors identified with particular sources or categories. Source/category, factor(s)

Theoretical models developed to explain influences

Indicate if one developed and if there is a name include it

Quality Assessment - MMAS		Responses			
Types of mixed methods study components or primary studies		Methodological quality criteria (see tutorial for definitions and examples)			
		Yes	No	Can't tell	Comments
Screening questions (for all types)		Are there clear qualitative and quantitative research questions (or objectives*), or a clear mixed methods question (or objective*)? Do the collected data allow address the research question (objective)? E.g., consider whether the follow-up period is long enough for the outcome to occur (for longitudinal studies or study components). <i>Further appraisal may be not feasible or appropriate when the answer is No or Can't tell to one or both screening questions.</i>			
1. Qualitative					
1.1. Are the sources of qualitative data (archives, documents, informants, observations) relevant to address the research question(objective)?		0	0	0	
1.2. Is the process for analyzing qualitative data relevant to address the research question (objective)?		0	0	0	
1.3. Is appropriate consideration given to how findings relate to the context, e.g., the setting, in which the data were collected?		0	0	0	
1.4. Is appropriate consideration given to how findings relate to researchers' influence, e.g., through their interactions with participants?		0	0	0	
Sum		0	0	0	
2. Quantitative - randomized controlled (trials)					
2.1. Is there a clear description of the randomization (or an appropriate sequence generation)?		0	0	0	
2.2. Is there a clear description of the allocation concealment (or blinding when applicable)?		0	0	0	
2.3. Are there complete outcome data (80% or above)?		0	0	0	
2.4. Is there low withdrawal/drop-out (below 20%)?		0	0	0	
Sum		0	0	0	
3. Quantitative - nonrandomized					
3.1. Are participants (organizations) recruited in a way that minimizes selection bias?		0	0	0	
3.2. Are measurements appropriate (clear origin, or validity known, or standard instrument; and absence of contamination between groups when appropriate) regarding the exposure/intervention and outcomes?		0	0	0	

3.3. In the groups being compared (exposed vs. non-exposed; with intervention vs. without; cases vs. controls), are the participants comparable, or do researchers take into account (control for) the difference between these groups?		0	0	0
3.4. Are there complete outcome data (80% or above), and, when applicable, an acceptable response rate (60% or above), or an acceptable follow-up rate for cohort studies (depending on the duration of follow-up)?		0	0	0
Sum		0	0	0
4. Quantitative - descriptive	4.1. Is the sampling strategy relevant to address the quantitative research question (quantitative aspect of the mixed methods question)?	0	0	0
	4.2. Is the sample representative of the population under study?	0	0	0
	4.3. Are measurements appropriate (clear origin, or validity known, or standard instrument)?	0	0	0
	4.4. Is there an acceptable response rate (60% or above)?	0	0	0
	Sum	0	0	0
5. Mixed methods	5.1. Is the mixed methods research design relevant to address the qualitative and quantitative research questions (or objectives), or the qualitative and quantitative aspects of the mixed methods question (or objective)?	0	0	0
	5.2. Is the integration of qualitative and quantitative data (or results*) relevant to address the research question (objective)?	0	0	0
	5.3. Is appropriate consideration given to the limitations associated with this integration, e.g., the divergence of qualitative and quantitative data (or results*) in a triangulation design?	0	0	0
	Sum	0	0	0
	<i>Criteria for the qualitative component (1.1 to 1.4), and appropriate criteria for the quantitative component (2.1 to 2.4, or 3.1 to 3.4, or 4.1 to 4.4), must be also applied.</i>			

Overall star rating based on sum totals for relevant sections * = low, **** = high quality rating

**** (delete stars as appropriate)

Appendix E Included studies (Chapter 3)

Bennett	Bennett	Barley	Asefzadeh	Arroll	Apalayine	Ankem	Andrews	Amary-Risch	Al-Ghabeesh	Author
2006	2005	2008	2008	2002	1996	2003	2005	2009	2012	Year
Survey	Survey	Interviews	Survey	Observation + survey	Survey	Interviews	Survey	Survey	Survey	Study method
Faxed Questionnaire	Faxed Questionnaire	Semi-structured interviews with topic guide	Questionnaire	Observation and questionnaire	Self-administered questionnaire	Telephone interview	Mailed questionnaire	Web-based questionnaire	Questionnaire	Tool type
Recall	Recall	Recall	Recall	Both	Recall	Recall	Recall	Recall	Recall	Recall or real-time
Author designed	Author designed	N/A	Unclear	None for sources	Unclear	Author designed	Author designed	Docstyles survey	Estabrooks'	Tool creator / name
Quantitative	Quantitative	Qualitative	Quantitative	Quantitative	Quantitative	Mixed	Quantitative	Quantitative	Quantitative	Qual/ Quant/ Mixed
Cross	Cross	Cross	Cross	Both	Cross	Cross	Cross	Cross	Cross	Cross-sectional/
USA	USA	England	Iran	New Zealand	Ghana	USA	USA	USA	Jordan	Country
All	Primary care	Hospital or primary care	All	Primary care	Primary care	Hospital	Primary care	Primary care + hospital	Hospital	Setting
Doctors	Doctors	Psychiatrists	Doctors, dentists	Doctors	Nurses and midwives	Interventional radiologists	physicians, nurse	Doctors	Nurses	Healthcare grp
2500	457	22	339	50	47	32	59	1500	555	n=
****	**	****	*	****	**	**	*	*	**	MMAS quality rating

Clarke	Chew-Graham	Chang	Callen	Butzlaff	Buckley	Bryant	Bringsvor	Botello-Harbaum	Bonner	Beualieu	Bernard
2002	2008	2009	2008	2002	2014	2004	2014	2013	2011	2008	2012
Case study	Interviews	Survey	Survey	Survey	Survey	Interviews	Interviews	Survey	Interviews	Case study	Survey
Interviews, focus group	Semi-structured interviews	Emailed questionnaire	Questionnaire	Questionnaire	Online questionnaire	One to one and group interviews	Focus groups	Online or printed questionnaire	One to one interviews	Interviews	Online questionnaire
Recall	Recall	Recall	Recall	Recall	Recall	Recall	Recall	Recall	Recall	Recall	Recall
N/A	N/A	Author designed	Author designed	Author designed	Author designed	N/A	N/A	Author designed	N/A	N/A	Author designed
Qualitative	Qualitative	Quantitative	Quantitative	Quantitative	Quantitative	Qualitative	Qualitative	Quantitative	Qualitative	Qualitative	Quantitative
Cross	Cross	Cross	Cross	Cross	Cross	Cross	Cross	Cross	Cross	Cross	Cross
UK	UK	South Korea	Mongolia	Germany	Australia	UK	Norway	USA	Australia	Canada	France
Primary care, hospital	Primary care	Not specified	Hospital	Primary care	Not specified	Primary care	Hospital	Primary care	Hospital	Primary care	Primary care
Nurses	Doctors	Dentists	Doctors	Doctors	Nurse practitioners	Doctors	Intensive care nurses	Dentists	Renal nurses	Doctors	Doctors
41	14	840	229	72	208	20	20	950	6	22	721
**	***	*	**	*****	**	**	*****	**	**	*****	*

Gavino	Gagliardi	Gabbay	Fairhurst	Estabrooks	Estabrooks	Estabrooks	Elliott	Dee	Curley	Codgill
2013	2008	2004	1998	2005a	2005b	1998	1991	1993	1990	2003
Survey	Survey	Ethnographic	Case study	Ethnographic	Survey	Survey	Survey	Case study	Survey	Survey and interviews
Internet and paper questionnaire	Mailed questionnaire	Interviews, observation, documentary review	Interviews	Observation; interview; card sort	Questionnaire	Questionnaire	Questionnaire	Interviews	Questionnaires	Mailed questionnaire and individual interviews
Recall	Recall	Both	Recall	Both	Recall	Recall	Recall	Recall	Recall	Recall
Modified Olson, R.,	Author designed	N/A	N/A	N/A	Author designed	Author designed	Author designed	N/A	Unclear	Author designed
Quantitative	Quantitative	Qualitative	Qualitative	Qualitative	Quantitative	Quantitative	Quantitative	Qualitative	Quantitative	Mixed
Cross	Cross	Longitudinal	Cross	Both	Cross	Cross	Cross	Cross	Cross	Cross
Philippines	Canada	UK	UK	Canada	Canada	Canada	USA	USA	USA	USA
Not specified	Hospital, community	Primary care	Primary care	Hospitals	Hospitals	Any	Not specified	Hospital, primary care	Hospital, primary care	Primary care
Doctors	Doctors	Doctors, nurses,	Doctors	Nurses	Nurses	Nurses	Doctors	Doctors	Doctors	Nurse practitioners
156	170	13	24	7 units; no info on participants	230	600	150	12	228	14
*	***	*****	****	**	**	****	**	**	**	**

¹ Information Access Trends Among Clinicians at a Community Hospital in Northeast Georgia. AMIA 2010 Symposium Proceedings [Internet]. 2010 [cited 2011 August 2]. pp. 1198. Accessible at: <http://proceedings.amia.org/120up3/1?highlightText=olson%20fontelo&>

McKnight	McGettigan	McCord	Martinez-Silveira	Kosteniuk	Kosteniuk	James	Jackson	Gravois	Gonzalez-Gonzalez	Gerrish
2006	2001	2007	2008	2013	2006	2010	2007	1995	2007	2008
Ethnography	Survey	Survey	Survey	Survey	Survey	Ethnography	Survey	Survey	Observation and interview	Survey
Observation, interviews	Questionnaire	Observation	Questionnaire	Questionnaire	Questionnaire	Observation, interviews, conversation	Postal Questionnaire	Questionnaire	Video and interview	Questionnaire
Both	Recall	Recall	Recall	Recall	Recall	Both	Recall	Recall	Both	Recall
N/A	Unclear	N/A	Author designed	Author designed	Author designed	N/A	Author designed	Author designed	N/A	Developing Evidence-Based
Qualitative	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative	Qualitative	Quantitative	Quantitative	Quantitative	Quantitative
Longitudinal	Cross	Cross	Cross	Cross	Cross	Longitudinal	Cross	Cross	Longitudinal	Cross
USA	Australia	USA	Brazil	Canada	Canada	Sweden	UK	USA	Spain	UK
Hospital	Hospital and primary care	Hospital	Hospital	Primary care	Various	Hospital	Primary care + hospital	Various	Primary care	Hospital
Nurses	Doctors	Doctors	Doctors	Doctors	Nurses	Nurses	Doctors, nurses	Hygienists	Doctors	Nurses
6	226	25	85	331	3933	25	54	44	112	598
****	**	**	*	****	****	****	**	**	**	**

Ozsoy	Oliveri	O'Leary	Nylenna	Northup	Norbert	Nieri	Nichols	Neher	Nail-Chiwetalu	Mills
2008	2004	2012	2000	1983	2013	2008	2008	2014	2007	2009
Survey	Survey	Interviews, Survey	Survey	Critical incident	Survey	Survey	Ethnography	Interviews	Survey	Survey
Questionnaire	Questionnaire	Interviews, questionnaire	Postal Questionnaire	Telephone interview	Questionnaire	Questionnaire via telephone interview	Observation and interview	One to one	Questionnaire	Questionnaire
Recall	Recall	Recall	Recall	Recall	Recall	Recall	Recall	Recall	Recall	Recall
Estabrooks'	Unclear but suspect	Author designed	Unclear	Author designed	Unclear but suspect	Unclear but suspect	N/A	N/A	Author designed	Developing Evidence-based
Quantitative	Quantitative	Mixed	Quantitative	Quantitative	Quantitative	Quantitative	Qualitative	Qualitative	Quantitative	Quantitative
Cross	Cross	Cross	Cross	Cross	Cross	Cross	Cross	Cross	Cross	Cross
Turkey	Denmark	Ireland	Norway	USA	Tanzania	Italy	UK	Sweden	USA	Australia
Hospital	Hospital	Various	Primary car and hospital	Varios	Hospital	Primary care	Hospital	Hospital and primary care	Various	Primary care
Nurses	Doctors	Nurses	Doctors	Doctors	Doctors	Dentists	Doctors, nurses	Rheumatology nurses	Speech and language	Nurses
498	226	29 interview 377 survey	1276	293	215	123	14	12	208	590
**	*	***	**	***	*	***	*****	***	**	***

² Information literacy skills of occupational therapy graduates: a survey of learning outcomes. J Med Libr Assoc 2003 Oct;91(4):468–77.

Sibbald	Shelstad	Selvi	Secco	Sarbaz	Robertson	Rappolt	Ramos	Perzeski	Pelzer	Peay	Papp
2013	1996	2002	2006	2016	2011	2002	2003	2012	1991	1984	2002
Questionnaire, Interviews	Survey	Survey	Survey	Survey	Ethnography	Ethnography	Observation	Survey	Survey	Survey	Survey
Questionnaire, Interviews	Questionnaire	Questionnaire	Questionnaire	Questionnaire	Interviews	Interviews	Observation	Questionnaire (web)	Questionnaire	Interviews	Questionnaire
Recall	Recall	Recall	Recall	Recall	Recall	Recall	Real-time	Recall	Recall	Recall	Recall
Social Network	Unclear but suspect	Author designed	Nursing Information	Author designed	N/A	N/A	N/A	Author designed	Author designed	N/A	Author designed
Qualitative	Quantitative	Quantitative	Quantitative	Quantitative	Qualitative	Qualitative	Quantitative	Quantitative	Quantitative	Quantitative	Quantitative
Cross	Cross	Cross	Cross	Cross	Cross	Cross	Longitudinal	Cross	Cross	Cross	Cross
Canada	USA	Turkey	USA	Iran	Australia	Canada	USA	USA	USA	Australia	USA
Primary care	Primary care + hospital	Primary care	Hospital	Hospital	Primary care	Primary care + hospital	Primary care	Various	Primary care	Primary care	Primary care
Nurses, doctors,	Doctors	Dentists	Nurses	Nurses	Doctors	Rehabilitation therapists	Doctors	Podiatrists	Vets	Doctors	Doctors
28	99	133	113	131	40	24	38	143	287	124	105
***	**	**	*	*	****	****	*	*	**	*	*

Weng	Warren-Findlow	Wardh	Vollmar	Urquhart	Timpka	Thompson	Tabatabaei-Malazy	Strother	Straub-Morarend	Stetler
2013	2010	2009	2009	1994	1989	2001a 2001b	2912	1986	2011	1991
Survey	Focus groups, interviews	Survey, interviews	Survey	Vignettes	Survey	Case study	Survey	Survey	Survey	Interviews
Questionnaire	Focus groups, interviews	Postal Questionnaire Focus group	Questionnaire	Vignettes	Questionnaire	Observation, interviews, document analysis, Q analysis	Questionnaire	Questionnaire	Questionnaire	Semi-structured interviews
Recall	Recall	Recall	Recall	Recall	Recall	Both	Recall	Recall	Recall	Recall
Author designed	N/A	Unclear but suggests author	Unclear but suspect	N/A	Author designed	N/A	Author designed	Author designed	Author designed	N/A
Quantitative	Qualitative	Mixed	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Quantitative	Quantitative	Quantitative
Cross	Cross	Cross	Cross	Cross	Cross	Both	Cross	Cross	Cross	Cross
Taiwan	USA	Sweden	Germany	UK	Sweden	UK	Iran	USA	USA	USA
Hospital	Primary care	Primary care; hospital	Primary care	Hospital and primary care	Primary care	Hospital	Any	Primary care + hospital	Primary care	Hospital
Doctors, nurses,	Doctors, nurses,	Dentists	Doctors	Nurses	Doctors	Nurses	Doctors	Dentists	Dentists	Nurses
6160	49	Questionnaire: 177. In focus groups: 15	264	64	186	108	319	344	518	24
****	**	**	**	****	**	****	**	**	*	*

Yousefi-Nooraie	Yadav
2007	2012
Survey	Survey
Questionnaire	Development of Evidence-Based Practice Questionnaire (Gerrish)
Recall	Recall
Unclear	Developing Evidence-based
Quantitative	Quantitative
Cross	Cross
Iran	Ireland
hospital	hospital, primary care
Doctors	Nurses
250	145
*	**

Appendix F Information and experiences extracted from included studies (Chapter 3)

Peers / colleagues
Observation of others' practice
Formalised supervision
Systematic self-evaluation
Specialist (including consultants in hospitals)
Email contact with specialist
Telephone hotline to specialist
University colleagues
Informal conversation with colleagues
Personal contacts
Colleagues via internet
Mentor / senior clinician
Peer opinion leaders
Specialist dentist
"Dental practice expert"
CNS/CNE
Preceptor/resource persons
Non-medical personnel
Unit managers
Practice development team
Students
Teachers
Preceptor / supervising doctor
Clinical leaders
Physicians (discussions with)
Residents
Grand rounds
Referral information & feedback from colleagues
Informal networks
Specialty groups
Allied health workers
"Other" healthcare professionals
Prescribing advisors
Other organisations
Social services

Local care delivery (arrangements)
Local service evaluations
Local prescribing culture
Pharmaceutical companies
Pharmaceutical companies' websites
Pharmaceutical / product literature
Drug company functions
Company reps
Company literature
Advertising (aimed at healthcare professionals)
Direct mail
Manufacturer
Drug information
Package insert
Medication / treatment pamphlets
Drug reference sources - print format
Drug reference sources - e-format
Filtering services
Clinical calculators
Computer decision aid
Patients
Patient questioning
Patient record
Patients' experiences of illness
Observing patients in public space
Patient surveys
Patients' families
Health information service for patients
The body - own
The body - other nurses'
The body - patient's
Reading the patient using senses (smell, listening, watching, touch)
Conferences / conventions / congresses
Seminars
Workshops
Courses - lecture-based
Courses - hands-on
Lectures sponsored by workplace
Symposiums
Continuing education - local
Continuing education - national
Continuing education - non-specific
CME articles
Departmental courses

In service education at work
Professional meetings including association meetings (national and international)
In-services
Internships
Orientations
Rounds
Meetings
Journal clubs
Quality circles
Study club
What has worked / not worked before
Personal development of acquired knowledge through experience and prior knowledge
Side-effects in patients
Personal clinical experience
Personal experience of patients' experiences of illness
Nurses' known explorations
Intuition
Setting knowledge arising from social & clinical pressure, expectations and events
Patients' charts
Policy & procedure manuals
National health policy
Government documents
Video & other media including audio tapes
Thesis or dissertation
Newsletters
Communication books
Bulletin boards
Electronic resources (including CD ROM)
Internet
Computer information networks
Intranet
Medical websites (incl. WebMD)
Organisational websites
Patient group websites e.g. dementia
Internet - public sites
Internet - databases
Internet - search engines
Computer programme
Computer databases
Personal digital assistant
Medline / index medicus (offline)

Point of care databases
Chatrooms
Email discussion lists
Email use
Online continuing education
CD Medical textbook
Patient information
Patient-specific information via internet
prescription / patient orders via internet
Books, journals, previous research
Textbooks (not grouped with other publications) including 'personal library'
Textbooks - electronic
Pocket reference / book
Handbooks or manuals
Technical reports
Diagnostic laboratory
Laboratory manual
Educational booklet or brochure
Informal documents
Journals (not grouped with other publications) including online journals
Journals - editorials
Summaries of studies including structured abstracts
evidence-based clinical decision support resource
Reviews
Case studies
Professional association updates via internet
Professional association
Professional association website
Unions
Professional newsletters
Brief updates
Professional organisations / societies
External (professional) bodies
Clinical guidelines
Locally developed guidelines or protocols
Evidence-based practice
Professional literature
Non-peer reviewed dental information
Free professional magazines
Public media
Personal beliefs
Personal non-clinical experience
Basic education (at nursing / medical / dental / vet etc. school)
Common sense

Training
Own notes
Local audit
Practice or intradepartmental meetings
Group/local norms
The ways it has always been done
Handover
Chiefs / local heads
Local community
Library / Information centre
Librarian
Electronic documents (offline e.g. on disk)
Hospice
Organisational features
Wall chart

Appendix G Example of email sent to user-testers (Chapter 4)

Dear,

Thanks very much for signing up to this user test of the knowledge encounters web form.

Could I ask you first to complete the training exercise here. I have attached a pdf [see Appendix H: Category and facet explanations provided to user-testers] that explains the coding used in the web form for each time you come across new information or experience something new.

Once you have done this your personal web form is here. This doesn't contain any identifiable information.

I would be grateful if you would use it for a 24-hour period to record any of the times when you come across something new or confirmatory - whether it be in the form of information or your own experience. If you are able to record information for longer and feedback on how this went that would be great.

If you are using your phone or tablet to record encounters you can create a short cut to the page to make it very quick (info here if you're unsure how to).

To help remember to record the knowledge encounters, I have suggested to others that they choose their own way of doing this e.g. by using an app that reminds or an alarm. How frequently you do this is up to you but it would be great if you could feedback on how this went.

Could I ask you to let me know when you plan to use the web form so that I can seek some feedback soon after?

Thanks again,

All the best,

Dominic

Dr Dominic Hurst BSc.(Lond) BDS (Lond) MSc (Oxf)

Clinical Lecturer in Adult Oral Health, Barts and The London School of Medicine and Dentistry, Queen Mary University of London

DPhil Student in Evidence-Based Healthcare, University of Oxford, Department of Primary Care Health Sciences

Appendix H Category and facet explanations provided to user-testers (Chapter 4)

1. What did you encounter?

- **Codified knowledge:** research, theoretical or practice-based knowledge subject to quality control by editors, peer review and debate e.g. *Journal, Guidelines, Textbook*
- **Codified knowledge in a personalised form:** codified knowledge presented in some manner by individuals in person e.g. *informal conversation with colleagues, seminars, or grand rounds*
- **Procedural knowledge:** e.g. *observation of other's practice*
- **Process or policy knowledge:** explicit descriptions of local or national processes and policies e.g. *local care delivery, national health policy*
- **Experiential knowledge:** e.g. *what has worked / not worked before, personal clinical experience, patient's experiences of illness*
- **Custom:** the implicit norms of a given healthcare setting or professional group e.g. *the way it has always been done*
- **Product or service knowledge:** e.g. that provided by a company representative, company literature

2. How was the information or knowledge communicated?

- **Verbal communication** e.g. *informal conversation with colleagues, telephone hotline to specialist*
- **Written format** e.g. *company literature, textbooks*
- **Visual** e.g. *video*
- **Haptic** e.g. *the pressure applied to an instrument during a procedure*
- **Olfactory** e.g. *reading the patient using smell*
- **Internal reflection** e.g. *thinking through a problem*

3. What mode was it transmitted by?

- **Using electronic technology** e.g. *email contact with specialist, telephone hotline to specialist*
- **Not using electronic technology** e.g. *conference, local audit, hand over, handbooks unless this is accessed electronically*

4. Who communicated the information or knowledge?

- **Practitioner** e.g. *colleague, colleagues via internet, clinical leaders, personal clinical experience, journal club, email discussion list, professional association*

- **Non-practitioner (colleague)** e.g. those working in *social services, non-medical personnel*
- **Patient** e.g. *patients, patient questioning, patients' experience of illness*
- **Researcher** e.g. *thesis, journal*
- **Educator** e.g. *teacher, educational booklet, laboratory manual, patient information, package insert* (if educational rather than promotional)
- **Regulator** e.g. *government documents, health policy*
- **Employer** e.g. *policy and procedure manuals, local guidelines*
- **Salesperson** e.g. *package insert* (if promotional rather than educational), *company literature, company representative, drug company functions*

5. How many people were involved in the encounter including yourself?

- **Alone** e.g. *personal development of acquired knowledge through experience and prior knowledge*
- **A couple** e.g. *informal conversation with colleagues* [assuming conversation is with one or two at a time]
- **A group** e.g. *email discussion lists, seminar*

6. What was the setting where you encountered the information or knowledge?

- **Work** e.g. *practice meeting, observing a colleague*
- **Educational** e.g. *conferences*
- **Domestic** e.g. *online continuing education, chatrooms* [assuming respondents did both of these at home]
- **Social** e.g. *over dinner*
- **Travelling** [added after the user-testing]

Appendix I User-tester feedback form questions (Chapter 4)



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Feedback on using the knowledge encounters web form

Thank you very much for user testing the web form. I would be very grateful for your comments on how it was to use and suggestions for how to improve it.

The intention of the web form is to capture the diversity of information and experiential encounters dentists have at work, home, in social and educational environments. In order to capture a more representative sample of time, the intention is to gather data over a 7 day period. This should allow me to capture any encounters that happen over the weekends and other times when dentists are not working (e.g. if part time).

This questionnaire is anonymous so please don't worry about causing offence - I would prefer to know now what the shortcomings are before enrolling dozens of dentists! I would, though, be very grateful for constructive input on how to overcome any shortcomings.

I would like to include the names of those who helped in my thesis and so will ask you individually whether you would prefer to remain an anonymous tester or named one.

Thank you once again for helping with this.

Dominic

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Regarding the simulations, I asked the GDPs to choose one response to each of the following questions:

1. How did you find accessing the simulations exercise?
 - a. No problem
 - b. Slightly problematic
 - c. Very problematic
 - d. Couldn't access them
2. How did you find doing the simulations exercise?
 - a. No problem
 - b. Slightly problematic
 - c. Very problematic
 - d. Couldn't do them
3. Approximately how long did it take you to do the simulations exercise?
 - a. Duration in hours / minutes / seconds
4. With regard to understanding the different "facet" terms in the categories
 - a. No problem
 - b. Slightly problematic
 - c. Very problematic
 - d. Couldn't understand them
5. Would it have been helpful to have some extra documentation to what you received for the simulation exercise?
 - a. Yes
 - b. No

A free text box was added after each question to allow the GDPs to add any comments about the respective aspect of the simulation exercise.

Two screenshots of these questions in the Google Form follow.



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Feedback on using the knowledge encounters web form

*Required

Questions about the simulation exercise

How did you find accessing the simulations exercise? *

☐ No problem
☐ Slightly problematic
☐ Very problematic
☐ Couldn't access it

Do you have any comments about accessing the simulations exercise?

How did you find doing the simulations exercise? *

☐ No problem
☐ Slightly problematic
☐ Very problematic
☐ Couldn't do it

Do you have any comments about doing the simulations exercise?

Approximately how long did it take you to do the simulations exercise? *

Hr ▼ : Min ▼ : Sec ▼

With regard to understanding the different "facet" terms in the categories *

☐ No problem
☐ Slightly problematic
☐ Very problematic
☐ Couldn't understand them

Do you have any comments about the facet terms used?

Would it have been helpful to have some extra documentation to what you received for the simulation exercise? *

☐ No

☐ Yes

If you answered yes, what would have helped?

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Regarding the use of the tool to record their own knowledge encounters, I asked the following:

1. How did you find accessing the web form for recording your own experiences?
 - a. No problem
 - b. Slightly problematic
 - c. Very problematic
2. How did you find storing the link to the web form somewhere accessible?
 - a. No problem
 - b. Slightly problematic
 - c. Very problematic
3. Where did you tend to access the web form? (multiple selections allowed)
 - a. Mobile phone
 - b. Tablet
 - c. Computer
 - d. Other + free text box
4. Based on your experience, do you think it likely you would record events that occurred... (multiple selections allowed)
 - a. At work
 - b. At home
 - c. At an educational event
 - d. At a social event
 - e. When travelling
 - f. None
5. Having used the web form, what barriers do you think there are to yourself using it daily for 7 days?
 - a. Free text box
6. Do you have any suggestions for how to overcome these?
 - a. Free text box
7. How would you feel about being reminded by text to record something?
 - a. Wouldn't mind
 - b. Would mind
 - c. Don't know
8. If you wouldn't mind, how many texts or emails a day would be reasonable?
 - a. Choice of 1 to 10
9. Would it have been helpful to have extra documentation to help you use the web form to capture your own experiences?
 - a. Yes
 - b. No
10. If you said yes, can you suggest what would have been helpful?
 - a. Free text box
11. Is there anything else that bugged you or that you think could be improved to make this tool more user friendly?
 - a. Free text box

Two screenshots of these questions in the Google Form follow.



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Feedback on using the knowledge encounters web form

*Required

Questions about using the web form to capture your own experiences

How did you find accessing the web form for recording your own experiences? *

☐ No problem
☐ Slightly problematic
☐ Very problematic
☐ Couldn't understand them

Do you have any comments about accessing the web form?

How did you find storing the link to the web form somewhere accessible? *

☐ No problem
☐ Slightly problematic
☐ Very problematic
☐ Couldn't understand them

Do you have any comments about storing the link to the web form?

Where did you tend to access the web form? *

☐ Mobile phone
☐ Tablet
☐ Computer
☐ Other:

Based on your experience, do you think it likely you would record events that occurred? *
Tick those that you think you would record

☐ At work
☐ At home
☐ At an educational event
☐ At a social event
☐ When travelling
☐ None

Having used the web form, what barriers do you think there are to yourself using it daily for 7 days? *

Do you have any suggestions for how to overcome these? *

How would you feel about being reminded by text to record something? *

☐ Wouldn't mind
☐ Would mind
☐ Don't know

If you wouldn't mind, how many texts or emails a day would be reasonable?

1 2 3 4 5 6 7 8 9 10

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Would it have been helpful to have extra documentation to help you use the web form to capture your own experiences? *

☐ Yes
☐ No

If you said yes, can you suggest what would have been helpful?

Is there anything else that bugged you or that you think could be improved to make this tool more user friendly?

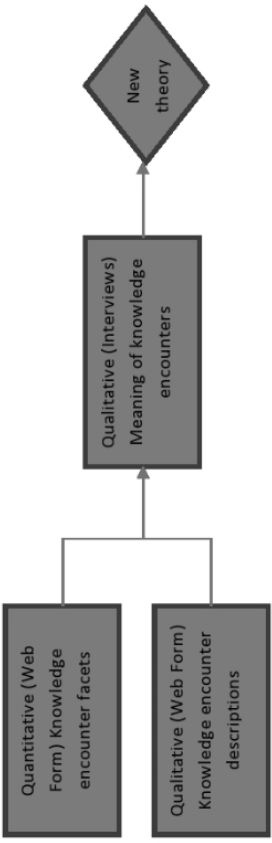
Appendix J Protocol for mixed methods study (Chapter 5)

Protocol for “General dental practitioners' knowledge encounters: a mixed methods study”

Dr Dominic Hurst, DPhil student University of Oxford

Item #		
Administrative information		
1	Title	General dental practitioners' knowledge encounters: a mixed methods study
2	Trial registration identifier	
3	Protocol version	5 (21/02/2015)
4	Study summary	This is a mixed methods study. Quantitative It will use a web form accessible via smartphones, tablet or computer to record the encounters that general dentists have with different knowledge sources and their intention at that time regarding its use. Each encounter will be classified using a purposely designed multifaceted classification. Data will be collected in 7-10 day blocks (depending on pilot data of frequency of encounter recording) on three separate occasions over the period of 2-6 months. Qualitative Each encounter will be described in the web form using the dentist's own words before using the classification described above. These will be explored in greater detail using in-depth interviews with a purposive sample shortly after the block of data collection. The intention is to get a better understanding of why some sources of knowledge have greater influence than others over the participants.
5	Responsible parties	Dr Dominic Hurst (DPhil student). Email: richard.hurst@kellogg.ox.ac.uk

		Professor Trisha Greenhalgh (Supervisor). Email: trish.greenhalgh@phc.ox.ac.uk Dr Sharon Mikan (Co-supervisor). Email: sharon.mikan@phc.ox.ac.uk
6	Funding	None
Introduction		
7	Rationale and background (including reference to up to date Systematic review)	Gabbay and Le May demonstrated in an ethnographic study that the way in which general medical practitioners act is determined by their own <i>mindlines</i> (1), which are formed and reformed over time by interactions with various knowledge or information sources, including that derived from their own experience. Their argument was that the evidence-based medicine movement has failed to understand how clinicians make decisions, which means that relevant research may not be absorbed into practice and thus fail to have the intended benefit of improving patient care. In their recommendations in <i>Practice-Based Evidence for Healthcare</i> they suggested we seek to use the existing channels through which information or knowledge flows (pg 200). They also drew attention to the potential for <i>mindlines</i> to spread collective folly and that methods should be developed to try and integrate relevant research knowledge into mindlines (pg 203). A mixed studies systematic review by Drs Hurst and Mikan identified 76 studies of knowledge sources used by clinicians [unpublished]. None of the quantitative studies followed clinicians for more than a 4 hour period and most of the qualitative studies involved interviews about knowledge sources used generally without reference to observed behaviour. There is a need to understand the channels that Gabbay and Le May describe and to develop some theories to help encourage integration of research with <i>mindlines</i>.
8	Objectives	1. To describe the knowledge encounters that dentists have with information and experience so that we can identify potential channels through which to facilitate the diffusion of relevant research 2. To develop theory to explain how different facets of knowledge encounters influence dentists' mindlines and knowledge non-use or use (instrumentally, conceptually or politically).
9	Type of study	Mixed methods study – explanatory sequential design (QUAN→QUAL). Rationale for using mixed methods

	• General: Quantitative research would not capture the deeper meanings that individuals make of their knowledge encounters. Qualitative data would not allow for wider patterns of knowledge encounters to be seen and generalisations to be drawn about how general dental practitioners encounter knowledge. • Specific: It enables us to ◦ obtain two perspectives ◦ obtain a more comprehensive view of the phenomenon of knowledge encounters and more data about the problem ◦ add to the facet descriptions greater detail about the influence of the various facets on the dentist's meaning of the encounter ◦ compare the results of the two methods to see if they are congruent or not (and therefore whether there is a problem with the quantitative instrument) Theoretical perspective: constructionist. This is the view that "all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context" (2). Knowledge is both personal (Polanyi) and at the same time collective (Wittgenstein). Knowledge is "the judgment of the significance of events and items, which comes from a particular context and/or theory" (3) 
Study methods: Participants and interventions	
10	Study setting None fixed
11	Eligibility criteria Inclusion criteria Any dentist working predominantly in primary care (>50% of their week).

		They must be able either to access the web form on their personal device or computer, or be able to print copies of a hard copy form. Exclusion criteria Student dentists or dentists working predominantly in tertiary care.
12	Data collection	1. Web form to record daily encounters with knowledge 2. In depth interviews either in person or over a VOIP connection (e.g. Skype or Google Hangouts)
13	Participant timeline	T0: consent to involvement in study – both quantitative and qualitative T1 (T0 up to 2 weeks): do online calibration exercise. Familiarise themselves with the form and trial for a day or two T2 (T1+ <1 month): collect data for 7-10 days; followed by in depth interviews for some T4 (T2+ at least 1 month): collect data for 7-10 days; followed by in depth interviews for some T5 (T3+ at least 1 month): collect data for 7-10 days; followed by in depth interviews for some
14	Target sample size	Quantitative For the web form component of the study the plan is to recruit at least 100 participants to capture sufficient data that will mean that facets are represented proportionately. [see how to select for surveys] Qualitative The number of in-depth interviews is likely to be in the range of 8-10 as suggested by Creswell (4) for phenomenology. An attempt will be made to sample based on maximal variation and up until saturation. Sampling variables are likely to include age, sex, qualifications, and facets recorded during knowledge encounters (i.e. to try and ensure qualitative data can be collected relating to the various categories to understand the implications of different facets on intended knowledge use)
15	Recruitment and retention strategies	Quantitative I have consent from the Dean of postgraduate dental studies in London to approach DF1 trainers and trainees as well as other dentists working in their practices. In addition, I have the support of Raj Rattan to disseminate the recruitment to other networks such as Local Dental Committees. I am in contact with the “research champions” funded by NOCLOR who have offered to help recruit dentists. I will also use social media to attract participants. I have no funding to offer inducements to dentists to remain in the study. I will, however, produce a summary for each participant of their recorded knowledge encounters and will keep them informed of progress with the study. If possible I will also show each how they compared to the average. Qualitative

		Participants will be recruited from the quantitative sample.
Study methods: Data collection, management, and analysis		
16	Outcomes	Quantitative 1. Counts of encounters with knowledge 2. Counts of intended knowledge use 3. Distribution of facets across the knowledge encounters 4. Association of facets with intended knowledge use Qualitative Themes describing the individuals' experience of the knowledge encounter and influential factors on intended knowledge use.
17	Data collection methods	Quantitative Participants enter information into the web form about the source of knowledge. They can do this on their smartphone, a tablet or computer. For those who wish to, we will also provide a printable table allowing them to record the encounter on paper (this would then be entered manually by the researchers). Knowledge sources will be classified by the dentists according to the facet classification. Participants will be encouraged to expand as much as they like on what they think of the knowledge encounter, why they feel the way they do about it and why they do or don't share it. This qualitative data will be used alongside the in depth interviews in deriving themes for why dentists feel the way they do about encounters with different knowledge sources. Qualitative In-depth interviews will take place either in person or over VOIP (e.g. Skype or Google Hangouts) and will last approximately ½-1 hour. These will seek to gain greater understanding of the influences of some sources identified from the app collection period. It will also allow us to understand how apparently similar encounters are recorded differently e.g. how and why the individual sees the giver of knowledge as a practitioner rather than an educator or vice versa. It is intended that the sources covered in the interviews match proportionately the sources encountered using the apps so that more weight is given to understanding more frequently-encountered knowledge sources.
18	Data management	Quantitative Data will be recorded from the web form in <i>Sheets</i> on Google Drive. Each clinician will have their own form and after each period of data collection the data will be downloaded to Excel on an Oxford University computer. Qualitative Analysis will be descriptive, probably using graphs created in Excel to visualise the facets used.

19	Statistical methods	In-depth and focus group interviews will be audio recorded, transcribed and the recordings then deleted immediately. Transcripts and the qualitative component of the web form data will be retained on a secure departmental computer and entered into NVIVO, which will be used to code the data. Quantitative Descriptive statistics 1. The number of encounters with knowledge sources 2. The number of facets recorded in each category 3. The proportion of encounters sought / not sought Qualitative There will be interim analysis of the free-text component added to the web form and as the interviews are conducted. This will allow for the refinement of questions in the following interviews. The transcripts of the interviews and the text from the web forms will be analysed deductively using the facet categorisation developed earlier but will allow inductively the generation of new categories (or themes) should these arise. The aim is to describe the phenomena from dentists' point of view of useful and not so useful encounters with new information and experiences. It is anticipated that the "framework" approach will be used: "Framework is a method for managing qualitative data analysis ... to help users organize and manage their data through a process of summarization, resulting in a series of themed matrices" (5). This involves 5 stages: familiarisation, identifying a thematic framework, indexing, charting, mapping and interpretation (6). Analysis will continue until there is data saturation – when no new themes arise after reading of multiple transcripts.
Ethical considerations & dissemination		
20	Research ethics approval	Research ethics approval has been sought through the University of Oxford research ethics committee. This study does not include patients so does not require NRES.
21	Protocol amendments	
22	Consent or assent	Participants will be given an information sheet explaining the research programme and offered the chance to ask questions either in person via telephone or VOIP, or via email, as they prefer. Before using the web form, it will be stated that in continuing to do so their consent will be assumed.
23	Confidentiality	No data will be shared with anyone outside of the research team and will be anonymised for qualitative work using initials or fictitious names. Locations, too, will be fictionalised where these feature in any of the interview transcripts.

24	Competing interests	DH will be doing this research as part of a DPhil at Oxford University.
25	Role of involved parties	DH will do all of the design, data collection and quantitative and qualitative analysis Guidance and assistance for qualitative analysis will be sought from Prof Greenhalgh Professor Rafael Perrera has agreed to assist with quantitative data analysis
26	Dissemination of results and publication policy	A webpage has been created to recruit participants and keep them informed http://knowledgeproject.info/ . It will also be used to disseminate results through an integrated blog and by using other social media channels such as Twitter and LinkedIn. Results will be disseminated to participants and opportunities to disseminate at relevant dental and knowledge transfer conferences sought. Publication will be sought in relevant open access journals.
Appendices		
27	Data collection forms	Quantitative The web form used for data collection is attached. Qualitative Data will be transcribed into a word document and then added to NVIVO.
28	Informed consent materials	Completed and submitted to ethics: participant information document and participant consent document

Reference

1. Gabbay J, Le May Ae. Practice-based evidence for healthcare : clinical mindlines. Abingdon: Routledge; 2011.
2. Crotty M. The foundations of social research : meaning and perspective in the research process. London: SAGE; 1998.
3. Tsoukas H, Vladimirou E. What is organizational knowledge? Journal of management studies. 2001;38(7):973-93.
4. Creswell JW. A concise introduction to mixed methods research: SAGE Publications; 2014.
5. NatCen. Framework analysis in NVivo 2015 [cited 2015 01/03/2015]. Available from: <https://www.natcen.ac.uk/our-expertise/methods-expertise/qualitative/framework/>.
6. Pope C, Ziebland S, Mays N. Analysing qualitative data. BMJ : British Medical Journal. 2000;320(7227):114-6. PubMed PMID: PMC1117368.



needed for research study in the Department of Primary Care
Health Sciences, University of Oxford



The study seeks to understand better how general dentists discover, stumble across and share information or experiences - what we term “knowledge encounters”.

Some dentists will also be asked to participate in a 30-60 minute interview about the meaning and use of their encounters.

Feedback from one participant: "Interesting, informative, easy to incorporate into a busy working day. Even a luddite like me found the tech a doddle. Thoroughly recommended!"



Please get in touch either through the contact form at <http://knowledgeproject.info/> or by emailing: richard.hurst@kellogg.ox.ac.uk

Lead researcher: Dr Dominic Hurst BSc BDS MSc
DPhil Student (U. Oxford) & Clinical Lecturer in Primary Dental Care (Queen Mary U. London)
<http://knowledgeproject.info/>

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7/3/2018

knowledge project « website for "General dental practitioners' knowledge encounters: a mixed methods study"

Tweets by @Dominic_H

Dominic Hurst
@Dominic_Hurst
#mentalhealthawarenessweek2018 begins tomorrow and @BBC6Music is supporting in now playing
bbc.co.uk/programmes/b0b...



May 13, 2018

Dominic Hurst Retweeted

Gill Ritchie
@gsritchie
Just discovered @DFletcherArtist and her fabulous pictures of the East End of London
doreenfletcherartist.com/copy-of-fp-016...



Apr 1, 2018

Embed View on Twitter



judgement about how GDPs practise clinically.

All documentation relevant to the study, including the protocol, participant information sheets and ethics approval letter, are available in the Project Documents section.

Please do get in touch using the form below if you'd like to know more. Even if you live some way from London, where I am based, I am happy to travel some distance to record a willing participant!

All the best,

Dominic

Name (required)

Dominic Hurst

Email (required)

dominic.hurst@gmail.com

Website

https://knowledgeprojectdotinfo.wordpress.com

Comment (required)

submit »

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Data collection is complete: Thank you GDPs, dental teams and patients

JANUARY 19, 2018 9:59 AM / LEAVE A COMMENT / EDIT

I am very grateful to all the GDPs, nurses, practice managers and patients who have contributed to my DPhil research. Over the past three years of fieldwork dozens of people have been willing to give up their time, "expose" themselves to interviews and videos and offered insights to improve the design of the research. Here are some examples:

- Testing and feeding back on a data gathering tool (Study 2 of the DPhil)
- Recording knowledge encounters and being interviewed about these (Study 2)
- Providing feedback on a study protocol and participation information leaflets (Study 3)
- Being filmed in clinical encounters between dentists and patients (Study 3)
- Being interviewed about those clinical encounters (Study 3)

There has been no financial reward for anyone and yet all these people have willingly given their time to help further my DPhil. I am very grateful and hope that my thesis will do justice to the efforts of all involved.

I am now writing up the thesis with the plan of submitting this summer. Wish me luck.

Share this:



https://knowledgeproject.info/

2/8

7/3/2018

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Knowledge encounters systematic review published

MARCH 15, 2017 9:39 AM / LEAVE A COMMENT / EDIT

I am pleased to write that my article describing how I derived my classification of knowledge encounters has just been published in Implementation Science. This work was used to design the knowledge encounters tool used in the studies described on this website.

<http://implementationscience.biomedcentral.com/articles/10.1186/s13012-017-0564-1>

I am very grateful to the GDPs who helped me test the usability of the classification. All the best.

Dominic

Share this:

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Update and recruitment request for GDPs in London area

JANUARY 8, 2017 4:53 PM / LEAVE A COMMENT / EDIT



It's been a while since I last posted. After the great response to my requests to participate in recording knowledge encounters I had a lot of really good data to analyze. And it's taken some time to work through.

Key themes that have arisen from the work are the role of routines as repositories of knowledge, the way dentists constantly innovate as they practice (and so generate new personal knowledge) and the role of case-based reasoning in advancing their understandings.

The implications for me are that if research evidence is to find its way into the complexity of practice we need to firstly recognize that knowledge in practice is something much greater than just research knowledge and then to work out ways of helping integrate research evidence alongside all the other knowledge dentists build.

My next and final phase of research is going to video and audio record dentists, patients and staff for a whole clinical session at a time. Building on the ideas developed from the previous research, the idea is to observe the roles of routine, innovation and case-based reasoning as dentists build knowledge in practice. As it involves NHS patients this is now going through NHS ethics approval but I hope to begin recording the clinical sessions from March 2017 onwards.

If you are a GDP working in NHS, mixed or private practice in the London area, I would welcome the opportunity to record one of your clinical sessions and to interview you for no more than an hour soon after. Here is the participant information sheet. Participant information sheet I have submitted for ethics approval. Although the ethics committee may make some suggestions for changes this shouldn't change it too much.

Please do get in touch if you might be interested using the form below or the email address on the information sheet.

Name (required)

Dominic Hurst

Email (required)

dominic.hurst@gmail.com

Comment (required)<https://knowledgeproject.info/>

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January 2016 update on the Knowledge Encounters project

JANUARY 22, 2016 12:03 PM / 1 COMMENT / EDIT

The knowledge encounters project continues with many colleagues kindly contributing their time to recording those events when they come across something new in their professional lives, which may or may not impact on their practice.

Whilst the knowledge encounters themselves reveal much about the ways in which dentists are actually learning, the interviews around these encounters are helping me to get a picture of what is going on in more detail.

Count of Encounters

Intended use



How do you intend to use the kn...

I intend to use it conceptually (think about it)

I intend to use it instrumentally (do something with it)

I intend to use it politically (make an argument for something)

I won't use it

The data so far suggests that the majority of encounters occur in the workplace and that dentists learn 2/5 of the time from fellow practitioners. The dentists recording these encounters on the whole intend in some way to use the new knowledge they have encountered even if it is only conceptually.

If you might be interested in contributing to this project by recording your own encounters for a week and reflecting on these in a 30-60 minute interview please do get in touch.

All the best,

Dominic



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<https://knowledgeproject.info/>

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Knowledge Encounters Project update

AUGUST 14, 2015 12:02 PM / LEAVE A COMMENT / EDIT

I've been a little quiet for the past few weeks as I have been organising dentists' data collection for the project.

It has been a real pleasure talking to the participants before they take part and very warming to hear their enthusiasm for the project as they come to understand in greater depth what I am up to.

As a recap, the knowledge encounters project I am running seeks to improve our understanding of where dentists get their knowledge from and how this knowledge is integrated (or not) with existing knowledge.



As evidenced by the breadth of knowledge encounters dentists have recorded so far, clinicians build knowledge from diverse sources.

I thought I'd pop out a few more interim results here as more data has come in from dentists recording their encounters.

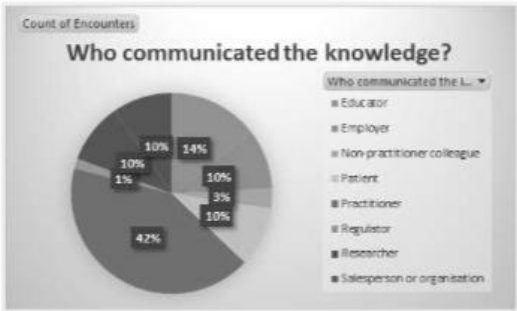
What?

As you can see below, experiential knowledge and codified knowledge (e.g. published articles, research, educational books) are encountered about a quarter of the time, and codified knowledge in a personalised form (e.g. a colleague or educator talking about codified knowledge) almost a fifth of the time. (There is a full description of what these terms mean here).



Who?

Perhaps not surprisingly the largest group of people who share knowledge with the dentists in this study are fellow colleagues 42% of the time. Interestingly, patients, employers, salespeople and researchers each share knowledge 10% of the time. The detail of the encounters with patients that emerges from the qualitative data collected is fascinating, with quite detailed knowledge being passed on to GDPs, particularly from specialists and hospital consultants.



How many?

Much of the knowledge encounters seem to take place when dentists are alone or with one other person, usually a colleague or patient. A large proportion of the group encounters involve online discussion forums.

<https://knowledgeproject.info/>

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Thanks!
Once again, I'd like to thank all my colleagues who have taken part so far and those who have enrolled and will soon begin collecting data.

If you think you would like to contribute please do get in touch.

All the Best,

Dominic

Name (required)
Dominic Hurst

Email (required)
dominic.hurst@gmail.com

Comment (required)

submit »

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2 hours of verifiable CPD for dentists taking part in the knowledge encounters study

JULY 10, 2015 2:10 PM / LEAVE A COMMENT / EDIT

It is clear from the data recorded by participants, and the narrative interview that follows it, that the process of recording knowledge encounters encourages dentists to reflect on what they are doing, ask further questions and seek answers to knowledge gaps.

It is therefore clear that this is a planned learning activity for most participants as they use the web form tool to collect and reflect on the experiences and knowledge that they come across over the course of a week. The narrative interviews have thrown up further deeper consideration of how dentists learn and therefore how they might further their development of the knowledge they have encountered.

The GDC defines CPD in the following way:

CPD for dental professionals is defined as: lectures, seminars, courses, individual study and other activities, that can be included in your CPD record if it can be reasonably expected to advance your professional development as a dentist or dental care professional and is relevant to your practice or intended practice.

Participants use about an hour to do the web form training and, over a week, record their own knowledge encounters. They also spend up to an hour describing, reflecting and analysing their encounters for up to one hour during a narrative interview. Therefore, I think this will adequately fulfil the GDC's requirements and enable participants to claim **2 hours of verifiable CPD** once the interview is completed.

<https://knowledgeproject.info/>

6/8

7/3/2018

knowledge project « website for "General dental practitioners' knowledge encounters: a mixed methods study"

The learning outcomes for this exercise are therefore:

- Participants will learn how to use a web-based tool to record and reflect on clinical knowledge encounters they have over the period of 1 week
- They will reflect on what they intend to do with the new knowledge or experience in terms of using it conceptually, politically, instrumentally or not at all
- Through a 1 hour narrative interview they will be encouraged to reflect on and analyse their encounters in greater depth

A requirement of the GDC is that all verifiable CPD providers encourage feedback as a quality assurance step and therefore participants will be asked to provide this using a brief web form.

Knowledge encounters study feedback

This feedback form is a shortened part of research quality in the design and delivery of the educational session. Please complete this form after the educational session.

(Optional)

Participating in this study encouraged me to reflect on my learning in practice?

☐ Strongly agree

☐ Agree

☐ Disagree

☐ Strongly disagree

The web form to give my self-reflection was easy to use?

☐ Strongly agree

☐ Agree

☐ Disagree

☐ Strongly disagree

Are there any comments you would like to make that could improve this learning experience?

Submit

Your content is saved through Google Forms

So now there's even more reason to join in.

Have a great weekend.

Dominic

Appendix M A summary of tweets about knowledge encounters (Chapter 5)

Permission to reproduce these tweets obtained from Dr Anita Kothari and Prof Trish Greenhalgh.

 Storify by Dominic Hurst a minute ago

Knowledge encounters

A tweet exchange between Trish Greenhalgh, Anita Kothari and Dominic Hurst on the meaning of "Knowledge Encounters"

Trisha Greenhalgh
@trishgreenhalgh

"What does this term mean?" I asked my PhD student. He went away, thought, & wrote a blog on 'knowledge encounters'.
knowledgeproject.info

 @Dominic_Hurst · 13 DAYS AGO

knowledge project

I was recently challenged by my supervisor to explain why I use the term "knowledge encounter" in my work. The story of how I arrived at it was actually one of frustration perhaps 12-18 months ago as I searched for terms in the literature that would best describe the experiences clinicians have of discovering new knowledge.

KNOWLEDGE PROJECT

Anita Kothari
@anitarena

@trishgreenhalgh @Dominic_Hurst Fascinating! Is K encounter limited to clinicians? Sometimes I have a-ha knowledge moments but not always 1/

12 DAYS AGO

Dominic Hurst
@Dominic_Hurst

@anitarena @trishgreenhalgh certainly not limited to us ;) just the focus of my research is clinicians

12 DAYS AGO



Anita Kothari
@anitarena

@trishgreenhalgh @Dominic_Hurst My grad level KT class is reading TG's work this week. Might I bring Feb 7,5 blogs into classroom? 2/

12 DAYS AGO



Dominic Hurst
@Dominic_Hurst

@anitarena @trishgreenhalgh would be very pleased if you do. Perhaps you could let me know reaction?

12 DAYS AGO



Anita Kothari
@anitarena

@Dominic_Hurst @trishgreenhalgh yes will ask class to come up with key thoughts for you. Maybe we tweet them real time. F 11th 1-4 EST. Cool

12 DAYS AGO



Anita Kothari
@anitarena

@Dominic_Hurst @trishgreenhalgh i wonder what makes a KE meaningful. When is K sticky enough..random musings on a Sun morning.

12 DAYS AGO



Dominic Hurst
@Dominic_Hurst

@anitarena @trishgreenhalgh really good question. I plan to explore through in depth interviews as dentists record their encounters. 1/2

🔗 @anitarena · 12 DAYS AGO



Dominic Hurst
@Dominic_Hurst

@anitarena @trishgreenhalgh like your phrase "sticky" - can I pinch it?
2/2

12 DAYS AGO



Anita Kothari
@anitarena

@Dominic_Hurst @trishgreenhalgh 'sticky' not mine see Szulanski from
business literature.

12 DAYS AGO



Trisha Greenhalgh
@trishgreenhalgh

@anitarena @Dominic_Hurst original ref to sticky here i think.
web.mit.edu/people/evhippe... (example of what i was saying re
ontology of kn)

↕ @Dominic_Hurst · 12 DAYS AGO



Trisha Greenhalgh
@trishgreenhalgh

@anitarena @Dominic_Hurst but this paper more readable
faculty.fuqua.duke.edu/~charlesw/s591...

12 DAYS AGO



Anita Kothari
@anitarena

@Dominic_Hurst FYI class composed of 1 dentist, rehab professionals,
health promotion and health information sci students

12 DAYS AGO



Dominic Hurst
@Dominic_Hurst

@anitarena sounds like an interesting group. Always great to learn with colleagues from different professions.

12 DAYS AGO



Dominic Hurst
@Dominic_Hurst

@anitarena what's your grad class? Are you teaching knowledge translation?

11 DAYS AGO



Anita Kothari
@anitarena

combining mixed methods and mixed studies - this one's for you
[@thinkkat annualreviews.org/eprint/qFxpDW...](http://thinkkat.annualreviews.org/eprint/qFxpDW...) thx @Dominic_Hurst !

11 DAYS AGO



Anita Kothari
@anitarena

KT Class Q: K Encounters - what prompts you to share works in progress via the blog? @Dominic_Hurst

9 DAYS AGO



Dominic Hurst
@Dominic_Hurst

@anitarena partly for comment and to develop idea. Partly to explain idea to potential participants in study

9 DAYS AGO



Anita Kothari
@anitarena

KT Class Q: why 'encounter'? Loaded term in humanities. Infers novel but mindlines not novel in practice. @Dominic_Hurst

9 DAYS AGO



Anita Kothari
@anitarena

KT Class Q: We noted survey conflated "information" and "knowledge." Problematic? Information encounter or KE? @Dominic_Hurst

9 DAYS AGO



Dominic Hurst
@Dominic_Hurst

@anitarena agreed. Lots of confusion between knowledge and information. "Knowledge products" actually information

9 DAYS AGO



Dominic Hurst
@Dominic_Hurst

@anitarena how is it in humanities?

9 DAYS AGO



Anita Kothari
@anitarena

KT Class Q: Do clinical encounters encompass learnings from one's practice? What is the scope of encounter? @Dominic_Hurst

9 DAYS AGO



Dominic Hurst
@Dominic_Hurst

@anitarena definitely. An encounter with the personal. Seems slightly odd in normal conversation but I think it makes sense

9 DAYS AGO



Anita Kothari
@anitarena

@Dominic_Hurst generally also refers to a specific time and space.
religious studies - epiphanies.

9 DAYS AGO



Anita Kothari
@anitarena

KT Class: Thanks for live tweeting! Good luck with the work.
@Dominic_Hurst

9 DAYS AGO



Dominic Hurst
@Dominic_Hurst

@anitarena do you think knowledge translation possible? Information is
conveyed & user then turns into knowledge of their own making

8 DAYS AGO



Anita Kothari
@anitarena

@Dominic_Hurst one's view of #knowledgetranslation depends on one's
epistemological position lol..

↩ @Dominic_Hurst · 7 DAYS AGO



Dominic Hurst
@Dominic_Hurst

@anitarena as I'm learning :)

7 DAYS AGO

Appendix N Mixed methods participant information sheet (Chapter 5)



Participant information document

Title of study

General dental practitioners' knowledge encounters: a mixed methods study

Principle researcher

Dr Dominic Hurst

DPhil Student, University of Oxford & Clinical Lecturer in Primary Dental Care, Queen Mary, University of London

Email: richard.hurst@kellogg.ox.ac.uk

Telephone: +44 (0)20 7882 2500

Department information

Nuffield Department of Primary Care Health Sciences, University of Oxford

New Radcliffe House, 2nd floor, Walton Street, Jericho, OX2 6NW

Telephone: +44 (0)1865 289300

Postal address: Radcliffe Observatory Quarter, Woodstock Road, OX2 6GG

Website: <http://www.phc.ox.ac.uk/>

Study Website

<http://knowledgeproject.info>

There is a 3 minute video introducing the project here: <https://youtu.be/4vzeNUVrrxE>

Purpose of study

This study seeks to gain a better understanding of where dentists acquire information, experience and other knowledge relevant to their day to day practice and how different sources of evidence combine, merge and morph as dentists build their knowledge-in-practice.

Its value will lie in improving how we view the different knowledge that dentists need to make good decisions with their patients.

Why you are being asked to participate

We are interested in understanding the building of knowledge in primary dental care and, in particular, among general dental practitioners. It is as a general dental practitioner that you have been invited to participate in this study.

What the study asks of you

There are three parts to this study: a training period using a web form, recording of learning encounters using the web form and interviews about the encounters.



Recording of learning encounters

Participants will be asked to record over a period of 7 days as many of their encounters with new information, experiences or other types of knowledge as they can. These encounters may occur at home, at work, at an educational event or when socialising. You will be asked to describe the encounter and to categorise it.

We will ask you to set yourself reminders during the day to record learning that took place. We may send one or two reminders per day via email or text with your permission.

If you are willing, you may be asked to repeat the 7 day data collection on two further occasions over the following three months.

The encounters will be recorded either online using a Google Web Form or on paper.

The online data collection form will be accessible using a smartphone, tablet or computer. These will need to have an internet connection, which will mean that there is data usage if accessing this via 3g / 4g. The data is not large but those who have a data usage limit may wish to monitor the amount of data used.

For those who would prefer to record their knowledge encounters on paper we will send these by post.

Training to record learning encounters

Prior to beginning this data collection you will be asked to work through a small number of scenarios that represent some of your knowledge encounters. You will be asked to classify these as you will in the recording of your own encounters. These are not expected to take more than 60 seconds each to complete. This will need to be completed on a computer even for those who will go on to record their own knowledge encounters on paper.

The purpose of this is to help calibrate those participating and to assess the reliability of the tool across all those participating.

Interviews about learning encounters

A sample of all those participating will be asked to take part in interviews reflecting on particular encounters they recorded. The interviews may be by telephone, a voice-over-internet-protocol such as Skype or Google Hangouts, or face-to-face depending on the participant's preference. They are expected to last between 30 minutes and an hour.

Interviews will be recorded and transcribed to allow them to be analysed. Once transcribed the recordings will be deleted. Transcriptions will be kept on a secure computer. They will be kept confidential with only members of the immediate research team having access to them. Any quotes used from these in the thesis or other publications arising from the research will be anonymised and personally-identifiable information removed.



Asking questions

You are free to ask questions about the study before you decide whether to take part. Please contact Dominic Hurst via email or telephone.

Choosing to participate

You are entirely at liberty to choose whether or not to take part in this study. If you choose to take part in the collection of learning encounters using the web form you are still free to choose whether or not you take part in the interviews following these.

Withdrawing during the study

If you choose to participate in the study you can withdraw at any time by advising the researcher. There are no penalties for this. You may be asked, if you consent to, for the reasons for withdrawal to help the researcher understand any problems with the study design or expectations of participants. You will not be obliged to answer this question.

Ethics approval

This study has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee (CUREC).

The reference number for this project is MS-IDREC-C1-2015-088 and is valid for a period of 18 months from the CUREC 1 approval date, 13th May 2015.

Personal data

The lead researcher alone will have access to personal data. This data will be stored on a password protected departmental computer. At the end of the study all identifiable data will be deleted.

Publication of results

The University of Oxford is committed to the dissemination of its research for the benefit of society and the economy and, in support of this commitment, has established an online archive of research materials. This archive includes digital copies of student theses successfully submitted as part of a University of Oxford postgraduate degree programme. Holding the archive online gives easy access for researchers to the full text of freely available theses, thereby increasing the likely impact and use of that research.

If you agree to participate in this project, the research will be written up as a thesis. On successful submission of the thesis, it will be deposited both in print and online in the University archives, to facilitate its use in future research. The thesis will be published with open access, open access meaning available to every internet user. Digital copies are published in an open access database, the Oxford University Research Archive (ORA). More information on this is available here: <http://www.bodleian.ox.ac.uk/ora/about>

It is also anticipated that the results of this study will be published in academic journals and presented at academic conferences. No personally identifiable data will be included in any

publications but excerpts from descriptions of learning encounters and interviews may be. If there is any possibility that a section of text could identify an individual or individuals it will be removed.

Benefits to participants

A direct benefit of participating in this study is that the results of your encounters will be fed back to you. This may be a helpful reflective aid in considering what sources of learning influence your practice, allowing you to explore how to optimise these or how you might use other sources to enrich your clinical practice.

Indirectly the results of the study, in helping to understand where dentists encounter learning, are intended to help design ways of getting high quality and meaningful, up to date research into practice using the routes dentists find most amenable. This should mean that your practice develops over time in a way that leads to greater improvements in patient outcomes.

Risks

There are no anticipated risks involved in this study.

Consent

If you agree to take part in this study you will be asked to sign a consent form. Please ensure that you have read this document and understand what you are being asked to do before doing so.

Raising concerns

If you have a concern about any aspect of this project, please speak to the primary researcher Dr Dominic Hurst (richard.hurst@kellogg.ox.ac.uk Tel: +44(0)20 7882 2500) or his supervisor, Professor Trish Greenhalgh, (trish.greenhalgh@phc.ox.ac.uk Tel: +44 (0)1865 289363) who will do their best to answer your query. They should acknowledge your concern within 10 working days and give you an indication of how they intend to deal with it. If you remain unhappy or wish to make a formal complaint, please contact the chair of the Research Ethics Committee at the University of Oxford (Chair, Medical Sciences Inter-Divisional Research Ethics Committee; Email: ethics@medsci.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD). The chair will seek to resolve the matter in a reasonably expeditious manner.

Appendix O Mixed methods consent form (Chapter 5)



Participant Consent Form

Title of study

A mixed methods study of formal and informal learning sources encountered by General Dental Practitioners

Principle researcher

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Website: <http://www.phc.ox.ac.uk/>

Study Website

<http://knowledgeproject.info>

Purpose of study

This study seeks to gain a better understanding of where dentists acquire information, experience and other knowledge relevant to their day to day practice and how different sources of evidence combine, merge and morph as dentists build their knowledge-in-practice.

Its value will lie in improving how we view the different knowledge that dentists need to make good decisions with their patients.

Declaration by participant

I confirm that I:

- Have read the participant information document and am aware that any interviews will be audio recorded and transcribed
- Have had the opportunity to ask questions about the study and received satisfactory answers to questions, and any additional details requested
- Understand that I may withdraw from the study without penalty at any time by advising the researchers of this decision
- Understand that this project has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee
- Understand who will have access to personal data provided, how the data will be stored; and what will happen to the data at the end of the project
- Understand that no personally identifiable data will be included in the researcher's thesis, publications or oral presentations arising from this study
- Understand that excerpts from descriptions of learning encounters and interviews may be included in the thesis, publications and oral presentations arising from this study
- Agree to participate in this study
- Understand how to raise a concern and make a complaint

Participant's signature: _____ [Not needed if emailing]

Participant's name (printed): _____

Date: _____

Researcher's signature: _____

Researcher's name: DR DOMINIC HURST

Date: _____

Appendix P Knowledge encounters participant registration form (Chapter 5)

Participant registration form	
Please complete all items on the form	
Items	Responses
First name	
Preferred name (if different from first name)	
Surname	
GDC registration number	
Birth year	
Sex	
Year of first dental degree	
Years in clinical dentistry	
Highest dental qualification	
Preferred telephone number	
Mobile telephone number	
Email address	
How many practices do you work at?	
Main practice name	
Practice address: number & street	
Practice address: village / town / city	
Practice county	
Practice postcode	
Region	
Maximum number of colleagues you come into contact with in a week in your practice(s)	
Remuneration	
DF1 Training practice?	
Hygienist working at practice(s)?	
Average hours of clinical work / week	
Your perceived usefulness of information technology in your working life. Usefulness is defined as "the degree to which you believe that using information technology enhances your performance"	
Your perceived ease of use of information technology. Ease of use is defined as "the degree to which you believe that using information technology is free of effort"	
Would you like to use the web form or paper form to collect your knowledge encounters? (You can change your mind later)	
Do you use Skype?	
Do you use Google Hangouts?	

Appendix Q Knowledge encounters data collection paper form (Chapter 5)



Knowledge encounters recording form

Date: _____
Time: _____

Describe the information or experience encountered in your own words

Category	Tick only one for each category	Facet
What did you encounter?		☐ Codified knowledge ☐ Codified knowledge in a personalised form ☐ Procedural knowledge ☐ Process or policy knowledge ☐ Experiential knowledge ☐ Custom ☐ Product or service knowledge
How was the information or experience communicated?		☐ Written ☐ Visual ☐ Verbal ☐ Haptic (touch) ☐ Olfactory ☐ Internal
What mode was it transmitted by?		☐ Using electronic technology (to communicate) ☐ Not using electronic technology (in person)
Who communicated the information or experience?		☐ Practitioner ☐ Non-practitioner colleague ☐ Patient ☐ Researcher ☐ Educator ☐ Regulator ☐ Employer ☐ Salesperson
How many people were involved in the encounter including yourself?		☐ Alone ☐ A couple ☐ A group
What was the setting where you encountered the information or experience?		☐ Work ☐ Educational ☐ Social ☐ Domestic
How do you intend to use the knowledge encountered?		☐ I won't use it ☐ I intend to use it instrumentally (do something with it) ☐ I intend to use it conceptually (think about it) ☐ I intend to use it politically (make an argument for something)

Appendix R Mixed methods interview guide (Chapter 5)

Knowledge encounters interview guide

The interviews take a narrative form. That is, the intention is to encourage participants to tell their own stories around their recorded knowledge encounters with the aim of understanding how they encounter new knowledge and how this is morphed, combined and made sense of within their existing knowledge base.

Introducing participant to interview

Thank the participant for taking part in the study and for having recorded their knowledge encounters.

Explain that the narrative interview follows the following structure:

1. I will ask you to tell your own story around one of your knowledge encounters you recorded. This will be uninterrupted.
2. After this, when you are happy that you have said all you want to about the encounter I may ask you some questions about the encounter or more generally about the way in which you encounter and use knowledge.
3. Depending on time and how you feel about talking about more of your encounters we will then move on to another encounter.
4. The interview is not intended to last any longer than 1 hour and you are free to stop us earlier for whatever reason.
5. Do you have any questions?

Checking consent

Although participants have already consented to the interview being recorded (it is described in the participant information sheet), remind them that the interview is to be recorded and that they are OK with this.

Main narrative

Begin the interview proper by asking the participant if there is a particular knowledge encounter that they would like to talk about. If there isn't choose an encounter and ask the participant to tell the story around that particular encounter.

As far as possible, try to keep to one encounter at a time so that the questions are directed at the way in which knowledge was built around it. However, where participants link different encounters this may be important to capture.

Questioning

When the participant seems to have finished telling their narrative, check if there is anything more they would like to say about it. If not, consider probing for more detail or for generalisations relating to the encounter they have described. Try to avoid closed questions and concentrate on trying to get them to describe in greater depth the phenomena they have narrated.

Appendix S Complete list of knowledge encounters recorded by GDPs in the mixed methods study (Chapter 5)

Free text responses to the section *Describe the information, experience or other knowledge encountered in your own words* appear below the respective categorical data.

Claire							
Number	What encountered?	How?	What mode?	Who?	How many?	Setting?	Intended use?
1	Codified	Written	Not electronic	Practitioner	Alone	Work	Conceptually
Read an article in the BDJ titled "Why are vulnerable children not brought to their dental appointments?". At work during lunch break. Thought about how we tend to see things through our own perspectives e.g meeting targets and forget about difficulties some patients have in making appointments.							
2	Process or policy	Written	Electronic	Employer	Alone	Work	Instrumentally
I was due to see a family of paediatric patients that were known to social services. There had been difficulties in contacting the family and trying to get them to attend appointments. I was not sure of the University's Safeguarding Policy so downloaded from the intranet (at work) and familiarised myself with the procedures. After reading the policy document I felt reassured that I knew how to raise any safeguarding issues and to escalate any concerns should the family miss the appointment. Fortunately they all attended.							
3	Process or policy	Written	Electronic	Practitioner	Alone	Work	Instrumentally
I wanted to revise the preventive advice stated in Delivering Better Oral Health for paediatric patients. I was at work and found the document online. Most of the principles are embedded into our treatment plan for each patient but some aspects of the fluoride use e.g fluoride mouth rinse for high risk patients needs to be emphasised more to students. Made me think how could we convey this message to the students ??							
4	Codified	Written	Not electronic	Practitioner	Alone	Work	Instrumentally
I was seeing a patient for an oral health reassessment. They were high caries risk and would benefit from Duraphat 2800 toothpaste. I wrote a prescription. Out of habit, before writing the prescription I ALWAYS consult the BNF even if I know the dose, name etc.!							
5	Codified knowledge	Written	Not electronic	Practitioner	Alone	Domestic	Instrumentally
Read an article in Dental Update on Management of Recurrent Aphthous Stomatitis in Children (at home). Liked the tables and clinical photos in the article. Made me think about my teaching unit in Oral Surgery and Oral Medicine to the dental therapists and how to deliver the information in a clear and simple to understand way.							
6	Experiential	Verbal	Not electronic	Practitioner	A couple	Work	Instrumentally
I had a set of bitewing radiographs that I saw on clinic a few days ago. I wanted to speak to a colleague regarding some radiolucencies to see what they would have done in the same situation. I gave some background information regarding the patient but did not disclose what I did. My colleague came to the same conclusion as myself, which was reassuring. (I work in an environment							

where there are many GDPs treatment planning patients and you will supervise treatment on patients that was not originally treatment planned by yourself. Occasionally a disagreement will arise e.g. A filling is planned but you cannot see the reason why).							
7	Codified	Written	Electronic	Practitioner	Alone	Domestic	Instrumentally
A patient presented with a fat face caused by an acute dental abscess associated with UR2. I explained the treatment would be extraction but he wanted antibiotics. I explained this would not be effective and the risk of infection spreading etc. The patient eventually agreed to extraction of the tooth which happened uneventfully. This encounter made me think of antibiotic guardianship that was mentioned at an infection control course I attended last month but had not had time to look into this. So I checked it out on the Internet. It was quite sobering to think about the spread of antibiotic resistance and how we need to be more careful with prescribing these drugs. I also checked the FGDP guidelines on antibiotic prescribing and the antimicrobial prescribing and stewardship competencies.							

Gemma							
Number	What encountered?	How?	What mode?	Who?	How many?	Setting?	Intended use?
8	Procedure	Visual	Not electronic	Practitioner	A couple	Work	Instrumentally
During work hours, I observed my dental foundation trainer take relevant records to construct a Michigan Splint which I hadn't previously done. I observed his method of putting the patient into RCP and recording this position using beauty wax and Temp Bond. It was interesting to see this visually as I had previously read about it in lectures but not experienced a case; observing this has now provided me with confidence to offer patients this treatment if indicated. I will also be observing the fit of this splint next week.							
9	Codified	Written	Electronic	Researcher	Alone	Domestic	Conceptually
A crown lengthening case is booked into my diary in the next few weeks. This is a procedure I did not have a lot of information about. I was assigned to read up about what it is, its indications, contraindications and the procedure. I used various web searches including pubmed, cochrane, the BDA library to find information and collated it. This was done at home. I thought it was beneficial to prepare myself for the treatment and it motivated me to research into the topic which I would not have done otherwise.							
10	Product or service	Verbal	Not electronic	Salesperson or organisation	Alone	Work	Instrumentally
Sensodyne representative came to visit the practice to discuss sensodyne repair and protect (with novamin) and pronamel toothpaste							
11	Experiential	Verbal	Not electronic	Practitioner	A couple	Work	Instrumentally
Patient complaining of sensitivity from hot and cold in upper right quadrant with heavily restored teeth with crowns. Radiographs indicated no obvious pathology and therefore explained options to the patient of either- reassess, remove crown and investigate and depending on amount of tooth tissue either re-restore, root treat if feasible or extract if unrestorable. This case was good to discuss with a colleague to reinforce the decision and the questionable diagnosis.							
12	Experiential	Verbal	Not electronic	Practitioner	A couple	Work	Conceptually
Patient lost his upper partial denture replacing both upper centrals. Attended the surgery requesting an immediate replacement before the weekend. The laboratory we send to normally takes a week to							

process lab work and therefore as I hadn't come across this I was unsure as to how I can speed the process up. I spoke to the principal (VT trainer) who for an independent charge suggested that the patient can get the denture back in 2 days and I called to confirm this with the lab. It was useful to learn how we can go about doing this in such a situation.							
13	Procedural	Visual	Electronic	Practitioner	A group	Educational	Conceptually
A study day was conducted presenting multiple treatment plans and cases each trainee had prepared during their year. It was useful to see what the different cases were and how colleagues went about treating the cases and in particular photographs of their work. It also gave me the opportunity to present my work and allowed self reflection of it.							
14	Codified	Written	Not electronic	Researcher	Alone	Work	Conceptually
During a last cancellation I was reading the Riskmatters magazine published by dental protection discussing- a summary of dealing with avulsion, importance of record keeping and shared decision making to work in the patients best interest							
15	Codified	Written	Not electronic	Educator	Alone	Domestic	Conceptually
I was given a book from my trainer "Grey areas in restorative dentistry" which discussed areas of dentistry encouraging thought.							
16	Product or service	Verbal	Electronic	Salesperson or organisation	A group	Work	Conceptually
Oral B representative came to the practice for a lunch and learn session in which information about electric toothbrushes and toothpaste was discussed.							

Phil							
Number	What encountered?	How?	What mode?	Who?	How many?	Setting?	Intended use?
17	Process or policy	Verbal	Not electronic	Educator	A couple	Work	Instrumentally
Referrals will sometimes get rejected if not submitted on official forms.							
18	Codified	Visual	Electronic	Educator	Alone	Domestic	Conceptually
The information encountered related to dental epidemiology, past, present and future and how it may impact upon workforce planning, and service provision in future.							
19	Procedural	Visual	Not electronic	Educator	A couple	Work	Conceptually
The procedure required for crown lengthening with bone removal							
20	Process or policy	Verbal	Not electronic	Practitioner	A couple	Social	Instrumentally
That the EES guidelines recommend that the volume of irrigant used is included in the notes.							
21	Experiential	Internal reflection	Not electronic	Practitioner	Alone	Work	Instrumentally
Polishing of composite method alterations - using sofex discs in combination with polishing points resulted in a better overall finish to the composite system currently in use in the practice and allowed to introduce better tooth morphology.							
22	Codified knowledge personalised	Verbal	Not electronic	Employer	A couple	Work	Instrumentally

Discussion over the placement of clasps on Co/cr dentures with colleague.							
23	Product or service	Verbal	Not electronic	Non-practitioner colleague	A couple	Work	I won't use it
Alcohol wipes can cause crinkling at the edges of radiograph films.							
24	Codified	Visual	Electronic	Educator	Alone	Work	Conceptually
The guidelines surrounding radiographs being taken and when, with a special focus on periodontal radiographs. Via E-learning for healthcare online (e-den) - produced by RCS							
25	Codified	Written	Not electronic	Researcher	Alone	Work	Conceptually
Orthodontic paper in the BDJ on the use of "short term" orthodontic systems in general practice.							
26	Procedural	Visual	Electronic	Educator	Alone	Work	Instrumentally
Information regarding primary impression taking for lower completes using impression compound using a youtube video							

Robert							
Number	What encountered?	How?	What mode?	Who?	How many?	Setting?	Intended use?
27	Experiential	Visual	Not electronic	Patient	A couple	Work	Politically
Abusive hostile patient's parents criticising my dental care							
28	Procedural	Haptic (touch)	Not electronic	Salesperson or organisation	A couple	Work	Conceptually
Demonstration of cerec by a salesperson							
29	Codified knowledge personalised	Written	Electronic	Patient	Alone	Domestic	Politically
Online discussion following the killing of a lion by a dentist							
30	Experiential	Written	Electronic	Practitioner	A group	Work	Conceptually
GDP-UK online forum discussion about amalgam vs composite							
31	Procedural	Verbal	Not electronic	Non-practitioner colleague	A couple	Work	Instrumentally
Scared that I am fitting someone else's denture. support from laboratory required							
32	Codified	Written	Electronic	Salesperson or organisation	Alone	Domestic	Conceptually
Reading Dentist magazine							
33	Experiential	Haptic (touch)	Not electronic	Patient	A couple	Work	Instrumentally
Trying to restore a split hopeless molar tooth which should be extracted							

34	Experiential	Written	Electronic	Practitioner	Alone	Domestic	Instrumentally
Discussion online about informed consent and patient led consent to fail							
35	Codified	Written	Electronic	Educator	Alone	Domestic	Instrumentally
Read Dental Probe magazine							
36	Codified knowledge personalised	Written	Electronic	Educator	Alone	Domestic	Politically
Reading risk management magazine by Dental Protection indemnity provider							
37	Experiential	Written	Electronic	Practitioner	A group	Domestic	Instrumentally
Online discussion regarding associate / principle expectations							
38	Procedural	Written	Electronic	Salesperson or organisation	Alone	Work	Conceptually
Reading about handheld xray machines / digital imaging							
39	Experiential	Written	Electronic	Practitioner	A group	Work	Politically
Online discussion about sheer waste of resources to be involved in a GDC case. Hotel bills, time wasted, stress							
40	Experiential	Written	Not electronic	Practitioner	Alone	Work	Politically
I avoided a new patient with obviously excessive expectations of routine NHS dental services							

Jason							
Number	What encountered?	How?	What mode?	Who?	How many?	Setting?	Intended use?
41	Process or policy	Written	Electronic	Employer	Alone	Work	Instrumentally
E-mail received from Dental Hospital detailing revised guidelines for the management of TMD within the hospital and inviting me to a lunchtime lecture 26.6.15							
42	Codified knowledge personalised	Verbal	Not electronic	Patient	A couple	Work	Instrumentally
Patient explained to me how she had been shown by the Oral Medicine consultant at the Dental Hospital how to manage her topical steroids for atrophic lichen planus							
43	Codified knowledge personalised	Verbal	Not electronic	Practitioner	A couple	Work	Conceptually
Discussion with a colleague about differential diagnosis of an ulcerated lesion on the buccal mucosa							
44	Product or service	Verbal	Not electronic	Salesperson or organisation	A group	Work	I won't use it

"Lunch and learn" at the practice run by rep from 3M. Explaining about new composites, abrasives and adhesives(and trying to sell them!)							
45	Codified	Visual	Electronic	Researcher	A couple	Domestic	Conceptually
Watched fascinating programme on terrestrial television at home about conjoined twins.							
46	Experiential	Verbal	Not electronic	Practitioner	A couple	Work	Conceptually
Discussion with colleague in practice re differential diagnosis of radiolucency on radiograph.							
47	Codified knowledge personalised	Verbal	Not electronic	Practitioner	A group	Work	Conceptually
Discussion with colleagues on undergraduate restorative clinic regarding treatment planning, to help one of the students with his patient.							
48	Codified knowledge personalised	Written	Not electronic	Employer	A couple	Work	Conceptually
Yearly peer appraisal of my teaching by clinical tutor, using information from anonymous feedback from the students I teach							
49	Product or service	Written	Electronic	Employer	Alone	Domestic	I won't use it
Circular Email from Dental Hospital informing me that the panic regarding latex within a Duraphat varnish tube was a false alarm-only latex in the band securing the crimped end of the tube, won't come into contact with contents. We can all sleep safe in our beds again.							
50	Process or policy	Written	Electronic	Employer	Alone	Domestic	Conceptually
Circular email from Dental Hospital informing me of new requirements imposed by the Trust regarding our mandatory CPD.							
51	Codified	Verbal	Not electronic	Researcher	A group	Educational	Conceptually
Attended Primary Care Research Day at Newcastle Dental School. Lectures from key research leads and practitioners undertaking research in primary care.							
52	Codified personalised	Verbal	Not electronic	Practitioner	A couple	Social	Instrumentally
Discussion with clinical academic over coffee at course regarding casemix and suitable undergraduate experience within the Dental Hospital. As usual on a course, conversations over coffee and lunch much more useful than scheduled programme!							
53	Process or policy	Verbal	Not electronic	Regulator	A couple	Social	Politically
Useful conversation over lunch with local educational adviser to the Deanery regarding policy development.							
54	Codified	Written	Not electronic	Educator	Alone	Domestic	Conceptually
Hour spent reading BDJ at side of swimming pool whilst daughters had swimming club training.							

Annabel							
Number	What encountered?	How?	What mode?	Who?	How many?	Setting?	Intended use?
55	Codified knowledge personalised	Verbal	Not electronic	Practitioner	A couple	Domestic	Instrumentally
A dental friend of mine phoned for a catch up. She told me about a patient in which she displaced an apex of their UL6 into the maxillary antrum. She sought advice from the local Oral and Maxillofacial Surgery Dept who advised her to refer the patient in to them. This led us on to a discussion about the potential management of this case. We were unsure whether the apex should always be removed, or whether there were situations in which it may be left and monitored. After this telephone conversation I sent a text to a friend of mine who is a consultant in oral and maxillofacial surgery to ask him how he would manage the case. He said that he would further investigate with a CT scan but then let the patient decide definitively. However he did say that his preference would be to remove the root (especially if it was big and if it was associated with a non vital tooth) and that if infection did develop, it is usually difficult to settle. I did also do a brief Google search on this to see what would come up but I mostly came across information on the management of oroantral communications/fistulas.							
56	Experiential	Internal reflection	Not electronic	Practitioner	A couple	Work	Conceptually
Today I was supervising third year dental undergraduates at an outreach centre. One of the students was treating a patient who had not had bitewing radiographs for seven years. There was no clinical reason I could find to justify exposing the patient to further radiation (no periodontal disease, good oral hygiene, low caries risk and no clinical caries) however I felt uneasy about letting the patient go without 'double checking' that everything was OK with the aid of radiography (I know I would not go without bitewings for seven years!) This led to a discussion between myself and the student about my thoughts on the matter. He agreed with my views (good student!) but also appreciated that we could not tick the 'justification' box. He looked online to see what guidance he could find. He found some guidelines from 2012 but said he was going to look into it further and let me know what he finds. Although I am aware that we do need a clinical justification for exposing a patient to radiation, previous experiences have shown me that despite deeming a patient to be relatively low risk with a seemingly clear dental examination (was I checking as thoroughly as I thought, and have I assessed their risk properly?) I have been surprised on several occasions to find radiographic radiolucent lesions suggestive of caries on patients who I would have guessed would have been caries free. I appreciate the value and importance of regulations, guidelines and evidence, however I also believe that there is a lot to be said about our own experiences (and those of others) along with our (dare I say it?) 'gut feeling' on a situation.							
57	Codified knowledge personalised	Verbal	Not electronic	Practitioner	A group	Work	I won't use it

My co-trainer had an apicectomy planned with our FD for a tutorial this afternoon. The three of us were discussing flap design during the lunch hour. Peter, my co-trainer, was explaining why he prefers the semi-lunar flap design for anterior apicectomies. His main reasons were that it doesn't interfere with the interdental papillae, therefore reducing the risk of visible scarring, and that is also avoids gingival recession.							
58	Codified knowledge personalised	Visual	Not electronic	Practitioner	A couple	Work	I won't use it
You and I were discussing your DPhil research project at lunch on Tuesday. You told me about a particular system that was used to record when smokers had a craving. This arose because I asked whether it mattered when my knowledge encounters were recorded. I don't remember much about the system you told me about I'm afraid(!), sorry, but can remember you doing a 'button pushing' motion with your hand. A brief knowledge encounter combined with a terrible memory!							
59	Experiential	Verbal	Not electronic	Patient	A couple	Work	Conceptually
My patient and I were discussing her Bell's Palsy. In 2003 it affected the right side of her face, and this is the side of her face that still has some visible paralysis. In 2006 she had Bell's Palsy again but on the left hand side this time. On examination today, there was no evidence of paralysis on the left hand side. She said that this is because she was given prednisolone when affected on the LHS, but was not given prednisolone when the RHS was affected because she was pregnant at the time. She said her doctor told her that the prednisolone was contra-indicated in pregnancy. I have just looked up prednisolone in the BNF and it states that prednisolone is the corticosteroid treatment of choice in pregnant women: dexamethasone and betamethasone readily cross the placenta where as 88% of prednisolone is inactivated as it crosses the placenta. It also states that the benefit of treatment with corticosteroids during pregnancy outweighs the risk. Going by the information my patient gave me today, it seems as though her doctor decided that the relatively low risk associated with taking prednisolone was still too high a risk to take. If I wasn't being reflective and filling this in, I am confident that I would not have looked up prednisolone in pregnancy.							
60	Custom	Written	Not electronic	Practitioner	Alone	Work	Instrumentally
Yesterday I received correspondence from an orthodontist regarding a teenager I had referred to him. He wrote to inform me that the patient had completed the initial retention phase (after fixed appliances) and should now wear her removable retainers every other night until growth was complete. This led me to realise that I was unsure of what orthodontists recommend in terms of retainer use during the initial phase of retention, although I did think that it was perhaps full time use for six months (apart from when eating). I intended to look it up. To be continued.....							

61	Experiential	Visual	Not electronic	Patient	A couple	Work	Instrumentally
....continued:							
I intended to search on line today to see what I could find about retention with removable appliances. During my morning session I saw a teenager for an exam whom I had referred for ortho treatment a while ago. Reading through my notes before calling her in, at her last exam I had made a note that she was near the end of her active ortho phase with fixed appliances and they should be off by her next exam appointment (today)...she was going to be the one that saved me a Google search! I asked her what the orthodontist had advised her to do about wearing her retainers. She said he advised her to wear them full time for the first three days, and then every night for six months, then down to every other night (as he had said in his letter). A lazy approach to finding out information but nonetheless one that I was content with - the information sounded about right....and it came from an intelligent, studious teenager set to do well in her A' levels...surely it's reliable knowledge!							

Archie							
Number	What encountered?	How?	What mode?	Who?	How many?	Setting?	Intended use?
62	Process or policy	Written	Electronic	Practitioner	Alone	Work	Conceptually
monday, gdpuk, Facebook for dentists							
63	Codified	Verbal	Not electronic	Educator	A group	Education al	Conceptually
Day 1 ESE conference 6 lectures							
64	Experiential	Visual	Electronic	Practitioner	Alone	Work	Conceptually
Gdpuk fbfd [Facebook For Dentists]							
65	Codified	Verbal	Not electronic	Educator	A group	Education al	Conceptually
ESE day 2 lectures plus trade Talks with videos trade show some new products							
66	Codified	Verbal	Not electronic	Educator	A group	Education al	Conceptually
ese lectures							
67	Procedural	Visual	Electronic	Practitioner	Alone	Social	Conceptually
fbfd gdpuk							
68	Product or service	Verbal	Not electronic	Salespersons or organisation	A couple	Education al	Instrumentally
ese trade saw new product, talked to developer later who I happened to meet in lecture we played golf in salt lake city 11 years ago							

Aaron							
Number	What encountered?	How?	What mode?	Who?	How many?	Setting?	Intended use?
69	Process or policy	Written	Electronic	Practitioner	A group	Work	Instrumentally
With a patient who has recently developed a poor MH, taking bisphosphonates IV, also having recently had endocarditis and chest surgery following a chest hernia. Presenting with a tooth with failed endo which needs extraction or hemisection. How to manage this with the MH caused me to investigate and seek guidance.							
70	Codified knowledge personalised	Verbal	Not electronic	Practitioner	A group	Domestic	Politically
Discussion with a visiting friend who is a consultant orthodontist following discussion with a colleague about orthodontic retention.							
71	Process or policy	Verbal	Not electronic	Practitioner	A group	Work	Instrumentally
A patient presented to a colleague with what seemed to be oral cancer at quite an advanced stage. The worst I've seen in 20+ years in practice. Learned what the current referral protocol at the local dental hospital is.							
72	Codified	Written	Electronic	Practitioner	Alone	Social	Instrumentally
From the tweets of a friend in Kent found a brilliant online learning resource about dental pain and diagnosis, amongst other things. Flow charts and other means of aiding diagnosis look extremely useful for me and also to bring to the attention of FDs and students.							

Jane							
Number	What encountered?	How?	What mode?	Who?	How many?	Setting?	Intended use?
73	Process or policy	Verbal	Not electronic	Practitioner	A group	Work	Instrumentally
Team meeting with team at work 6 of us. 1 hour out of working day. Learnt about new employer pension scheme for the staff and learned about a dental essentials contract form and how to use it and planned to order for each surgery							
74	Codified knowledge personalised	Verbal	Not electronic	Practitioner	A couple	Work	Instrumentally
Informal meet during working day at teabreak, to discuss radiograph diagnosis possible internal resorption and management of the tooth. Also discussed management of dark upper A, submerging post trauma in almost 6 year old							
75	Codified knowledge personalised	Verbal	Not electronic	Practitioner	A couple	Domestic	Instrumentally
Radiograph discussion with husband on managing removal of composite core material from root under crown. Was an unfamiliar appearance of material in root Mark confirmed likely material and suggested trying EmS Piezon tip to attempt removal							

76	Process or policy	Written	Electronic	Regulator	Alone	Work	Conceptually
Read gdc bulletin on mobile phone at work. Was emailed and clicked link to read it.							
77	Codified	Written	Not electronic	Researcher	Alone	Work	Conceptually
Primary dental care journal read half of it at work while waiting for computer update to install							
78	Codified	Written	Electronic	Researcher	Alone	Work	Instrumentally
Dental elf tweet photodynamic therapy for treatment of aggressive periodontitis found little strong evidence to support - reports if systematic reviews and metanalysis							
79	Codified knowledge personalised	Verbal	Not electronic	Practitioner	A couple	Work	Instrumentally
Conversation with practice principal about the dental nurse working with vdp - deskilling of the nurse decided to bring her back into rotation so working with the more experienced dentists also							
80	Process or policy	Written	Electronic	Employer	Alone	Domestic	Instrumentally
Email received from the trust to say that referrals are now only to be made using online gateway and informing of contact details							
81	Experiential	Verbal	Not electronic	Practitioner	A couple	Work	Instrumentally
Discussion with vdp considering which type of crown to use on which teeth. What radiographs to take for heavily restored teeth.							
82	Codified knowledge personalised	Written	Not electronic	Educator	Alone	Domestic	Instrumentally
Read book Dale Carnegie how to stop worrying and start living. Multiple tips in managing stressful life/ job							
83	Codified	Written	Not electronic	Educator	Alone	Domestic	Instrumentally
Mddus (indemnity organisation) summons magazine articles about stress in a dentist case report, and report of a set of communication errors that led to removal of the wrong tooth.							
84	Codified	Written	Electronic	Researcher	A group	Work	Instrumentally
Young patient with fractured incisor following trauma, management discussed with principal and vdp in Practice and reviewed the dental trauma guide online for management advice							
85	Experiential	Verbal	Not electronic	Non-practitioner colleague	A couple	Work	Instrumentally
Conversation with denture technician on how to manage a rock on the try in. Planned a way forward.							
86	Codified	Written	Electronic	Researcher	A couple	Work	Instrumentally
Dental trauma guide reviewed to plan recall interval for trauma patient, with the vdp [vocational dental practitioner]							
87	Experiential	Verbal	Not electronic	Practitioner	A couple	Work	Instrumentally
Conversation with vdp passed on a tip from a trainer to wet cotton wool pledget to smooth Oraseal against the rubber dam							
88	Codified	Written	Not electronic	Researcher	A couple	Work	Instrumentally

Discussion with patient who was pregnant about which pain meds and antibiotics she could take for pericoronitis. She said she had been recommended only paracetamol. Looked up bnf to confirm amoxicillin safest opt if has to be taken. No metronidazole							
89	Experiential	Verbal	Not electronic	Practitioner	A couple	Domestic	Conceptually
In kitchen eveing discuss with dentist husband management of a friends toothwear -possibly is occlusal cause secondary to hutchesons extractions of 6s under GA when young - has left residual space and drifting. I had not heard of this tech							
90	Product or service	Written	Not electronic	Salespers on or organisation	Alone	Work	Instrumtally
EMax crown delivery for patient I don't often fit these so looked up online the recommended cementation protocols							
91	Experiential	Verbal	Electronic	Educator	Alone	Social	Instrumtally
Walking home from work listened to podcast if conversation Ashley latter and and American dentist about communicating costs of treatment to patients							
92	Procedural	Written	Electronic	Practitioner	A group	Domestic	Conceptually
Whilst looking at an online discussion on a page where dentists share their experiences and knowledge, I learned about porcelain bonding techniques for repairing porcelain fractures in a predictable way which yields good aesthetic results. It does require many different materials and steps and is technique sensitive.							

Anita							
Number	What encountered?	How?	What mode?	Who?	How many?	Setting?	Intended use?
93	Experiential	Verbal	Not electronic	Patient	A couple	Work	Conceptually
When speaking to a patient, she mentioned that she sometimes gets a small shock-like sensation in her mouth- like a battery effect when 2 different metals rub in her mouth which influenced her decision on whether an amalgam or resin material was to be used. This was the 2nd time I have heard this from a patient and makes me think whether this is a side effect experienced by everyone/should we warn patients of this when giving them their options for a restoration if it were to oppose eg a gold or NPM crown?							
94	Codified	Written	Not electronic	Researcher	Alone	Domestic	Instrumtally
Read in the BDJ about using a wedge with a metal wing prior to cavity prep to protect adjacent tooth from any damage and also separate the teeth slightly prior to restoration which will aid in the placement of the matrix band and also allow for a better contact point. I found this interesting as I have seen these kind of wedges at my new practice but was unsure of how to use them. This is something that I can start implementing from now on.							
95	Experiential	Internal reflection	Not electronic	Practitioner	Alone	Work	Instrumtally
During the process of placing a composite veneer on an upper lateral incisor, I made the mistake of placing bonding agent before putting the interproximal strips in place. As a result, it was difficult to open up the contact point again prior to placing the composite. This is something I will avoid next time by making sure the teeth are separated before applying the bonding agent.							

96	Codified	Written	Not electronic	Researcher	Alone	Domestic	Conceptually
Skimmed through an article in the BDJ which looked at effectiveness of articaine buccal infiltrations for lower molars vs lidocaine IDBs. Concluded that they are not statistically different. I found this interesting as from my experience, lower 7s are usually better anaesthetised with an IDB and I have found this to be more reliable whereas a buccal infiltration alone of articaine I have found to be a hit and miss. However, should the IDB not be enough then I have found buccal infiltrations of articaine to top it up very effective. From this and my own experience and preferences, I think I will continue to IDBs when complete anaesthesia is required eg for deep fillings or XLAs. However, for small fillings eg PRRs the buccal articaine infilt would be sufficient.							

Linda							
Number	What encountered?	How?	What mode?	Who?	How many?	Setting?	Intended use?
97	Codified	Written	Electronic	Researcher	Alone	Social	Conceptually
Reading a journal on Magnifying loupes Vs microscope in Endodontics surgery in BDJ							
98	Codified	Written	Electronic	Practitioner	Alone	Work	Instrumentally
Reading peer reviewed journal Dental Update on Warfarin and drug interactions: Prescribing vigilance							
99	Codified	Written	Electronic	Practitioner	Alone	Work	Conceptually
Journal reading in Dental Update on Extra-oral appliances in Orthodontic Treatment. The journal is interesting in terms of the insights of potential problems using head gear and how to avoid it.							
100	Product or service	Verbal	Not electronic	Salesperson or organisation	A group	Work	Conceptually
CQC compliance manual. Work with denplan							

Appendix T Poster presented at the International Association of Dental Research Conference, London. July 2018 (Chapter 5)

What Knowledge-in-practice is for General Dental Practitioners

Poster #:
2103

Dr Dominic Hurst

University of Oxford and Queen Mary University of London

Email: richard.hurst@kellogg.ox.ac.uk / r.d.hurst@qmul.ac.uk



Introduction

- Professional knowledge is critical to clinical care.
- Whilst knowledge translation strategies typically assume knowledge to be codified and explicit, other theoretical approaches take a broader view of knowledge as embodied, practical, craft-like and shared among communities of practitioners ('mindlines').
- This study sought to explore and theorise the tacit, embodied and collaborative aspects of professional knowledge.
- The term "knowledge encounters"² is used to reflect those occasions when GPs experienced an encounter with a person or thing that generated new learning for them or confirmed existing knowledge.

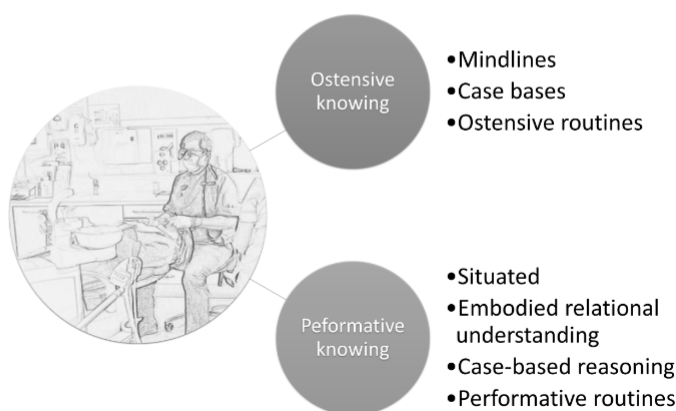
Methods

- 11 GPs in the UK
- Free text web-based diaries used to record knowledge encounters for one week
- Narrative interviews using diary entries as stimuli
- Interview transcripts analysed using a constant comparative approach
- Analysis drew on linked theoretical perspectives, which have in common the embodied, tacit and collectively shared nature of professional knowledge, including mindlines¹, theories of case-based reasoning^{4,5}, diffusion of innovations⁶, socio-materiality⁶ and the sociology of collaborative routines⁷.



Literature cited

- Gabbay, J., Le May, A. (2011). Practice-based evidence for healthcare: clinical mindlines. Abingdon: Routledge.
- Hurst, D., Mikan S. (2017). Implementation Science. 12(1):35.
- Hunter, K. M. (1989). Journal of Medicine and Philosophy, 14(2), 193-212.
- Montgomery, K. (2006). How doctors think: clinical judgment and the practice of medicine. Oxford ; New



Results

- Knowledge encounters were situated and strongly influenced by the local, moment-by-moment unfolding of events and actions.
- Much learning occurred from cases seen in the past (by GPs themselves or their colleagues), which was applied to new cases in the moment of practising.
- The translation of GPs' embodied knowing into the interactions with patients, other people and things, was shaped by physical and material aspects and the constraints of time and space.
- Much clinical work followed well-rehearsed patterns, which were sufficiently plastic to accommodate innovation and learning.
- GPs' case-base understandings and routines appeared to evolve through the interaction of storytelling or narrative, collective sense-making, embodied understandings and the materiality of experiences from other practices in time and space.

Conclusions

- Knowledge-in-practice is an interaction between an ostensive but plastic knowing (mindlines, case bases and ostensive routines) and performative and interactional knowing (embodied relational understandings, case-based reasoning and performative routines).
- Distributing guidelines and assuming we've improved the knowledge of primary care practitioners about how best to improve patient care can only hope to address one aspect of knowledge-in-practice.
- We need approaches that acknowledge a broader understanding of what knowledge is for the GP and the central role played by in-practice knowing in the professional learning process.

Acknowledgments

I am very grateful to the dentists who kindly gave up their time to take part, and to Professor Trish Greenhalgh for help in conducting and analysing this study.

York: Oxford University Press.

- Rogers, E. M. (2003). Diffusion of innovations (5th ed.). New York: Simon & Schuster.
- Feldman, M.S., Orlikowski, W.J. (2011). Organization Science. 22(5):1240-53.
- Feldman, M.S., Pentland, B. T. (2003). Administrative Science Quarterly, 48(1), 94-118.

Appendix U GDP recruitment flier for video study (Chapter 6)



NUFFIELD DEPARTMENT OF
PRIMARY CARE
HEALTH SCIENCES
Medical Sciences Division

RECRUITING GDPS IN LONDON

HOW DO DENTISTS BUILD THEIR KNOWLEDGE AS THEY PRACTICE?

I am a Clinical Lecturer at QMUL and a part-time DPhil student at the University of Oxford. The study described below will contribute towards the thesis for my DPhil.



I am inviting GDPs working in and around London to participate in a study exploring the ways in which dentists build their practising knowledge.

WHAT'S INVOLVED

After obtaining consent from dentists, their staff and patients, I will video and audio record a single clinical session. Ideally this will include at least one check-up or assessment and one treatment appointment with adults.

Interactions with patients and fellow staff in the video will be used with the dentist to stimulate reflections about what was happening during the clinical session. The interview should last no more than an hour and would be arranged as soon as possible after the clinical session but at a time convenient to the dentist.

The video and audio transcripts will be analysed at a different time so there will be no further call on your time after the interview.

PLEASE GET IN TOUCH

The study is currently going through the NHS Research Ethics process and I anticipate starting recordings in March 2017 but will continue through to approximately May or June 2017.

If you would like to know more about being involved in this study please get in touch via either:

Study Website: <https://knowledgeproject.info/>

Email: Richard.hurst@kellogg.ox.ac.uk

Or Telephone: 07932 660120

Recruitment document

How do routines, case-based reasoning and innovating interact as general dental practitioners generate abstract and specific knowledge-in-practice?

CI

Version/Date: 02 03 2017 v1.0

IRAS Project number: 216672

Page 1 of 1

Appendix V Contents page from site document (Chapter 6)

Contents

- Flow diagram of research process
- Protocol for the study
- Statement of Activities (HRA)
- A recruitment “poster” for dentists
- A covering letter template for practices to use with patient recruitment letters
- An invitation to participate letter to patients
- An invitation to participate letter to staff
- Participation Information Sheet for dentists, staff and patients respectively
- A consent form
- The topic guide
- Dominic Hurst’s CV
- Trish Greenhalgh’s CV
- Sponsorship letter from the sponsor (University of Oxford)
- Insurance policy from sponsor
- Ethics approval document
- HRA approval document
- IRAS form

Site document contents

How do routines, case-based reasoning and innovating interact as general dental practitioners generate abstract and specific knowledge-in-practice?

Chief investigator: Dr Richard Dominic Hurst

Version/Date: 05 05 2017 v1.0

IRAS Project number: 216672

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Appendix W Participant information sheet for GDPs (Chapter 6)



Chief Investigator: Dr Richard Dominic Hurst
 Email: richard.hurst@kellog.ox.ac.uk
 C/o Professor Trisha Greenhalgh
 Nuffield Department of Primary Care Health Sciences
 Radcliffe Observatory Quarter, Woodstock Road, Oxford. OX2 6GG.

PARTICIPANT INFORMATION SHEET: Dentists

How do routines, case-based reasoning and innovating interact as general dental practitioners generate abstract and specific knowledge-in-practice? An ethnographic and qualitative interview-based study

We'd like to invite you to take part in our research study. Before you decide, it is important that you understand why the research is being done and what it would involve for you. Please take time to read this information, and discuss it with others if you wish. *If there is anything that is not clear, or if you would like more information, please ask us.*

What is the purpose of the study?

The purpose of the study is to help explore how dentists in general practice build and use knowledge in the context within which they work by observing their routines and reasoning as they work.

Why have I been invited?

You have been invited as a general dental practitioner who has at least 5 years of clinical experience post-graduation.

We intend to recruit 10 dentists to our study.

Do I have to take part?

No, you do not have to take part. Taking part is entirely voluntary.

If you do consent to participate you will be able to withdraw if you later change your mind, without giving a reason.

What will happen if I decide to take part?

We will ask you to choose a clinical half-day when you have one or more patients attending for the following appointments: a new patient assessment, a re-assessment and a short treatment appointment (no more than 30 minutes). On this day we will ask you to make an hour available for an interview. If this is not convenient in the middle of the day for a morning clinical session, we can do this at the end of the day.

We will ask you to send, on our behalf, participant information sheets similar to this one for each of the patients attending one of these appointments on that day (all stationary and postage costs will be covered by us). We will also ask for your receptionist to contact the patients approximately 2 days in advance to check they received the letter and to check that they are happy to be filmed as part of the clinical encounter with you. Patients will still be able to attend and withhold consent so they need not cancel their appointment.

We would also like you to identify a private space where the patient can discuss their role in their study with the researcher and, where applicable, provide consent. In the patient's information sheet, we will

ask that they attend 15-20 minutes ahead of their appointment in order to have time to give consent and not disrupt your timekeeping. We will ask that your receptionists remind them of this when calling to confirm the appointment.

On the chosen day the researcher will arrange one or two digital video cameras in your surgery. The arrangement of these will be such as to prioritise the minimisation of inconvenience to you, your patient and staff over the best placement to capture the clinical encounter. A digital audio recorder will also be placed in the room in a position that does not interfere with your cross-infection control or other activities.

As your patients attend the researcher will explain their involvement in the study with the reference to the information sheet previously sent to them. They will be asked to consent to be video and audio-recorded during the appointment. Any staff likely to enter your clinical surgery during this time will also be asked to consent to being video and audio-recorded.

All appointments for which patients, staff and yourself have consented to will be recorded using a digital audio recorder and one or two video cameras (depending on space). At the end of the clinical session we will ask you to rest for at least 30 minutes. During this time the researcher will identify three appointments.

After the rest the researcher will show you the three videos one-by-one as part of an interview exploring how you have built your knowledge-in-practice and how it develops as you work. The videos will serve as stimuli for the interview and they will also be watched at a later time by the researcher to look at the ways in which you, your patient and other staff interact. Nobody apart from yourself and the researcher will look at the video. Once notes have been made from the video it will be deleted.

The interview will be recorded on the digital recorder for transcription and analysis at a later time. During transcription of the interview and clinical encounters you will be given a pseudonym and any identifiable information about your practice, other staff or your patients will be removed. The conversations between you, the patient and other staff will then be analysed.

The reason for audio recording the clinical encounter is so that it can be transcribed by an external organisation who do not need to see the encounter.

Are there any possible disadvantages or risks from taking part?

We will attempt to minimise the intrusion on your practice but it is possible that by seeking consent from patients we delay appointments and a possibility that patients may cancel appointments if they feel they will be obliged to take part in the research, though we make very clear in the patient information sheet that their involvement is entirely voluntary.

What are the possible benefits of taking part?

There will not be any immediate benefits to you.

We anticipate this research helping to benefit patients and dental practices by understanding better how dentists modify their practice.

Will my taking part in the study be kept confidential?

The data recorded on the video and audio recorders will be transferred to a secure university computer. The video recording will be deleted as soon as the researcher has analysed the appointment. The audio recordings will be deleted once they have been transcribed and the transcriptions checked against the recordings for accuracy. Any identifiable information will be removed from the transcription.

Responsible members of the University of Oxford may be given access to data for monitoring and/or audit of the study to ensure that the research is complying with applicable regulations.

Will I be reimbursed for taking part?

There is no reimbursement for taking part in this study.

What will happen to my data?

We will store anonymous transcripts and notes made from the video of the appointment for 20 years.

We may analyse the transcripts in future as part of a different study and share the anonymous data with EU-based academic colleagues working on similar research topics in future.

What will happen if I don't want to carry on with the study?

We will confirm after each appointment that you are happy to include it in the interview and later analysis. You are at liberty to withdraw consent for data from the whole study or any of the individual appointments to be used at any stage.

If you withdraw consent for one or more appointments to be used, we will delete all data associated with it or them.

What will happen to the results of this study?

Dentist, staff and patient participants will not be identified from any report or publication placed in the public domain.

This research is being conducted as part of a DPhil in Evidence-Based Healthcare at the University of Oxford and the results will be published in a doctoral thesis that will be held in an open access database by the university.

We will also seek to publish the results in one or more academic journals.

We will provide you with a copy of any publications arising from the study.

In order to further disseminate the results, we will seek to present the findings at relevant academic and practitioner conferences.

What if there is a problem?

The University of Oxford, as Sponsor, has appropriate insurance in place in the unlikely event that you suffer any harm as a direct consequence of your participation in this study.

If you wish to complain about any aspect of the way in which you have been approached or treated during the course of this study, you should contact Professor Trisha Greenhalgh ((0)1865 617816, email: trish.greenhalgh@phc.ox.ac.uk) or you may contact the University of Oxford Clinical Trials and Research Governance (CTRG) office on 01865 572224, or the head of CTRG, email ctrg@admin.ox.ac.uk.

How have patients and the public been involved in this study?

Potential participants (both patients and dentists) were involved in reviewing the Participant Information Sheet and on reviewing our video and audio-recording methods.

The links below give general information about taking part in research if you are interested in exploring this further.

www.crn.nihr.ac.uk/can-help/patients-carers-public/how-to-take-part-in-a-study/

www.nhs.uk/Conditions/Clinical-trials/Pages/Introduction.aspx

Who is organising and funding the study?

The study has been organised by Dr Richard Dominic Hurst as part of a self-funded DPhil research degree at the University of Oxford.

No external funding has been received for this study.

Who has reviewed the study?

All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect participants' interests. This study has been reviewed and given favourable opinion by _____ Research Ethics Committee.

Further information and contact details:

Please contact Dr Richard Dominic Hurst by email richard.hurst@kellog.ox.ac.uk or by telephone on 020 7882 2500.

Thank you for considering taking part.

Appendix X Participant information sheet for staff (Chapter 6)



Chief Investigator: Dr Richard Dominic Hurst
 Email: Richard.hurst@kellogg.ox.ac.uk
 C/o Professor Trisha Greenhalgh
 Nuffield Department of Primary Care Health Sciences
 Radcliffe Observatory Quarter, Woodstock Road, Oxford. OX2 6GG.

PARTICIPANT INFORMATION SHEET: Staff

How do routines, case-based reasoning and innovating interact as general dental practitioners generate abstract and specific knowledge-in-practice? An ethnographic and qualitative interview-based study

We'd like to invite you to take part in our research study. Before you decide, it is important that you understand why the research is being done and what it would involve for you. Please take time to read this information, and discuss it with others if you wish. *If there is anything that is not clear, or if you would like more information, please ask us.*

What is the purpose of the study?

The purpose of the study is to help explore how dentists in general practice build and use knowledge in the context within which they work by observing their routines and reasoning as they work.

Why have I been invited?

You have been invited as a staff member likely to enter the surgery of a dentist in your practice who has agreed to take part in this study.

Do I have to take part?

No, you do not have to take part. Taking part is entirely voluntary.

If you do consent to participate you will be able to withdraw if you later change your mind, without giving a reason.

What will happen if I decide to take part?

One or more of the dentists you work with will choose a clinical half-day when they have one or more patients attending for the following appointments: a new patient assessment, a re-assessment and a short treatment appointment (no more than 30 minutes). On this day they will be asked to make space in their diary for a rest before then making an hour available for an interview.

We will ask them to send, on our behalf, participant information sheets similar to this one for each of the patients attending one of these appointments on that day. The receptionist will be asked to confirm with the selected patients that they have received the information sheet and check they are happy to attend. They will not have to participate if they choose to attend as they will still need to give their consent to be recorded. Patients will be asked to attend 15-20 minutes before their appointment to give time to ask questions and give consent.

On the chosen day the researcher will arrange one or two digital video cameras in the dentist's surgery. The arrangement of these will be such as to prioritise the minimisation of inconvenience to you, the patient and the dentist over the best placement to capture the clinical encounter. A digital audio recorder

Staff Participants Information Sheet

Version/Date: 02 03 2017 v1.0

How do routines, case-based reasoning and innovating interact as general dental practitioners generate abstract and specific knowledge-in-practice?
 IRAS Project number: 216672

Chief investigator: Dr Richard Dominic Hurst

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will also be placed in the room in a position that does not interfere with your cross-infection control or other activities.

As patients attend the researcher will explain their involvement in the study with reference to the information sheet previously sent to them. They will be asked to consent to be video and audio-recorded during the appointment. Any staff (including yourself) likely to enter your clinical surgery during this time will also be video and audio-recorded.

All appointments for which patients, staff and the dentists have consented to will be recorded using a digital audio recorder and one or two video cameras (depending on space).

The video will serve as a stimulus for an interview we conduct with the dentist and will also be watched at a later time by the researcher to look at the ways in which you, the patient and the dentist interact. Nobody apart from the dentist and the researcher will look at the video. Once notes have been made from the video it will be deleted.

The audio recording will be transcribed and any identifiable information about you, the dentist or patient will be removed. The conversations between you, the dentist and patients will then be analysed.

It is necessary to audio record the appointment so that when we send this to a confidential transcription service there is no video.

Are there any possible disadvantages or risks from taking part?

We will attempt to minimise the intrusion on your practice but it is possible that by seeking consent from patients we delay appointments and a possibility that patients may cancel appointments if they feel they will be obliged to take part in the research, though we make very clear in the patient information sheet that their involvement is entirely voluntary.

What are the possible benefits of taking part?

There will not be any immediate benefits to you.

We anticipate this research helping to benefit patients and dental practices by understanding better how dentists modify their practice.

Will my taking part in the study be kept confidential?

The data recorded on the video and audio recorders will be transferred to a secure university computer. The video recording will be deleted as soon as the researcher has analysed the appointment. The audio recordings will be deleted once they have been transcribed and the transcriptions checked against the recordings for accuracy. Any identifiable information will be removed from the transcription.

Responsible members of the University of Oxford may be given access to data for monitoring and/or audit of the study to ensure that the research is complying with applicable regulations.

Will I be reimbursed for taking part?

There is no reimbursement for taking part in this study.

What will happen to my data?

We will store anonymous transcripts and notes made from the video of the appointment for 20 years.

We may analyse the transcripts in future as part of a different study and share the anonymous data with EU-based academic colleagues working on similar research topics in future.

What will happen if I don't want to carry on with the study?

We will confirm after each appointment that you are happy to include it in the interview and later analysis. You are at liberty to withdraw consent for data from the whole study or any of the individual appointments to be used at any stage independently of the dentist and patient consenting.

If you withdraw consent for one or more appointments to be used, we will delete all data associated with it or them.

What will happen to the results of this study?

Dentists, staff and patient participants will not be identified from any report or publication placed in the public domain.

This research is being conducted as part of a DPhil in Evidence-Based Healthcare at the University of Oxford and the results will be published in a doctoral thesis that will be held in an open access database by the university.

We will also seek to publish the results in one or more academic journals.

We will provide the dentist with a copy of any publications arising from the study.

In order to further disseminate the results, we will seek to present the findings at relevant academic and practitioner conferences.

What if there is a problem?

The University of Oxford, as Sponsor, has appropriate insurance in place in the unlikely event that you suffer any harm as a direct consequence of your participation in this study.

If you wish to complain about any aspect of the way in which you have been approached or treated during the course of this study, you should contact Professor Trisha Greenhalgh ((0)1865 617816, email: trish.greenhalgh@phc.ox.ac.uk) or you may contact the University of Oxford Clinical Trials and Research Governance (CTRG) office on 01865 572224, or the head of CTRG, email ctrg@admin.ox.ac.uk.

How have patients and the public been involved in this study?

Potential participants (both patients and dentists) were involved in reviewing the Participant Information Sheet and on reviewing our video and audio-recording methods.

The links below give general information about taking part in research if you are interested in exploring this further.

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www.nhs.uk/Conditions/Clinical-trials/Pages/Introduction.aspx

Who is organising and funding the study?

The study has been organised by Dr Richard Dominic Hurst as part of a self-funded DPhil research degree at the University of Oxford.

No external funding has been received for this study.

Who has reviewed the study?

All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect participants' interests. This study has been reviewed and given favourable opinion by _____ Research Ethics Committee.

Further information and contact details:

Please contact Dr Richard Dominic Hurst by email Richard.hurst@kellogg.ox.ac.uk or by telephone on 020 7882 2500.

Thank you for considering taking part.

Appendix Y Participant information sheet for patients (Chapter 6)



Chief Investigator: Dr Richard Dominic Hurst
 Email: Richard.hurst@kellogg.ox.ac.uk
 C/O Professor Trisha Greenhalgh
 Nuffield Department of Primary Care Health Sciences
 Radcliffe Observatory Quarter, Woodstock Road, Oxford. OX2 6GG.

PARTICIPANT INFORMATION SHEET: Patients

How do routines, case-based reasoning and innovating interact as general dental practitioners generate abstract and specific knowledge-in-practice? An ethnographic and qualitative interview-based study

We'd like to invite you to take part in our research study. Before you decide to take part it is important that you understand why the research is being done and what it would involve for you. Please take time to read this information, and discuss it with others if you wish. *If there is anything that is not clear, or if you would like more information, please ask us.*

What is the purpose of the study?

The purpose of the study is to help explore how dentists in general practice build and use knowledge in the context within which they work by observing their routines and reasoning as they work.

Why have I been invited?

You have been invited as a patient who is being seen by a general dental practitioner and attending an appointment with them for either a new patient assessment, a re-assessment or a short treatment appointment.

We intend to recruit 8-10 dentists to our study and, for each, up to 6 patients attending for these types of appointments.

Do I have to take part?

No, you do not have to take part. Taking part is entirely voluntary.

If you do consent to participate, you will be able to withdraw if you later change your mind, without giving a reason.

Withdrawal will not affect your clinical care.

What will happen if I decide to take part?

We will ask you to arrive 15-20 minutes before your appointment to allow you time to ask any questions and, if you agree to participate, to obtain your consent.

Your appointment will proceed as normal and there will be no interference in your clinical care at all. The appointment will be recorded on a digital video camera and on a digital audio recorder.

The video will be viewed by the dentist you are seeing with a researcher and nobody else. The video will be used to help prompt the dentist as they are interviewed about their routine and their reasoning.

The video will also be watched separately by the researcher to see how the dentist, you and other staff interact during the appointment. After this the video recording will be deleted.

The audio recording will be transcribed and any identifiable information about you, the dentist or other staff will be removed. The conversations between you, the dentist and other staff will then be analysed. It is necessary to audio record the appointment so that when we send this to a confidential transcription service there is no video.

Are there any possible disadvantages or risks from taking part?

We do not anticipate there being any disadvantages to you.

What are the possible benefits of taking part?

There will not be any immediate benefits to you.

We anticipate this research helping to benefit patients generally by understanding better how dentists modify their practice.

Will my taking part in the study be kept confidential?

The data recorded on the video and audio recorders will be transferred to a secure university computer. The video recording will be deleted as soon as the researcher has analysed the appointment. The audio recording will be deleted once it has been transcribed and the transcription checked against the recording for accuracy. Any identifiable information will be removed from the transcription.

Responsible members of the University of Oxford may be given access to data for monitoring and/or audit of the study to ensure that the research is complying with applicable regulations.

Will I be reimbursed for taking part?

There is no reimbursement for taking part in this study.

What will happen to my data?

We will store anonymous transcripts and notes made from the video of the appointment for 20 years.

We may analyse the transcripts in future as part of a different study and share the anonymous data with UK and/or other EU-based academic colleagues working on similar research topics in future.

What will happen if I don't want to carry on with the study?

We will confirm after the appointment has finished that you are still happy for your data to be used. You may withdraw your consent later, even if you agree at this stage.

Withdrawal will not affect the care you receive from your dentist or any NHS service.

If you withdraw consent, we will delete all data associated with your appointment.

What will happen to the results of this study?

Participants will not be identified from any report or publication placed in the public domain.

This research is being conducted as part of a DPhil in Evidence-Based Healthcare at the University of Oxford and the results will be published in a doctoral thesis.

We will also seek to publish the results in one or more academic journals.

We will provide your dentist with a copy of any publications arising from the study. You are free to contact the chief investigator (Richard Dominic Hurst) by email should you wish to receive a copy of the publications. Email r.d.hurst@qmul.ac.uk

In order to further disseminate the results, we will seek to present the findings at relevant academic and practitioner conferences.

What if there is a problem?

The University of Oxford, as Sponsor, has appropriate insurance in place in the unlikely event that you suffer any harm as a direct consequence of your participation in this study.

If you wish to complain about any aspect of the way in which you have been approached or treated during the course of this study, you should contact Professor Trisha Greenhalgh ((0)1865 617816, email:

trish.greenhalgh@phc.ox.ac.uk) or you may contact the University of Oxford Clinical Trials and Research Governance (CTRG) office on 01865 572224, or the head of CTRG, email ctrg@admin.ox.ac.uk.

How have patients and the public been involved in this study?

Potential participants were involved in reviewing the Participant Information Sheet and on reviewing our video and audio-recording methods.

The links below give general information about taking part in research if you are interested in exploring this further.

www.crn.nihr.ac.uk/can-help/patients-carers-public/how-to-take-part-in-a-study/

www.nhs.uk/Conditions/Clinical-trials/Pages/Introduction.aspx

Who is organising and funding the study?

The study has been organised by Dr Richard Dominic Hurst as part of a self-funded DPhil research degree at the University of Oxford.

No external funding has been received for this study.

Your dentist and their staff are not being paid to take part in this study and have also consented as participants.

Who has reviewed the study?

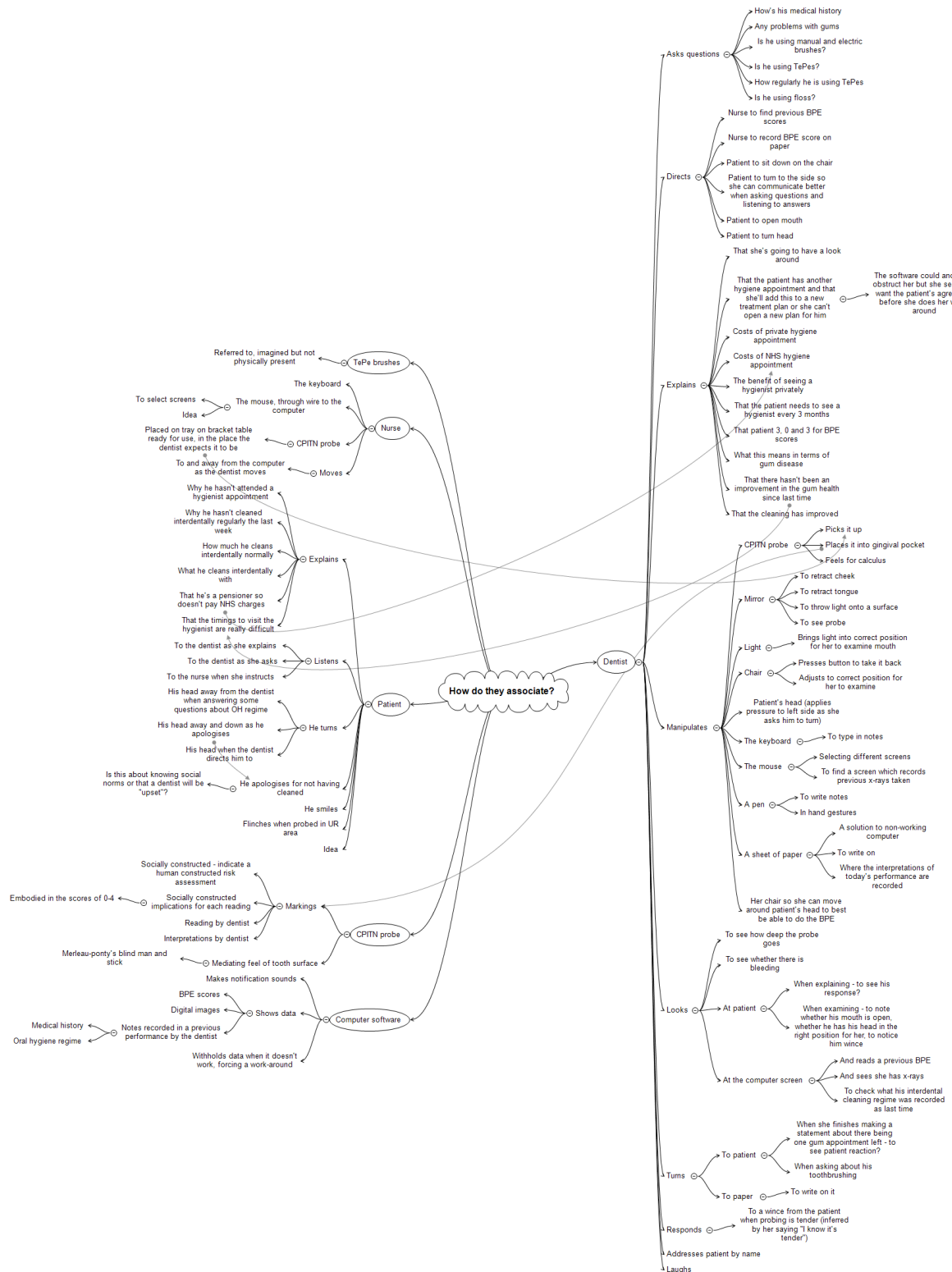
All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect participants' interests. This study has been reviewed and given favourable opinion by _____ Research Ethics Committee.

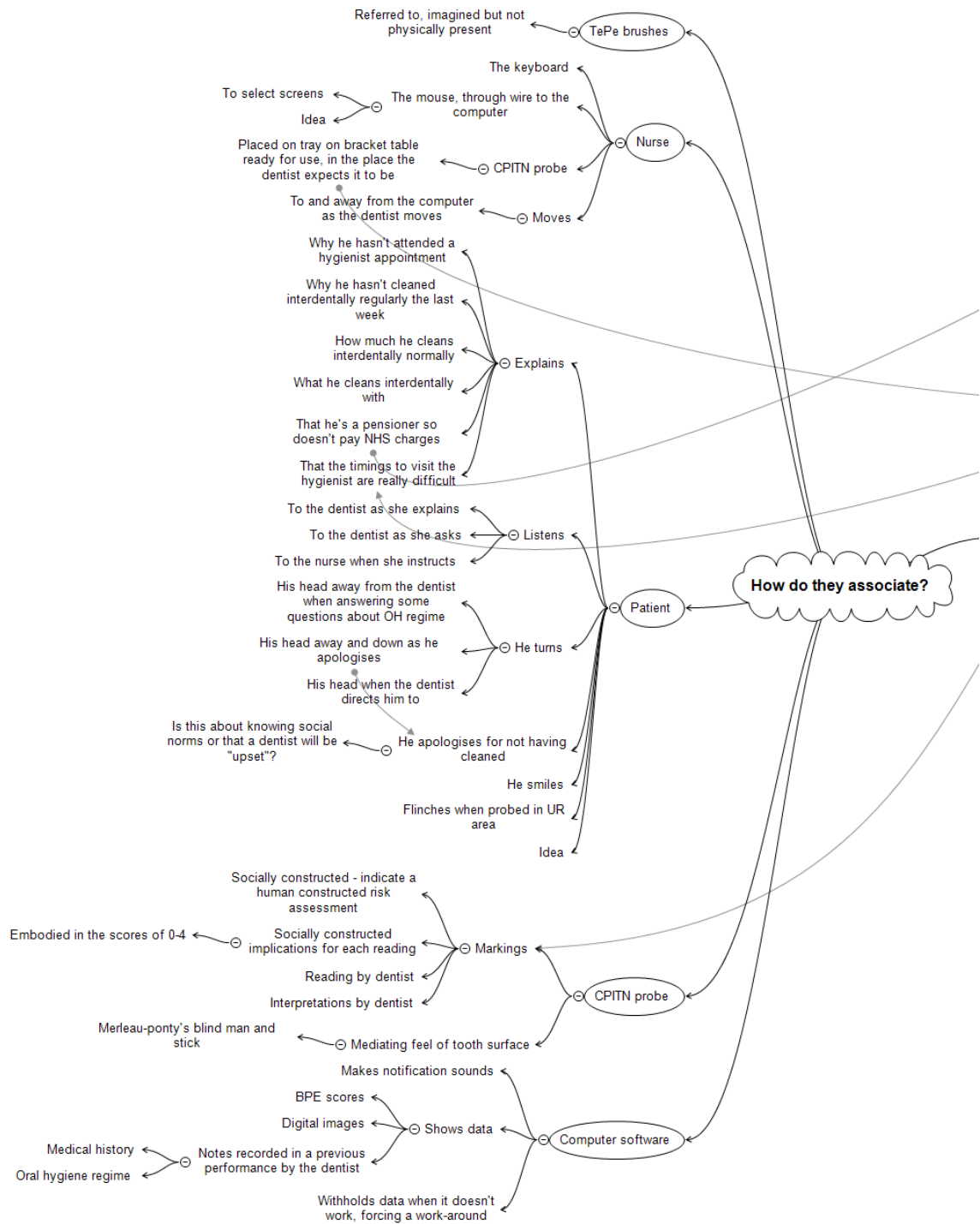
Further information and contact details:

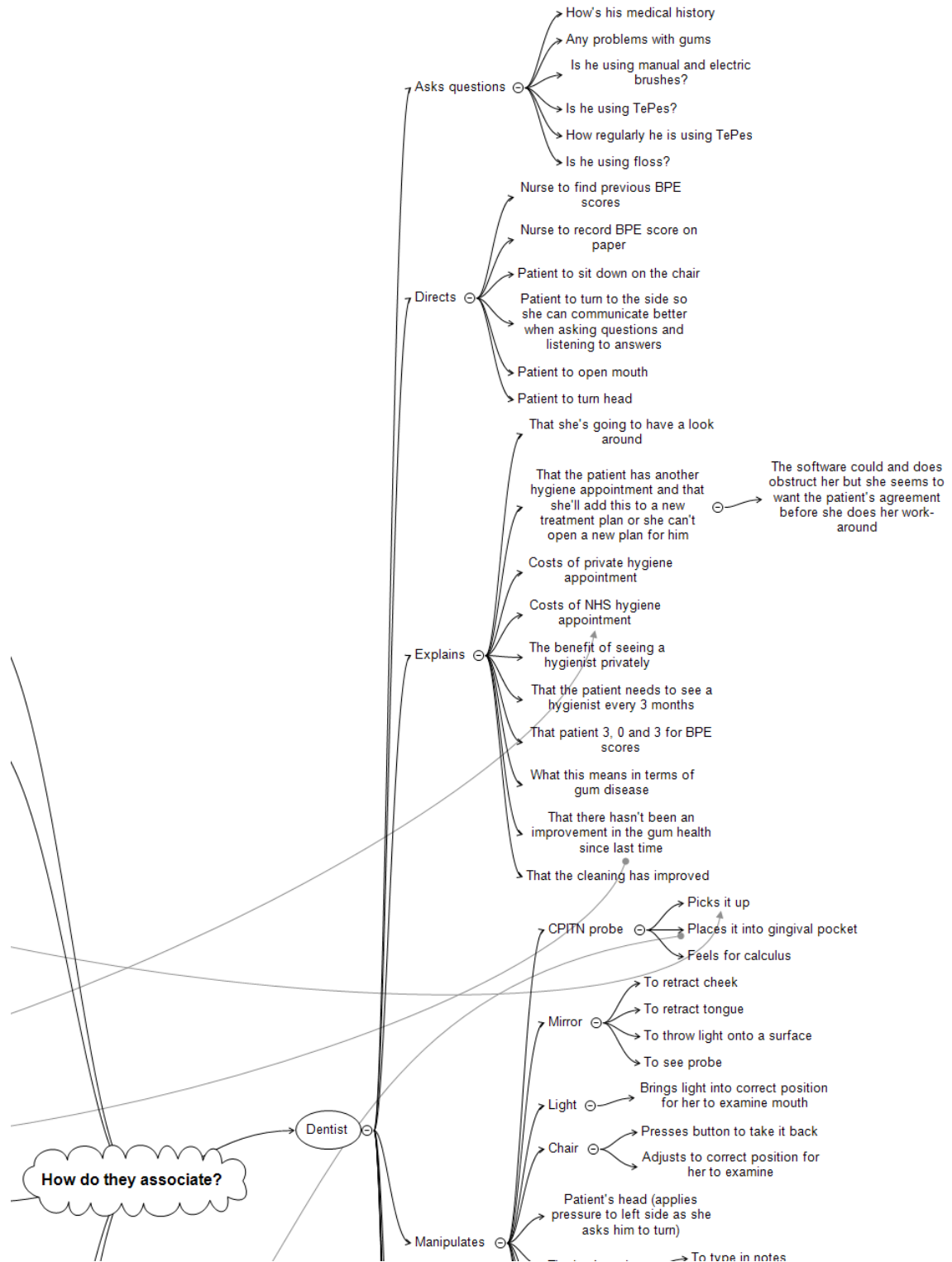
Please contact Dr Richard Dominic Hurst by email Richard.hurst@kellogg.ox.ac.uk or by telephone on 020 7882 2500.

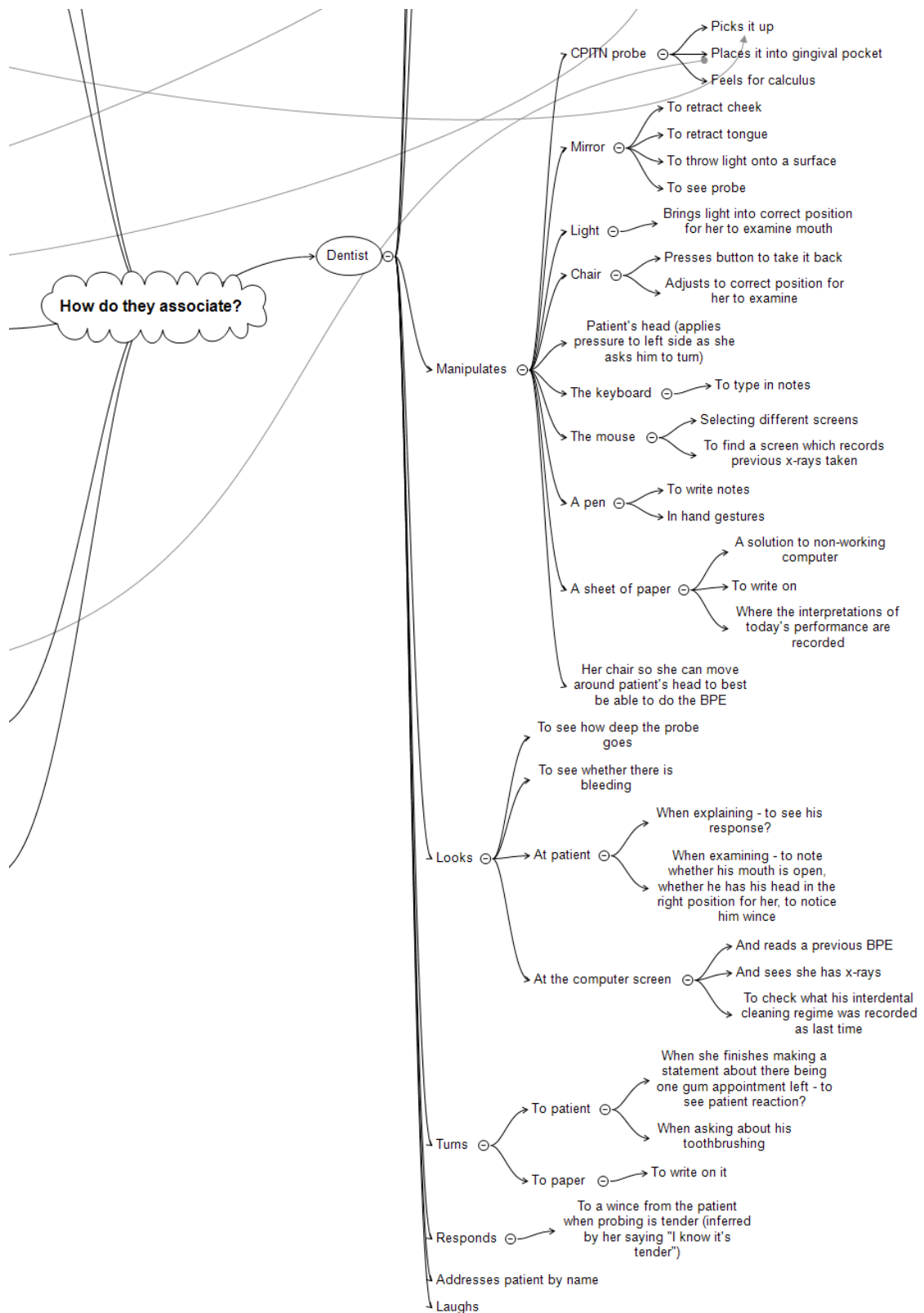
Thank you for considering taking part.

Appendix Z Mind map of periodontal healthing conjuncture (Chapter 6)

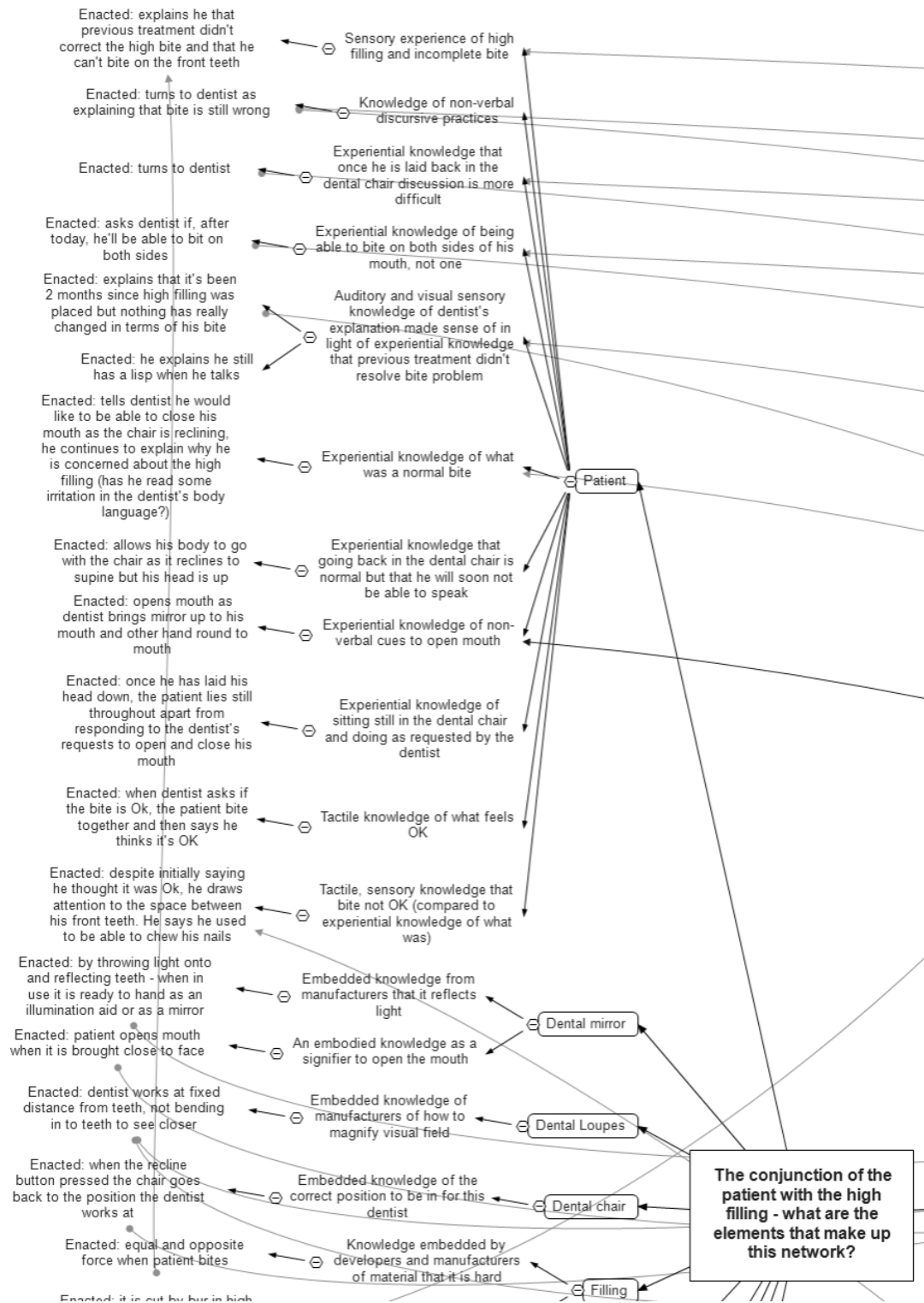


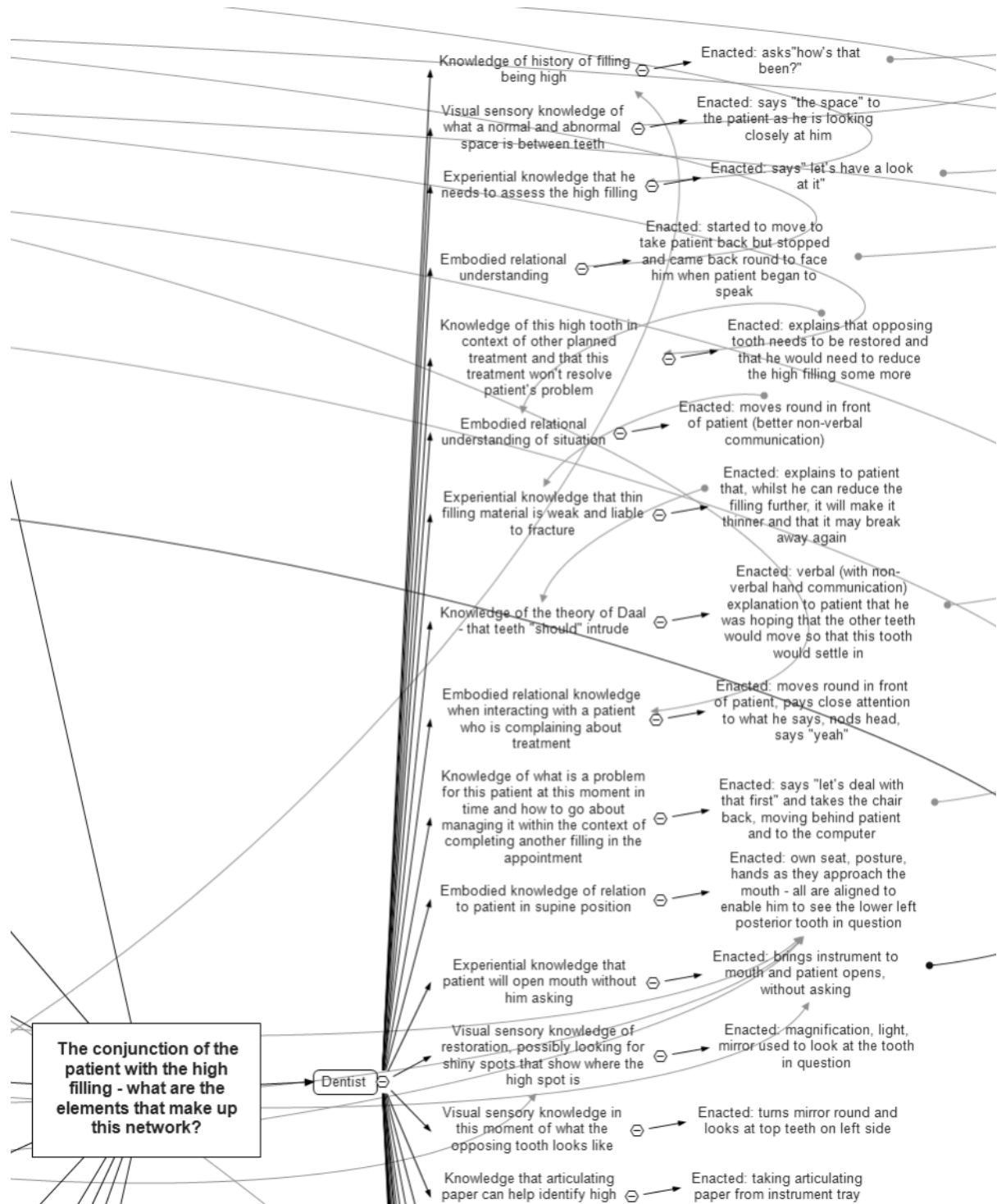


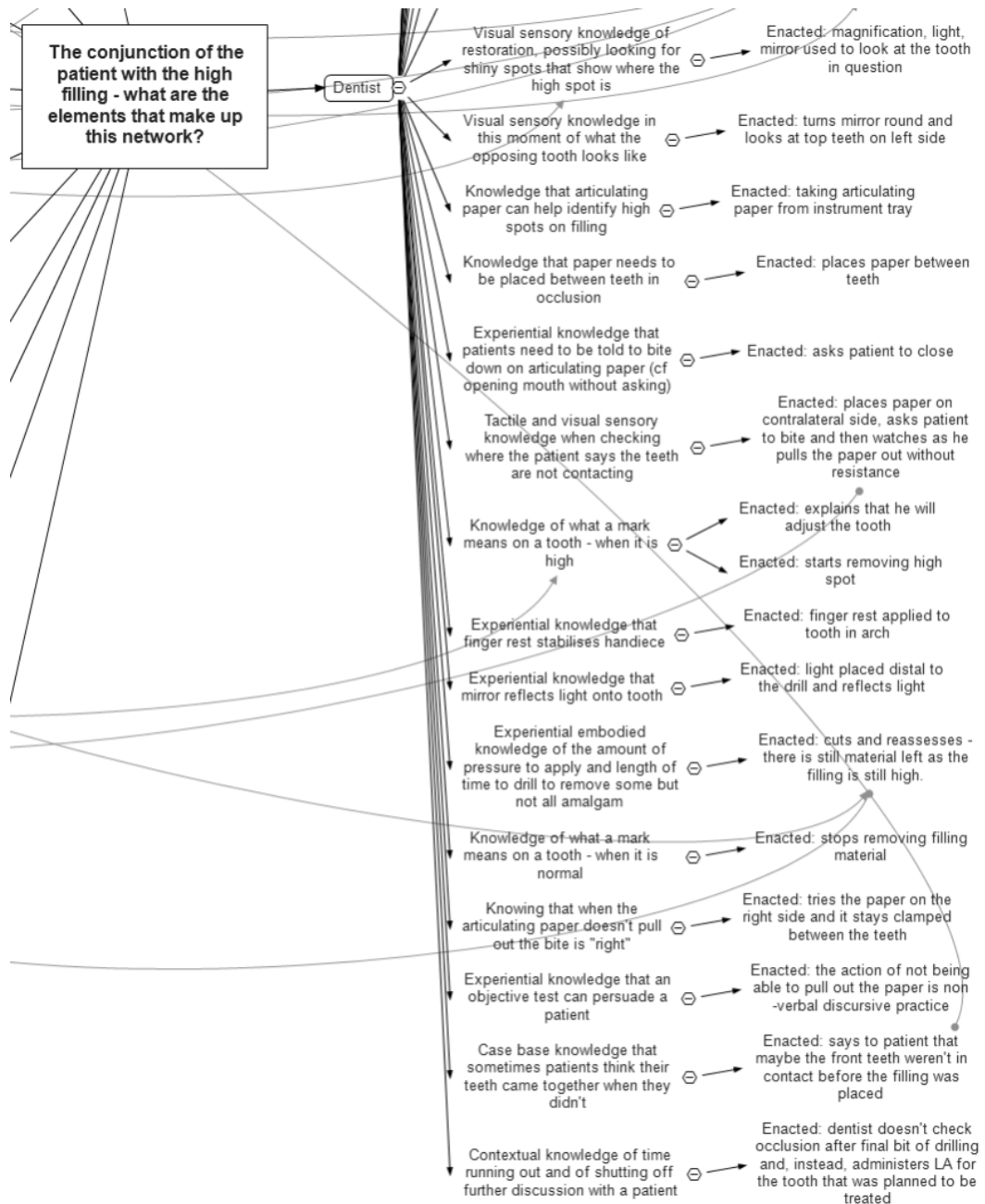


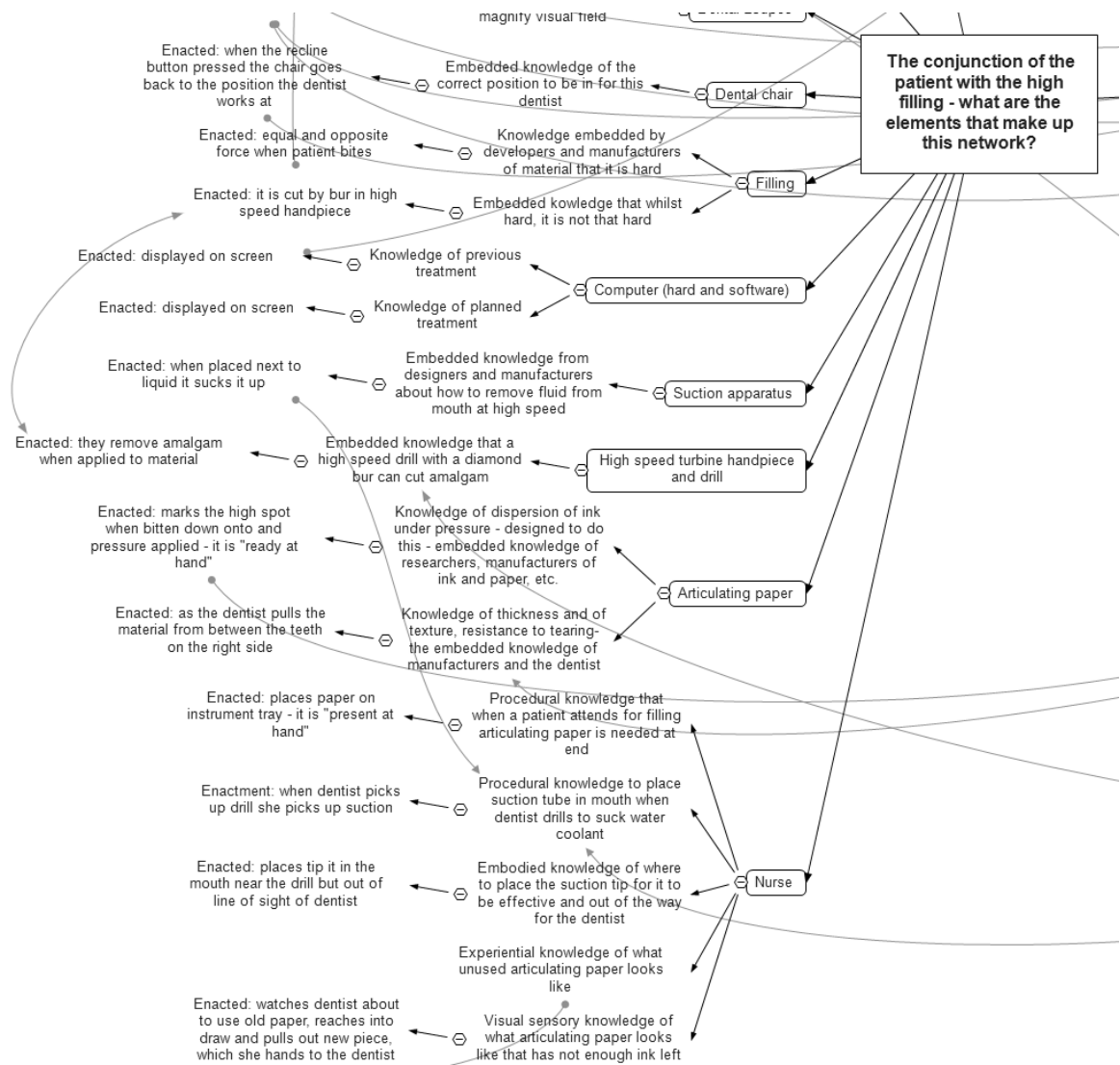












Appendix BB Example of a note made during analysis in Evernote (Chapter 6)

Bruni paper

Notebook: Routine study
Created: 30/09/2017 12:38 **Updated:** 30/09/2017 16:33
Author: Dominic Hurst

Attila Bruni , Silvia Gherardi & Laura Lucia Parolin (2007) Knowing in a System of Fragmented Knowledge, Mind, Culture, and Activity, 14:1-2, 83-102, DOI: 10.1080/10749030701307754
 To link to this article: <http://dx.doi.org/10.1080/10749030701307754>

"The metaphor of knowing as enactment conveys the idea of a network that is socially woven around a domain of knowledge. This metaphor is grounded in an actor-network sensibility and in concepts such as "knowing-as-displacing" (Law, 2000), or learning in the face of mystery (Gherardi, 1999). At its heart lies the idea of **enactment as "an occasion in a location, a set of actions with a series of effects"** (Law, 2000, p. 349). **The knowledge, the subjects, and the objects of knowledge may be understood as mutually produced within a situated practice.**"

"When we conceive knowledge as substance, we see it as materialized in objects; when we conceive it as a property, we see it as owned by individuals. When we look at **knowing-in-practice, we define it as the mobilization of the knowledge embedded in humans and nonhumans performing workplace practices.**"

something I've been thinking about the last couple of days is by over focus on knowing in practice. I think I need to be clearer that I am still interested in the generation of so-called knowledge products such as guidelines et cetera for research and recognise that there is other knowledge that people acquire and is embedded in their bodies. This quote helps to relate the abstract bit to the performative and is therefore quite helpful. In relation to evidence-based medicine or dentistry this focus on practice is about understanding better performances or practice to enable appropriate research to be used alongside other knowledges.

In my videos I don't think it is possible to say what other knowledges are used. I think I have addressed this to some extent in the knowledge encounters study. In terms of looking at this practice as a performance involving the mobilisation of knowledge embedded in humans and non-humans this would be a novel in relation to dentistry. I am slightly frustrated with the theoretical stuff that I am reading, which does not

suggest practical applications to help understand how to improve practice. So perhaps I should be asking how can socio-material perspectives help to improve general dental practice?

How do these socio-material theories help us generate new understandings of what is actually going on in practice and how practice might change so that patient care improves?

One of the things I take away from ANT is the way in which different actors within the network influences each other's activities. also, in one of the chapters in the socio-materiality and learning book stresses that the blue form enacts the doctor. If we adopt this idea that other people and objects in a dentists network in essence determine what the dentist does, I might begin by looking at how this could be working in the videos I am watching. Subsequently one might make proposals about somehow changing the network by manipulating objects or relations in some manner.

Let's take the BPE. What are the actors in this network?

- the patient
- the dentist
- the nurse
- the computer software
- the CPITN probe
- the light
- the dental chair
- the dentist's loupes
- the on scene profession in the form of norms, prior education et cetera

The way in which different actors influence each other is about power. How, in these videos, is power expressed? I don't think I can say why certain interactions because behaviours that are different in different actors. All I can say is that there is variation in the way in which the computer software, for example, influences the activity of young and old dentists.

What embedded knowledge is being mobilised in these videos?

«One of the most important directions taken by practice-based approach to research is the study of the practical organization of knowledge in the form of methods of reasoning and action in the association of human and nonhuman elements (Bruni, 2005b). In the following section we assume an *equivalence* relation between knowing and practicing, in the sense that

practicing is knowing-in-practice, whether the subject is aware of it or not. Acting as a competent practitioner is synonymous with knowing how to connect successfully with the field of practices thus activated."

"A remote consultation may be defined as the outcome of a collaborative practice that aligns all the relevant knowledge embedded in the SFK designed to carry it out. **Knowledge is fragmented and resides in bodies, machines, images, evaluations, routines, laboratory techniques, and it is enacted by material-discursive practices. Mapping the elements considered to embody relevant knowledge and the relationships among them is the first step in determining who and what is involved in a "successful" remote consultation** (as judged by the practitioners). The course of action will activate some elements and not others: some will be significant by their presence, others by their absence. The concept of SFK is a heuristic framework, useful for mapping in terms of knowledge repositories, the interdependent elements that, on the one hand, constitute the setting for the remote consultation, and on the other, provide the resources for performance of the practice."

in the videos knowledge resides in radiographs and other images but, as in readiness to hand, they were only activated (the term used above) on some occasions. The CP ITN probe also has knowledge residing in it if we think of how the bands on the probe were created and the codes that the bands help to indicate. Activation seems to be a result of the material enactment of using them. Is that correct? Using the terminology above, the material objects are resources for the performance of the practice, which the authors equate with knowing. Thus, by this logic, if because they are absent the practice cannot occur then neither can knowing. In this way they are integral to knowing in practice.

I am beginning to like this idea of mapping the elements considered to embody relevant knowledge and the relationships among them. If, for example, I look at knowledge residing in the body of a dentist and software of computer I could examine in detail the relationship between these and how that relationship affects the knowledge residing in the

body of the patient. So, for example, when XX is turned towards the computer taking a pain history, his relationship with the computer as absorbing as it is, means that he does not pick up on visual clues which display the knowledge the patient is attempting to articulate. The patient's knowledge is of their symptoms. A successful conclusion to the appointment requires that this knowledge be shared and adequately understood. Another occasion when XX for some reason does not pick up on knowledge being given by the patient is the elderly lady with the ill fitting denture. So each body or object has latent knowledge within them and I suppose it is the responsibility of the clinician to elucidate and interpret these and to articulate their understandings or their knowledge in relationship with patients so that the patient can in turn interpret and understand before making a decision. Not all knowledge can be enacted through the material discursive practices within an appointment. Why is this? The practices may not be effective at enabling enactment or, perhaps, there is too much knowledge to be enacted in a 15 or 30 minute appointment.

A competent clinician, perhaps, is one who can optimise those material discursive practices in the time and in the context available to them. What can I see in the videos that seem to be good or effective practices in this regard? And what seems to get in the way? Even in the Practice Y ZZ is pulled away from listening to the patient as he tries to dictate to the nurse. On the other hand, when dentists do not turn their attention to writing notes or dictating notes they appear to be able to listen better. This requirement for making thorough notes or at least the perception that that is what they need to do seems to hamper the dentists ability to practice good history taking. This is a complex situation that involves understandings of professional norms and risks, the notes as artefacts themselves, the articulation of problems by patients and their complexity, and the dentists judgement of what they need to write. The notes do, though, also serve as a knowledge repository for when the dentists see the patient again. I can see frequently that the dentists refer back to the notes either themselves looking or, in the case of Practice Y, the nurse reading from the screen for the dentist. Again the knowledge is latent and becomes enacted as a part of the practice, whatever this is.

It seems to me that ANT doesn't address context particularly well. I can look at the social and material objects and their relations within a practice but can I also describe something of the situated nature within which

these networks are taking place? Clearly each situation is different even when it is taking place in the same setting. But are there themes I can determine regarding context or situatedness? if one considers context to be personal then maybe this isn't possible to describe from the videos. Is the fact that a dentist does a BPE differently on two different occasions a consequence of context or of the relation they have with material and social objects at a particular moment? Is shortness of time a relationship with context or the material discursive practices with the patient? That is, the length of time of the appointment would be adequate if the problem at hand were not so complex, for example. By taking a socio-material perspective does one do away with a separate context? Is context another way of describing the socio-material interactions an individual has?

«In the case examined, for example, the cardiologist had to compile a patient file card

as an instrument of organizational accountability that defined the sequence and content of the questions the cardiologist usually addressed to the general practitioner. The telephone interactions between the cardiologist and the GP exhibited a very similar structure, at least in the preliminary exchanges, to that of the patient card. **This set of preestablished questions not only shaped the interaction between cardiologist and GP, but also reflected the forms of knowledge deemed relevant in the situation.**»

I have already noted that the presence of protocols on computers seems to shape the interactions of GPs with their patients. this is not just the sequence of actions they take e.g. checking the social history, medical history then doing an examination. It also affects where the dentist sits in relation to the patient. As a socially constructed tool the note keeping elements of the computer also draws the dentist away from the patient even as they take a history and could be learning so much from watching the patient. We are taught to listen to the patient but if one also has to make contemporaneous notes because that is what is considered or interpreted to be professional, then we no longer listen to the patient in the same way we might have done. The Practice Y arranged their socio-material network to overcome this to some degree. That is the nurses were all trained to write notes as the dentist was talking to the patients. In this way the dentists were able to sit in front of the patient as they asked questions rather than with their back to the patient as they wrote

notes. This is actually a very helpful example of the different socio-material networks. Perhaps this is the way to explore my data.

in Practice X one dentist did have a socio-material network that meant he could sit in front of the patient and speak to them while the nurse rates some notes or clipped boxes on the computer screen.

Can I think of other examples? One is the use and non-use of safety glasses on patients. The socio-material arrangement or network in Practice X meant that the nurses always applied a bib and safety glasses to patients as they went back or just before they went back in the chair. This was notably absent in the Practice Y.

Appendix CC Still images from one conjuncture with transcription (Chapter 6)

Time **Still**

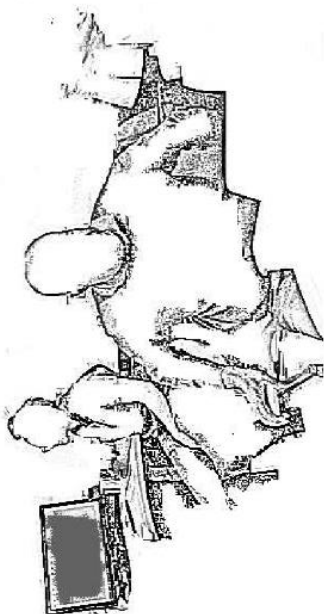
Narrative

The dentist speaks from outside the dental surgery. "OK [patient], do you want to come through?" She enters the surgery and turns to look through the door as the patient enters. She says, "just pop anything you want on the side," and the patient walks across in front of the camera to deposit his things on a chair to the right. The dentist, meanwhile, moves towards the computer. As she sits on her chair in front of the computer she says "have a seat over here" to the patient. At the same time, the nurse enters and says "hello". The dentist says, "we've got [nurse] working with us today. One of the trainee nurses." The patient has just begun to move away from where he left his things to approach the chair.

The dentist, who has moved on her chair to beside the patient's chair, says, "I think you've had a word with Dominic, haven't you?" and the patient mutters a reply confirming. The nurse has walked past with a plastic box for decontaminating instruments. The dentist continues, "I think it's [the video camera] just watching me rather than you" as she pulls the armrest away from the chair. The patient sits down on the chair whilst the dentist returns to her seat at the computer. He sits facing forwards.

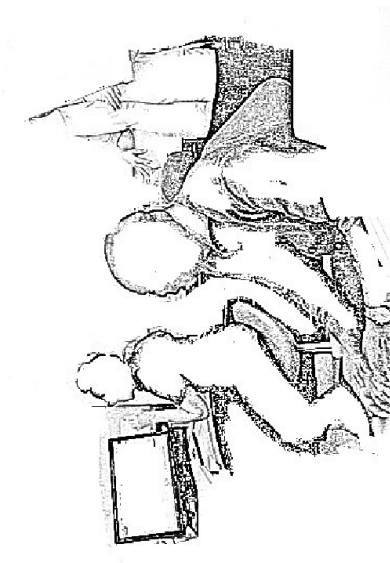


The dentist, still at her computer, says "can you just turn this way for me please [patient]?" The patient says, "sorry" and turns round so that he is sitting side-on to the chair.



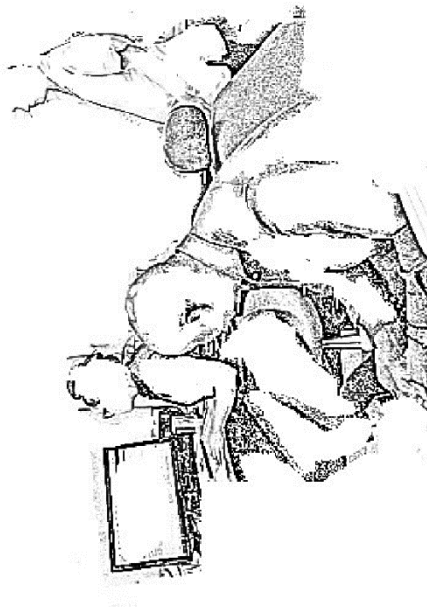
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The dentist continues, "So I've got you back for a check-up today". She is facing the computer as she says this, clicking on an element in the EDR software. The patient says "yep" as he wipes his lower face once with his left hand. She says, "OK, it's just going to be a few questions, having a look round." She pauses, still at the computer and then continues, "umm, just before I do anything, since last time you've still got one more gum," she turns now to face the patient, "appointment booked." The patient partly interrupts, saying "yeah, yeah. Just that, timing-wise," but gets cut off as he hesitates by the dentist. She says, "OK, I'm just going to add that to your next treatment otherwise I can't open up a new check up," referring to the computer software." She turns back to the computer and says, "at the moment it's not letting me send off your notes." She turns slightly to her left from the computer and picks up a piece of paper that is sitting on the work surface as she does. "So I'm just going to write down everything." The patient, who is looking at her, opens and shuts his hands, his elbows resting on his legs, in a sign of understanding. The dentist turns back to the computer and says, "then I'll add it to the system later." The computer software does allow her to check previous notes. There seems to be a problem in creating a new treatment plan.



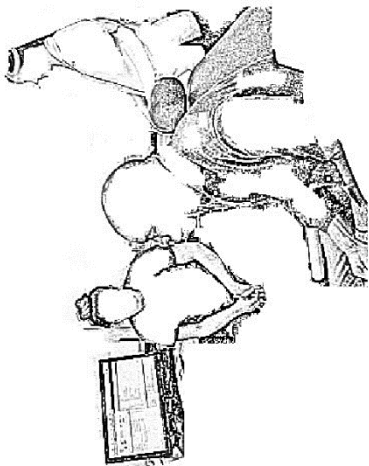
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The dentist, facing the computer on which there is a form (medical history form?), asks "So, before I do anything, any changes to your medical history, [patient name]?" and then turns partially towards the patient, right hand still on the computer mouse. The nurse is standing behind the dentist, seemingly watching the dentist or the computer. The patient rocks back a little as he says, "No, not really." He speaks unclearly but mentions the word tablets. The dentist turns back to the computer and says, "Brilliant." At this moment the nurse begins to pick up a bib that has been sitting on the work surface beside her. The dentist, meanwhile carries on, "and in terms of" turning back towards the patient, leaving the computer mouse behind, "your teeth and gums, any problems or concerns from your point."



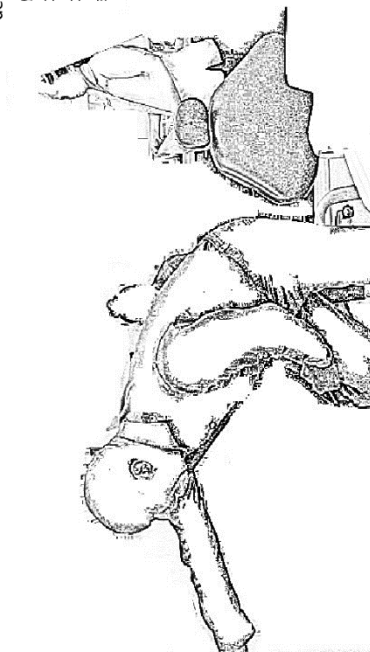
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Although the dentist is now looking directly at the patient he looks ahead as he begins to speak. "It's fine," he says, and the dentist turns to her piece of paper and writes. Then, as the patient raises his hand and points towards the wall he says, "one thing I do want to mention is Dur... this thing." The dentist looks up from the paper and the nurse turn towards him, each with quizzical looks on their faces.



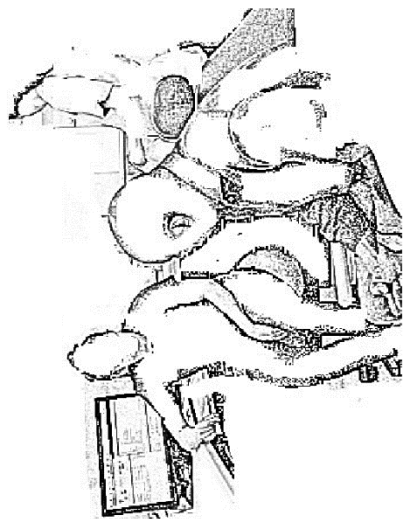
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He stands up and points at the wall where there are patient information leaflets. The dentist says, "Duraphat? Yeah" and nods, though the patient is not looking at her. He says, "yeah, uh, " as he speaks he sits back down on the chair and turns his head to see the dentist, "because I found it quite good and I thought it was....". The dentist, seeing him and with her pen in her hand, says "yeah", and he continues, "but when I went to the dentist, sorry, the chemist, she said you can only get it on prescription."



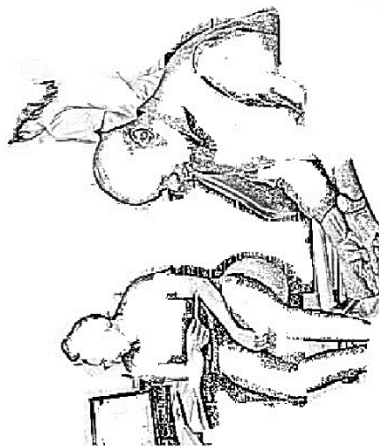
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The dentist is now leaning on the work surface with her right arm and holding a biro in her right hand. She uses it to first point in the direction of the leaflet the patient went to just before as she says, "yeah, so with Duraphat it's prescription only." The patient says, "alright". The dentist's pen adds effect to the movements she is making with her right hand. Her left arm sits passively across her left leg. The patient is looking at her as she explains, "the reason we prescribe it is because it's got a lot more fluoride in there, which helps the fight against decay but it's only effective in patients who are at high risk of decay." The patient turns his head away from her and shuffles back in the dental chair as she continues, "so what I am going to do as part of today's check up" he turns back to her, "is have a look at your teeth..." He says, "yeah". She continues, "see what your risk of decay is and then if you do need that I will happily prescribe that."



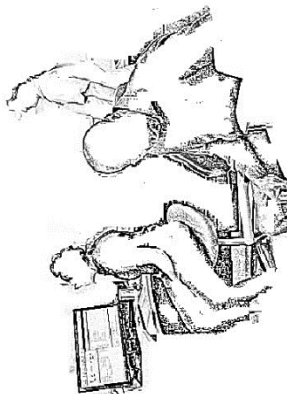
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The patient nods and turns his head down to the left. The dentist says, "Is that OK?" and turns away from him and towards her computer.



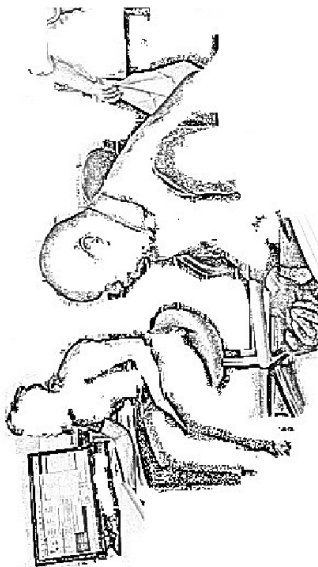
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The patient looks down to something on the chair beside him to the left (possibly some papers he brought in with him). The dentist is facing the computer, clicks on a form on the screen (which presumably is a record of the previous visit) and continues, "in terms of your brushing, umm... [patient name], last time you said its a mixture of manual," she turns, pen in hand, crosses her right leg over her left, "and electric twice a day." The patient isn't facing her, despite her looking at him. She turns to her piece of paper and says, "is it still the same?" He says "yep" as he rubs his hands together. The dentist looks at the record on the screen. "And, and" she turns her head to face the patient, whilst her right hand is poised with the pen over the paper, "are you using TePe brushes?" The patient doesn't look at her. She turns away from him again and writes on the paper. "Er, I am." He is nodding his head and continues to look down, not facing the dentist. "I've been away," he says. "Last week and I've forgotten." he looks to his left briefly, "I'm sorry".

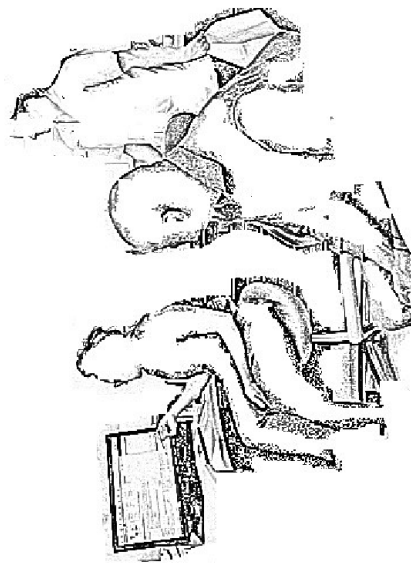


00:02:13

The nurse is still holding the patient bib. The patient has what looks like a forced smile on his face, he seems embarrassed by his response. The dentist continues, "prior to that, how often are you TePe-ing?" He says, "Er...try and do it most days but sometimes every other day." As he finishes the sentence he turns to the dentist, who has been watching him as he speaks. She asks, "would you say three to four times a week?" At this stage he turns away again, as he says, "yeah". The dentist says, "yeah?" as she nods her head and turns to write on the paper again. "And are you still using floss or," she looks at the computer and puts her right hand on the mouse, "is it just the TePes?" The patient says, "no, just the TePes". The dentist says "fine", turns back to the piece of paper and as she writes and looks again at the computer asks, "and with your diet, last time I had one sugar in your tea and coffee" and the patients speaks over her saying "yeah" as she turns towards him and continues with "three cups, three cups a day?" The dentist is flicking her biro back and for in her fingers as she asks. There is a slight pause before the patient says, "about right". The dentist says "yeah?" and he says, "maybe two". The dentist has turned back to the computer and continues to read from the record on the screen. "Fizzy drinks, two or three times a week." The patient says "yeah" and the dentist continues very quickly, "cranberry juice only with mealtimes and" the dentist turns again to the patient, "maybe two snacks a day." Again, a slight pause and then the patient nods and says, "yeah" and the dentist asks, "would you say it was still about the same?" He nods, "about the same, yeah" and she writes on the paper, nodding too. "It might be less snacks," he says. She says, looking at him, "OK, yeah".



The dentist turns quickly towards the screen and the patient, who has been looking down at the floor, follows her gaze and also looks towards the computer. The dentist says, "yeah" and as she continues turns part way towards the patient, who also turns back to looking at the floor. "So with the diet, exactly as I said last time, what I'm looking at is not the amount of sugar you're having but how often you're having sugar." As she is saying this she is looking at him but he doesn't look at her. He says, "Ok" and she continues, "the more often you have sugar the higher the chance you're going to have decay." The patient says "cay" as the dentist says decay and says, "yeah". He nods his head and looks up, though only looking forward at the wall opposite him. The dentist turns back to the computer. "So with the sugar," she turns back to the patient, who is still looking straight ahead, "I'm not concerned with how much sugar you're having in your tea or coffee, it's the number of cups you're having." The patient says, "right" but still doesn't look at the dentist. The dentist says, "now ideally, what I'd recommend is eliminating that sugar or switching to sweetener." The dentist turns to her computer with her pen as though to point at something and begins to speak but the patient interrupts, "so if I have cups of tea with no sugar that would be better?" The dentist smiles and with a sweep of her right hand says, "perfect, that would be brilliant," as the patient, at the same time says, "that would be the best solution". The patient has now made eye contact with the dentist. The patient braces a little in his chair. The dentist stands up from her chair and stretches her right hand towards the alcohol wash on the wall, which automatically dispenses alcohol liquid onto her hands, which she wipes together. "Lovely. Let's pop you back [patient name]", says the dentist, and returned to the computer as she finished her sentence. She stood looking at the screen for a second or two. The patient swings his feet up onto the chair and says something that I cannot discern. The nurse now comes into action with the dental bib. It is made up of the paper bib and a thin collar that clips onto it.

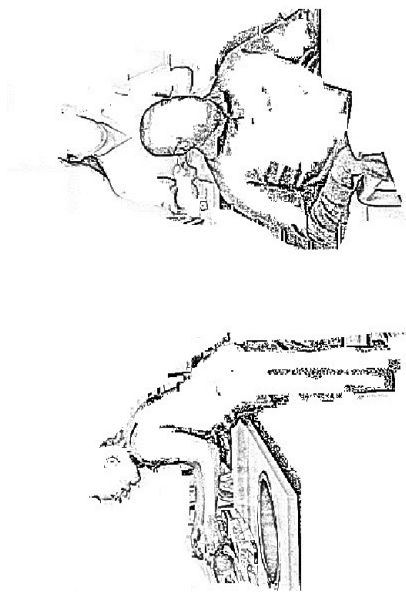


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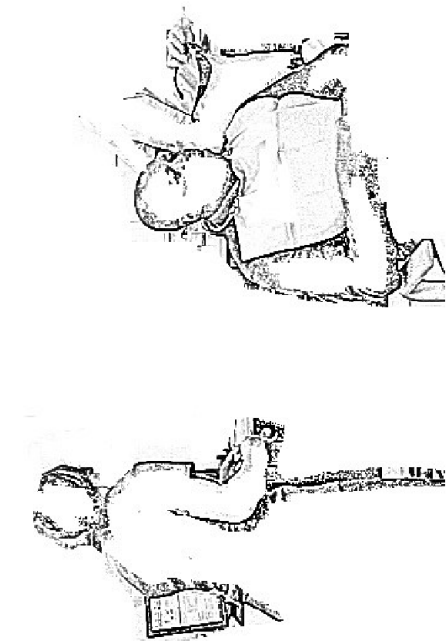
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The dentist laughs a little as she reaches for gloves from a box on the work surface. She asks, "so how have you been since last time I saw you?" The nurse now puts the bib on the patient as he responds, "yeah. OK. I mean, [something I can't hear - perhaps "we'll get onto this"], we have still got that tooth that we couldn't make up our mind whether to do anything about." The dentist has come round to the side of the patient as she puts her gloves on and says, "yeah" as she nods her head. The patient says, "I'm pretty sure it's about the same." The patient doesn't look at the dentist but as she moves away he briefly looks toward her and then back down.



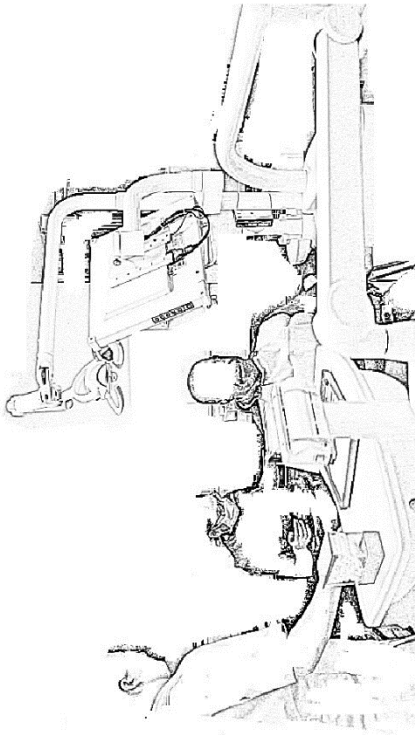
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The dentist says, "OK, let's have a look at that" as she turns toward the computer (perhaps to check the records about the tooth the patient has referred to?) and the nurse, at the same time, offers the patient some safety glasses. As he takes them, the nurse says, "thank you" and he puts them on. The dentist finishes putting on her gloves, takes a face mask from a box on the work surface. The nurse has begun to move towards the computer but before she can reach it the dentist asks, "[nurse's name] can you pass me the [bracket table]?" and as the nurse looks towards it the dentist says, "push it round?". The dentist puts on her face mask as the nurse makes her way between patient and dentist. The patient is looking to his left toward where there are two certificates or other information on the wall (in camera frame - there may be more).



00:04:51

As the nurse grabs the bracket table to pull it back the dentist says, "I'm just going to pop you back. OK [patient name]?" The patient says something I can't hear as the dentist presses the button that tells the chair to recline. As the chair begins to recline and the dentist leans across to pull the bracket table closer, the patient says, "my only problem is I don't like to go too far back." The dentist says, "yes". The patient says, "but also, I know your back as well" and laughs. The dentist laughs too. She says, "just let me know when enough is enough." The dentist stops the chair and asks, "is that alright?". The patient says, "yeah" and the dentist lowers the whole chair to the right height for her saying, "I'll pop you lower," as she does. "Yeah" he says. "I'm not tall enough," says the dentist. She laughs and he utters something at the same time.



00:05:04

In the sequence above the dental chair, which is rigged up to the bracket table, the dental light, the spittoon and a computer screen that doesn't get used, moves into a supine position with the seat of the chair above the dentist's thighs. She then brings it down so that the seat is well below her knees. The action of preparing a patient to be examined is achieved through interaction between the dentist, the patient and the chair. The patient sits but offers a limitation not to go too far back. The dentist acknowledges this as she and the chair interact.

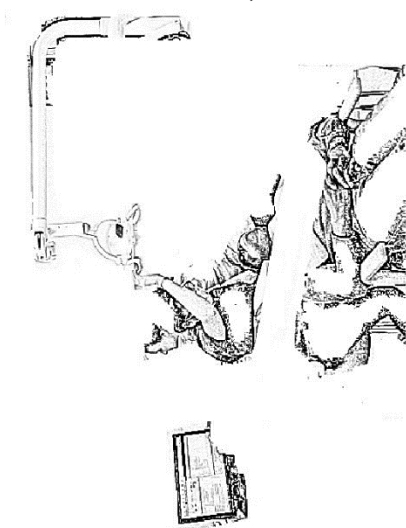


"OK. Brilliant," says the dentist. "Will you just pop your chin up for me?" and reaches up for the dental light, which she swings round and down closer to the patient. The nurse has moved to the computer. The patient lifts his whole head up off the headrest. The dentist notices and says, "ooh no. Head back". The patient says, "sorry" and drops his head back to the headrest. The dentist drops the headrest back a bit as he does. He lifts his head again and the dentist says, "pop your head back." He says, "sorry" as he puts his head back down on the headrest. The dentist says, "pop your chin up" and the patient lifts his chin. "That's it," she says, adjusting the position of the light again and then gently touching the patient's neck behind his chin. "That's perfect." The nurse had turned her head to face the dentist and patient but now leans towards the computer and takes the mouse in her right hand. The dentist passes her right hand under the sensor on the light, which now switches on.



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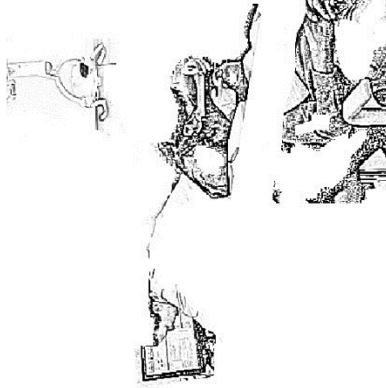
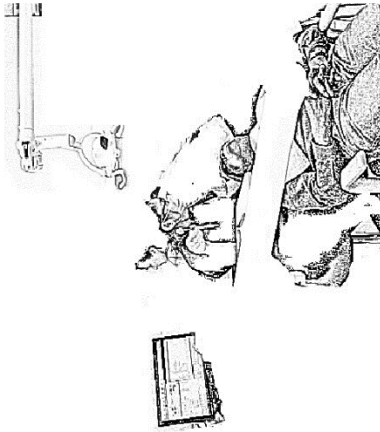
She adjusts the light so that the light falls onto the patient's unopen mouth. "As usual" she says, "I'm going to start by feeling underneath your chin. I'll explain everything at the end. Is that alright?" The patient mutters agreement and the dentist begins to palpate under his chin. The nurse is looking intently at the computer screen. The dentist says to the nurse, "extra-oral fine," but the nurse doesn't seem to respond by clicking anything on the computer. The dentist says to the patient after placing her fingers beside his TMJ, "open". The patient opens his mouth. "Close" she says and he does. "Open," she says and he does, as she turns her head toward the bracket table.



00:05:37

The dentist has reached for the dental mirror on the bracket table and is lifting it as she says again, "Extra-oral fine". The dentist turns towards the nurse, looking over her left shoulder. The nurse says, "uhum", clicks on something on the computer, and the dentist shifts the mirror from her right to left hand, returning to the patient. She brings the mirror over the patient's mouth and hesitates. "Yeah?" says the dentist to the nurse as she turns to look over her shoulder again. The nurse pulls up a different screen. It has an outline of a face on it (for annotating clinical findings?). The dentist turns her body half way round and uses the mirror in her left hand to point to the computer. The patient closes his mouth. "Oh no, sorry," says the dentist, "that's the old system." The nurse closes the screen before the dentist finishes her sentence. "You're going to have to write down," says the dentist and the nurse immediately moves across to the piece of paper, picking up the pen as she does. The dentist at the same time turns back round to the patient.

The dentist has the mirror in her left hand. She says, "open wide" to the patient as she moves towards him. He had started but widens a little quicker. The nurse is at the work surface looking at the paper. (For the moment, the computer has stopped being an actor in this game, except perhaps as an obstruction by "not working"). The dentist places the mirror in the patient's mouth and uses it to look at the palate as she leans to her right. She then looks directly into the patient's mouth. The mirror appears to be used as cheek retractor (boundary region?). She says, "Tongue to the top" and the patient sticks his tongue up to his palate. The dentist says "side to side" and he moves his tongue from left to right. "Stick your tongue out" says the dentist and the patient does. The dentist turns away, back to the bracket table. The nurse continues to write.

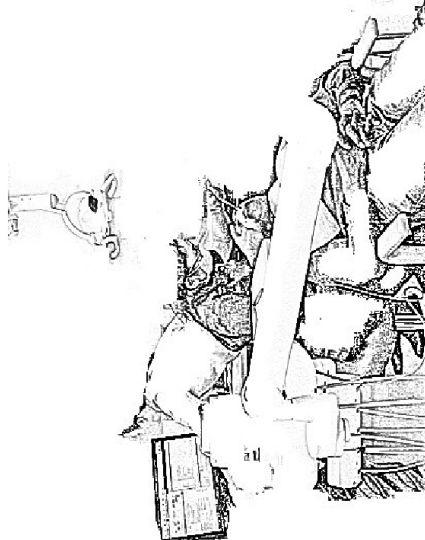


The dentist picks up the 3-in-1 from the bracket table. The nurse is still leaning over the paper. The patient keeps his mouth open but when the dentist returns to him with the 3-in-1 in her right hand, mirror in her left, she says, "open wide for me [patient name]." She has just put the mirror and 3-in-1 tip into the opening of the patient's mouth when she withdraws them and turns her body half way towards the nurse. "So with the charting, [nurse]..." begins the dentist But the nurse says, "I'm going to have to do it here," indicating the paper as she looks at the dentist. The dentist says, "just, if I write anything different from what's on the chart, sound don't write it," and waves her hands across each other. "Only if I say there's decay or anything like that, okay?" Says the dentist.



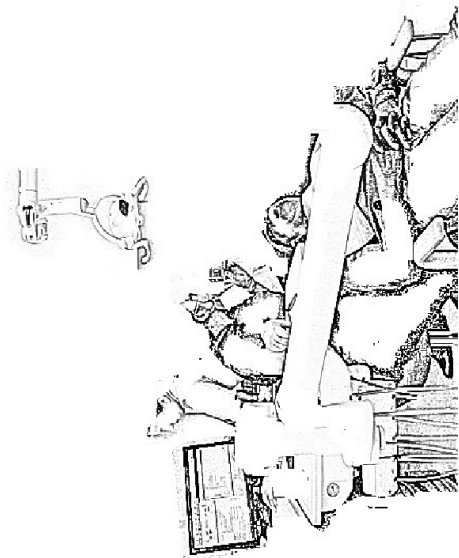
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Okay says the nurse and turns to the computer and the dentist turns back to the patient. The patient had closed his mouth as the dentist and nurse were talking (backstage talk). Once the dentist has placed the mirror and 3-in-1 tip close to his mouth, he opens without the dentist asking him to. The dentist sprays air over teeth on the lower left and says, "lower left seven sound, six sound". She turns to look over her shoulder at the nurse and the computer. The nurse is checking the charting on the patient's record as the dentist calls out. The dentist is still looking over her shoulder as she says "five, four" and then turns her head back to look in the patient's mouth. The nurse says, "uhum" as she looks at the charting. The dentist says, "three, two, one." She moves the 3-in-1 tip round to the right sulcus. "One, two, three, four, five sound. Six missing..." The nurse says, "yep". The dentist turns her body half way and looks at the computer screen. "Have we got seven distal decay?" she asks the nurse who says "yes." The dentist turns back to the patients saying, "we'll have a look at that one". Then, as she puts the mirror and tip in the patient's mouth, "that's the one isn't it?" to the patient. He makes an assenting sound with his mouth still open. "Is that causing you any bother," asks the dentist. The patient lifts his right hand and waves away as he utters "uhu", mouth still open. The nurse hovers over the teeth on the charting and notes of their charting appear as she does (knowledge of past findings and treatments?) The dentist says "lunner right eight sound seven missing six sound



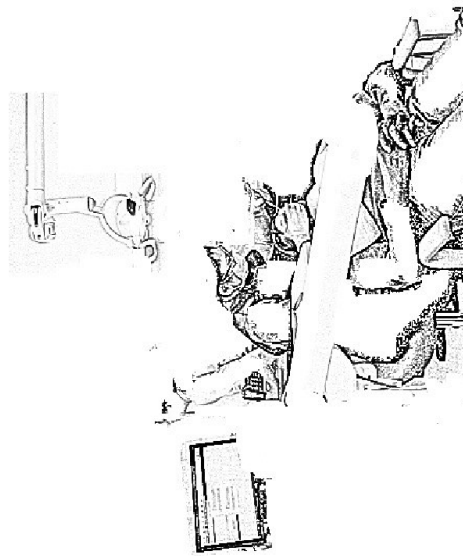
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The dentist picks up the CPITN probe, which has been sitting on a metal tray on the bracket table, which was placed there before the patient entered by the nurse. The patient has shut his mouth. The nurse looks down at the piece of paper and the dentist turns to her. "Can you check previous BPEs (British Periodontal Examination) for me please [nurse]," says the dentist and turns, as she finishes, back to the patient and the nurse leans in to the computer. The patient opens his mouth as the dentist approaches, without her asking him to. As her instruments approach she suddenly turns back to the nurse. It is unclear why. She says something like, "just for schedules" and with her left hand (holding the dental mirror) points to the screen and says, "if you just go up." The nurse has pulled up a screen and it appears to be the one with the previous BPE scores on it as the dentist says, "oh yea. Three, one, one, one, three - it's fine." The nurse says, "yeah" over the top. The dentist returns to the patient as she finishes speaking and he opens his mouth as she brings the mirror to his lower lip.



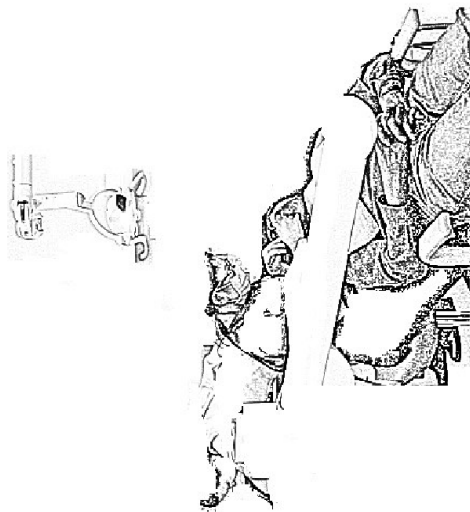
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"Tilt your head towards me," she says to the patient whilst at the same time placing her right hand on the left side of his chin (presumably applying a small amount of pressure to guide him). The dentist begins to examine the periodontium in the lower left sextant with the probe, using the mirror to retract the left cheek and says to the nurse, "please write these down for me." The nurse, who had been looking at the computer screen, now quickly picks up a pen and leans down to the paper. The dentist says, "so lower left..." and the nurse says, "lower left, yeah." The dentist says, "I'm gonna go three, bleeding." The nurse says, "yeah." The dentist has moved to probe around the lower front teeth and either uses the mirror to read the scores or to reflect light onto the lingual surface of the teeth as she quickly moves her probe along and says, "lower central, zero." The nurse acknowledges with a quiet "uhum."



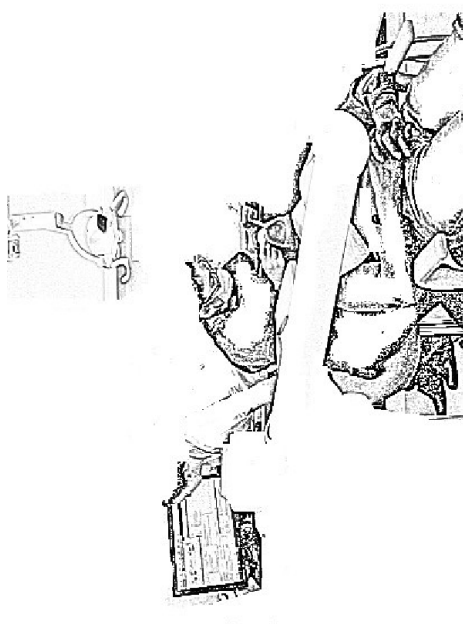
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The dentist moves herself a little to the right (9 o'clock position) and retracts the right cheek with the mirror as she uses the probe to examine the lower right sextent. She then moves to the 1 o'clock position and probes the patient's lingual periodontium. The mirror is being used to either retract the tongue or reflect light up. The patient sits calmly with his mouth open. The dentist says, "lower right I'm goin to say three bleeding," and moves back round to the right of the patient. The nurse continues to write on the paper. As the dentist probes the upper right posterior sextent, the computer makes a notification sound. The nurse looks up from the paper to the computer (as though a person had called for her attention). The nurse looks back down to her paper and then turns her head to the dentist who is still probing around the teeth. She says to the patient quietly, "sorry, I know that's tender." (did the patient flinch as she probed there to cause her to say this?). The dentist is spending much longer than the other areas examining this sextent and says something I can't hear. Then she says, "upper right, I'm going to say three bleeding." The nurse writes this down and says "uhum."



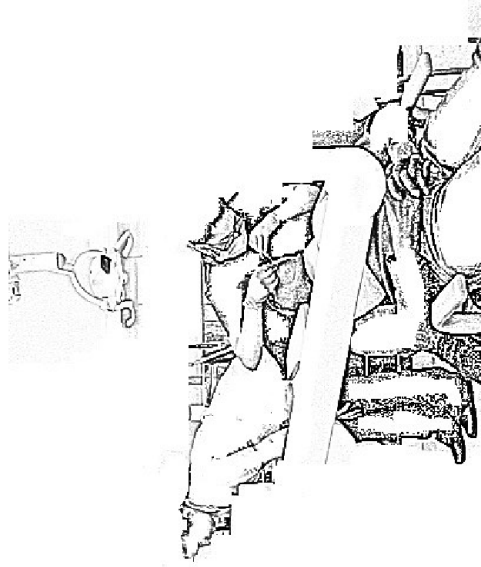
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The dentist moves to the 11 o'clock position to probe the upper anterior sextent. The computer makes another notification sound. The nurse continues to write and looks up after a couple of seconds. She reads something on the screen for a few moments. The dentist says "upper central, zero" and the nurse quickly looks down to the paper, where she writes and says, "uhum." The dentist examines the palatal surfaces of the upper left posterior teeth using direct vision and says to the patient, "nice and wide". He opens a little wider but also tilts his head back a little.



00:07:52

The dentist finishes the palatal side and moves round to the 1 o'clock position to examine the buccal surfaces. She says, "upper left, three" and brings herself round to the right of the patient, reaching across to the bracket table and depositing the mirror and probe onto the metal tray on it.



00:08:09

The dentist says, "alright, [patient], I'm just going to pop you up." She presses a button on the bracket table and the chair back begins to lift. The patient lifts his head as it does and, as he approaches the spittoon, the dentist says "just have a rinse there."



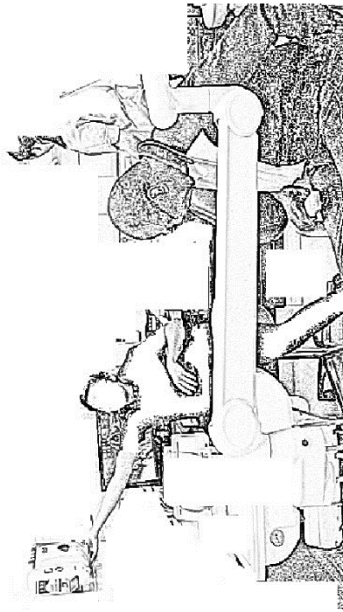
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The dentist turns round to her right and faces the screen as the patient sits forward to rinse. The dentist points with her right, gloved hand, at the screen and says to the nurse, "can you just check my umm..." The nurse stands up from where she has been writing and looks with the dentist at the screen. The dentist seems to read something that is on the screen already. She then says, "close" and points to the top of the screen. The patient, meanwhile, is rinsing his mouth and spitting into the spittoon. The nurse clicks the mouse, which closes a dialogue box on the screen. The dentist says, "images" as she points towards the top of the screen. "Top right." The nurse clicks the mouse and the dentist says, "fine, I've got x-rays,". An x-ray image appears on the screen as the nurse clicks again but the dentist has begun to turn away from the screen, removing her gloves and then her mask as she does. She throws them into the sink. The patient is sitting calmly in the chair with his hands clasped on his lap and looking straight ahead. The dentist asks the nurse, "can you just exit?" as she reaches to the alcohol dispenser. It makes as noise as the gel / liquid drops onto the dentist's hand. She rubs the gel / liquid into her hands and moves to the computer. The nurse steps back, releasing the mouse, and the dentist takes it and begins to click on the screen. Another image comes up and then there is a notification sound, and another as the dentist clicks onto another screen (I don't think these two actions are linked). The patient has looked to the posters / certificates on the wall to the left. The nurse is watching the dentist. The dentist spends several moments clicking on items on the screen. Small pop up boxes appear as she does. At length she closes down the dental software and the homescreen is left. "Just let the system go down," says the dentist. She turns to face forward and moves on her chair to the bracket table, which she pushes out of her way. She says to the patient, "Alright, [patient], will you just twist round this way?" (i.e. at right angles to the chair). "Sure," he says and swings his legs off the chair.



00:08:16

The dentist, pushes her chair back a little and whilst still seated, puts her right hand up to the alcohol gel / liquid dispenser. As the patient sits side-on on the chair, the dentist, rubbing the gel into her hands, says, "just bear with me. I think our computers having a little bit of a tough morning." The patient smiles and utters an acknowledgement. He still wears the dark safety glasses. The dentist pushes her chair back and turns her head to the computer. The nurse stands and watches from behind the patient. "They're just re-setting the system, OK?" says the dentist returning to face the patient. She looks at him and then, turning to the piece of paper on the side and with a motion of her right hand, says, "feel free to pop the goggles off." There is a slight pause and then he takes the safety glasses off with his right hand. He initially closes up the glasses in his lap and then puts them on the bracket table. The nurse has turned and seems to be looking at this action. Meanwhile the dentist has turned back to the patient, crossed her right leg over her left and continues, "I'm just going to talk through the check-up, OK? Any questions, fire them at me." The patient is facing the dentist as she says, "I started by feeling underneath your chin, just like last time to feel for any lumps or bumps that shouldn't be there." The nurse, with a glove on her left hand opens a drawer behind the dentist and places what looks like an x-ray film holder [that had been taken out ready for use but not used because the dentist already had x-rays?] in the drawer as the dentist continues. "



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Appendix DD London Deanery DF1 & CPD course outline
(Chapter 7)

London Deanery DF1 & CPD course Prepared by Dominic Hurst for the London Deanery 16/03/2014		
Aims	The aim here is to facilitate the process of identifying different sources of evidence and learning how to make changes to practice that incorporate both a clinician's experience and patients' wishes.	
Objectives	By the end of the course participants should be able to: 1. Explain the value of different sources of evidence 2. Identify research evidence efficiently 3. Conduct an audit of practice and differentiate between process and outcome data 4. Critically appraise research and non-research sources of evidence 5. Identify barriers to, and facilitators of, change in practice 6. Explain the role of patients in shared decision-making and create decision aids 7. Develop an implementation strategy that integrates research and audit evidence 8. Evaluate their own success in bringing about change in practice	
Format	This course structure anticipates that participants will do a large quantity of work in their own time and that seminars are used principally to work through practical tasks, though some didactic teaching is expected in small bursts. The table below sets out the components. These need not be on separate days or even in different sessions, if time and organisation permit. However, sufficient time will be needed to allow for the preparatory work.	
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The success or otherwise of uptake of new knowledge is believed to be dependent on the local context as much as anything else. Therefore, where possible in the DF1 course, trainers and other practice staff should participate. Trainers in particular will need to sign up to this if it is not to be simply an academic and, therefore, ultimately unproductive exercise.

Evaluation

Use of standardised EBP questionnaire (see Tilson JK, Kaplan SL, Harris JL, Hutchinson A, Illic D, Niederman R, et al. Sicily statement on classification and development of evidence-based practice learning assessment tools. BMC Med Educ. 2011;11:78.)

Whilst the outline below is modelled on a 12 month DF1 course, a CPD course for GPs could follow a similar outline. However, extra attention will need to be placed on developing the community of practice within which they should work during the course.

Content	Description of content	Activities/tasks	Resource requirements	Time required	Learning outcomes. Be able to:
1 Understanding evidence	What is the purpose of EBD? Where does evidence come from? Research, experience, colleagues, patients, reps... Social learning theories of knowledge sharing (communities of practice)	Prior: read core EBD papers During: identify sources of evidence; discuss advantages & disadvantages; collate	Prior: core papers to be sent out During: facilitator; seminar room	Prior: 2 hrs During: 2-3 hrs	Explain an EBD approach; sources of evidence; explain the risks of bias & usefulness to GPs of each; describe theoretical approaches to knowledge sharing
2 Finding evidence from research	Creating a structured question (PICO); searching medical databases + search engines; using EBD journal,	Prior: watch online explanation of how to create PICO questions; create PICO arising from a	Prior: online PICO presentation During: information specialist (BDA)	Prior: 1 hr for presentation & task During: 2-3 hrs search skills	Create a structured question; create a search

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		dentalelf, ADA EBD summaries etc.	clinical question they have from practice During: use PICO to search for relevant research; present PICO and findings to group	librarian?) to run search sessions; computer room; projector; facilitator	development & prep to present findings; 10 mins each to present	strategy in medical databases; communicate results effectively
3	Evaluating research evidence 1	Recap of study designs – SRs, RCTs, cohort, case-control, surveys, case series; critical appraisal of research evidence: validity, 4 results, generalisability	Prior: watch online presentations of study designs and critical appraisal of RCT/SR; During: attempt critical appraisal of RCT/SR; discuss appraisal	Prior: online presentations for study designs and critical appraisal During: seminar room, facilitator	Prior: 2 hrs online prep During: 1 hour to critically-appraise in groups of 3-4; 1 hour to discuss	Describe different study designs; match these to question types; critically appraise a SR/RCT
4	Evaluating research evidence 2	Further critical appraisal to develop skills	Prior: critical appraisal of another 2 SRs / RCTs During: discuss appraisal; reach consensus on whether to use the research to inform practice; think of barriers to implementing in own practice	Prior: have paper to critically-appraise During: journal club format seminar; facilitator		Critically appraise SR/RCT; explain why the research should/shouldn't be used; identify potential barriers to use
5	What the reps say	Analysing the "evidence" reps offer.	Prior: identify a sales publication either in print or online that refers to evidence, critically appraise their referenced material, identify other studies + critically appraise; write a "sales publication" that takes a	Prior: students to identify literature from practice / web During: seminar room; facilitator	Prior: 3-4 hrs During: 10 minutes per person; 1 hr to reflect on what has been learned	Critically evaluate sales literature; create a balanced presentation that includes uncertainty of effectiveness

			balanced view of the evidence During: present sales material and new one explaining what is different		when research is poor
6	Evaluating own practice through audit 1	What is audit? How do we do it?	Prior: watch online audit presentation During: use sets of fictitious records to conduct 1) an audit of 7 practice related to research evidence and 2) another that systematically evaluates success of own practice; group to identify an area of practice that they want to identify literature on and audit in their own practice	Prior: online presentation of how to do an audit During: fictitious records – say 30-40 – on which to conduct audit; seminar room; facilitator	Prior: 30 mins for online prep During: 3 hrs mixed session
7	Evaluating own practice through audit 2	Audit of own practice and critical appraisal of audit	Prior: ½ group to carry out an audit related to adherence to evidence, the other ½ to do an audit of success of related diagnosis/treatment; search for relevant literature and appraise; prepare presentation of audit During: present to group; critically appraise others'	Prior: brief document on appraisal of audit; distance support for audit During: seminar room; projector; facilitator	Prior: 4 weeks for audit, lit search & presentation prep During: 15-20 minutes/presentation + critical appraisal; considering research & own evidence

Commented [DH1]: This is not just in the sense of a traditional audit to see if we are adhering to standard procedures but is to identify personal practice success rates whilst also looking at procedural components e.g. for survival of RBBs – how many placed in last 3-5 years at practice? How many known to be lost? How many patients not seen (i.e. lost to follow up)? How were bridges cemented? Isolation with rubber dam? Design e.g. occlusal coverage? On enamel / amalgam / composite?

Commented [DH3]: See pg 166 in Ajetunmobi, *Making sense of critical appraisal*.

Commented [DH2]: For example, one group could look to see if RBBs are being placed using given adhesive cement whilst the other looks at the longevity of those that are placed with it compared to those that are not.

			audits; agree implementation goal based on prior research + audits				
8	Change management: getting evidence into practice 1	Context: organisational (practice) structure and the technical, learning and soft skills needed to improve care; various managerial analysis and implementation tools	Prior: read NICE guidance on change + other pertinent literature on change theory During: start to analyse own practice's barriers & facilitators of applying evidence identified above	Prior: provide link to NICE document + other literature During: facilitator; seminar room	Prior: 3-4 hrs to read During: 2 hrs group work	Identify the barriers in own practice to change	
9	Change management: getting evidence into practice 2	Identifying practice barriers and developing an implementation plan	Prior: evaluate the organisational, technical, educational & personnel barriers to change in respective practices During: Present findings; work out implementation strategy using fishbone, force field etc. analysis of problem + e.g. PDSA (Plan, Do, Study, Act)	Prior: Support for evaluation; template of what to evaluate + how During: facilitator, seminar room	Prior: 3-4 hours for evaluation and prep to present During: 10 mins presentation each; 1 hr interactive on using management tools for analysis; 2 hrs group work around planning + develop plan for own practice	Construct an implementation strategy to change practice	
10	Communicating evidence to patients	The role of evidence in shared decision-making; decision aids; ways to communicate success / failure data	Prior: read / watch something on how to create decision support aids During: Develop one based on results from research and audit data	Prior: link to presentation / literature on decision aids During: facilitator; computers?	Prior: 1 hr During: 3 hrs	Explain what a decision aid is; create a decision aid to support shared decision-making	
11	Negotiating change	Return to practice and agree change with trainer	Send agreed protocol for change to DF1 lead;	4 weeks	Template for implementation	Negotiate with key	

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		and team	include means to gather patient experiences of intervention (whether used or not)		protocol	stakeholders when agreeing implementation strategy
12	Implement change			Over 4-6 mths	Support from facilitator; progress reviews	Attempt implementation of a change strategy in own practice
13	Evaluating implementation	Re-auditing and qualitative methods to understand why implementation did or didn't work	Prior: re-audit of original; prepare presentation showing change or not and analysis of why (including patient factors) During: present, reflect and critique on the implementation process	Prior: support of re-audit During: facilitator; seminar room; projector	Prior: 4 weeks During: 15-20 minutes per presentation incl. critical appraisal	Explain how to evaluate implementation / knowledge translation; demonstrate an evaluation of own project
14	Evaluating process	How has EBD been used and implemented? What might have been done differently?	Prior: prepare presentation on the 5 stage process During: present + discuss	During: facilitation; seminar room; projector	Prior: 2-3 hrs preparation During: 2-3 hrs	Reflect on the process of incorporating EBD into practice; identify areas for improvement

Appendix EE GDP narrative about blood testing (Chapter 7)

My name is [actual name removed]. This is my story about how I introduced blood glucose testing into my clinical practice to treat patients in a more holistic way.

What got me started?

I am a general dental practitioner working in mixed private and NHS practice in [town removed].

I recently attended an FGDP lecture on periodontal disease where specialist periodontist Phil Ower spoke about the relationship between periodontal disease and other inflammatory conditions such as type II diabetes. Through this course, I read a paper by Grossi [2] that suggested that 80% of periodontal pocketing was due to a person's inflammatory response and only 20% was due to bacteria.

I found this fascinating as I was taught in dental school to treat periodontal disease almost in a surgical fashion i.e. you find the problem and then cut it out! But if the issue lies with the host response this approach may only be partially effective.

Research has shown that periodontal disease and diabetes have a bi-directional relationship [3]. In practical terms, this means that treating one can help to improve the outcomes for the other [4]. I am not suggesting that we are suitably trained for treating diabetes, or that medical practitioners should treat periodontal disease, but given that many systemic conditions share confounding risk factors I think there is a role that we can all play in improving our patients' health.

Unfortunately, this role lacks definition. I think we are still in our infancy in understanding how best to treat diseases that overlap with each other.

That said, I am aware that some specialist periodontists carry out blood glucose testing as part of their routine periodontal assessment. This made me curious whether there is a role for blood glucose testing in general dental practice to help identify patients at high risk of diabetes.

Learning about blood glucose testing

The blood glucose test strips are low cost so I ordered a blood glucose meter and a pack of test strips. This cost me around £50. However, I didn't have any experience of doing the tests so I popped a question on a dental forum to ask if anyone else did.

This prompted a series of really interesting discussions about the advantages and disadvantages of blood glucose testing in dental practice.

Box 1

This is a video showing how to do a blood test: youtu.be/rMMpeLLgdgY



- Colleagues who favoured testing tended to share the view that we have a role in helping prevent or manage other diseases. There was agreement that trying to manage the periodontal disease without addressing the diabetes was futile.
- There were concerns from some colleagues that the cost would be burdensome. However, as the test strips cost 40p I could easily absorb this in my practice.
- Another concern was that we would be diagnosing patients if we used blood glucose tests but this was never the intention.

NICE guidance (see link in Box 2) already recommends that the following people be encouraged to go for a diabetes risk assessment:

- adults aged 40 and above, except pregnant women
- people aged 25–39 of South Asian, Chinese, African-Caribbean, black African and other high-risk black and minority ethnic groups, except pregnant women
- adults with conditions that increase the risk of type 2 diabetes. These include cardiovascular disease, hypertension, obesity, stroke, polycystic ovary syndrome, a history of gestational diabetes and mental health problems.

Box 2

NICE guidance recommends dentists be active in encouraging certain patients to have a diabetes risk assessment

“Encouraging people to have a risk assessment for type 2 diabetes and identifying those at risk”

<https://goo.gl/4ge8wu>

Diabetes UK’s Risk Score site:
riskscore.diabetes.org.uk

We are also encouraged to use a validated risk assessment tool such as Diabetes UK’s Risk Score with patients (see Box 2) and advise them to see their doctor if high risk.

However, in a patient with periodontitis we would consider this to be a “diabetes symptom” just as polyuria and dehydration are. When we decide to do a blood test in such a patient we are following a clinical suspicion that they may have diabetes. (See box 3) In this case we are not screening but we are not making a diagnosis either.

Putting it into practice

The blood glucose monitor arrived in the post. My intention was to use blood from TePe brushes that I pass interdentally when checking patients’ oral hygiene (limited to patients I suspect have periodontal disease). However, I found that I could get the right amount of blood more easily from a bleeding periodontal pocket (in patients with periodontal disease) or used the finger prick technique for those who lack marginal bleeding, such as smokers.

I try tactfully to explain to each patient that a raised blood glucose level may be associated with periodontal disease and ask permission to quickly check their blood glucose level. I have generally found patients to be receptive and testing to be quick and easy.

Box 3

WHO Diagnosis of diabetes [1]

Diabetes symptoms plus:

- a random venous plasma glucose concentration ≥ 11.1 mmol/l or
- a fasting plasma glucose concentration ≥ 7.0 mmol/l (whole blood ≥ 6.1 mmol/l) or
- two-hour plasma glucose concentration ≥ 11.1 mmol/l two hours after 75g anhydrous glucose in an oral glucose tolerance test

These blood tests are known as Random Capillary Blood Glucose Tests. For non-fasting glucose tests the results are higher than venous plasma glucose (recommended for use when making a diagnosis) but are the same for fasting glucose tests.

For our patients with periodontitis, a random blood glucose score above 11 mmol/l, particularly if they haven't eaten for several hours, would be highly suggestive of diabetes.

Those with a fasting glucose of >7 mmol/l are also diagnosed as diabetic (See Box 3). So in my practice it seemed sensible to have a cut-off point for referral to a GP of 7 mmol/l in case at the moment of testing they hadn't eaten in a while.

For patients without diabetes symptoms the WHO advise to test again on another day and, if the value is still elevated to diagnose diabetes. But as I am testing those with a "symptom of diabetes" – patients with periodontitis – I advise patients to see their GP after a single high test.

All this explanation is not to say that I intend to make a diagnosis. Understanding how diabetes is diagnosed helps me to explain the blood test result to my patients and answer their questions. I inform them if the result is high (>7 mmol/l) that their GP is best placed to follow up.

Reflections

At this stage, I am generally positive about the role that dentists can play in improving wider health outcomes. Periodontal treatment is likely to have reduced outcomes in the presence of poorly controlled sugar levels and the systemic effects of diabetes mean that exploring the possibility with a blood glucose test makes sense.

So far every patient I have asked has agreed to be tested, even those who needed a finger prick. They have overwhelmingly responded positively and of the few tests I have done so far, two patients with elevated levels have gone to see their respective GPs.

My final thought is that the additional benefit of doing this, beyond identifying those at high risk of a disease, is in using our consultations as a platform to promote general well-being. My patients seem to appreciate this.

References

1. World Health Organization., International Diabetes Federation. Definition and diagnosis of diabetes mellitus and intermediate hyperglycaemia : report of a WHO/IDF consultation. Geneva: World Health Organization; 2006. p. p.
2. Grossi SG, Zambon JJ, Ho AW, Koch G, Dunford RG, Machtei EE, et al. Assessment of risk for periodontal disease. I. Risk indicators for attachment loss. *Journal of periodontology*. 1994;65(3):260-7.
3. Preshaw PM, Alba AL, Herrera D, Jepsen S, Konstantinidis A, Makrilakis K, et al. Periodontitis and diabetes: a two-way relationship. *Diabetologia*. 2012;55(1):21-31.
4. Simpson TC, Weldon JC, Worthington HV, Needleman I, Wild SH, Moles DR, et al. Treatment of periodontal disease for glycaemic control in people with diabetes mellitus. *Cochrane Database of Systematic Reviews*. 2015(11).