Knowledge, Science & Clinical Practice: what do we need to know, how do we know what we know and what can and can’t science tell us about how to treat our patients?

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Since the introduction of evidence-based medicine (EBM) in the early 1990’s (Guyatt 1991, Sackett et al 1996) there has been an explosion in the volume of research evidence available to the practitioner. In medicine, a 2003 study estimated that it would take until 2015 to produce the 10,000 Cochrane reviews required to summarise existing evidence based on current rates of publication of randomised trials and completion of systematic reviews (Guyatt 2004, Mallet 2003). Trends in physiotherapy mirror those in medicine with an exponential rise in the number of controlled trials since the late 1980’s (Fig.1). As the busy practitioner wonders how they will find time to read 10,000 Cochrane reviews “knowledge translation” has emerged as a new funding priority to translate the science for clinicians to apply into practice. We continue to push forward with an emphasis on RCTs, systematic reviews, and implementation of clinical guidelines, but it seems some key issues are being ignored along the way. Can research provide all the knowledge we need to be effective clinicians? Is it valid to value knowledge generated from certain sources (RCTs) above knowledge from other sources? Will translation of science into clinical practice truly guarantee wise clinical decisions and best health care? The aim of this article is to explore several ideas and themes related to these questions, not as an exhaustive coverage of the topics, but to stimulate thought, discussion and suggest new directions.

Figure 1: Number of controlled trials (CT) and systematic reviews in Physiotherapy between 1945 and 2009. With permission from Roger Kerry (2011)
What is “knowledge” and where does it come from?

The knowledge base of a profession is one of its defining characteristics and is essential for clinical reasoning and decision-making (Higgs & Titchen 2000).

Physiotherapists spend a considerable amount of time gaining the necessary knowledge to practice their chosen career and a commitment to life-long learning to build on an entry-level knowledge base is necessary to move from a novice to experienced practitioner (Jensen et al 2007).

The field of epistemology investigates and debates the origin, nature, methods and limits of knowledge. Different types of knowledge have been defined since the time of Plato and Aristotle. The Oxford English Dictionary includes the following definitions:

- The faculty of understanding or knowing; intelligence, intellect
- The apprehension of fact or truth with the mind; clear and certain perception of fact or truth; the state or condition of knowing fact or truth
- Perception by means of the senses
- A person’s range of mental perception; awareness
- Skill or expertise acquired in a particular subject.

These varied definitions illustrate that there are different ways of knowing, for example with the mind, by means of the senses or related to skill or expertise. These are linked to the three main forms of knowledge outlined in various terms by many authors relating to science, productivity and creativity and practical wisdom and ethics.

In relation to physiotherapy practice, Higgs & Titchen (1995) divide knowledge into 2 types: propositional and non-propositional (Higgs, Jones & Titchen 2008). Propositional knowledge (“knowing that”) is theoretical and scientific and obtained through research and/or scholarship. In current context it is often considered to have a higher status than non-propositional knowledge. Non-propositional knowledge (“knowing how”) is experience-based knowledge, and includes professional craft knowledge and personal knowledge.

Professional craft knowledge is embedded in practice, can be tacit (implied, understood, inferred) and includes both general professional knowledge gained from experience and specific knowledge related to a particular client and situation. It is acquired from a variety of experiences – listening to patients, learning and implementing clinical skills, reflection and clinical reasoning, and peer affiliation and mentorship. Personal knowledge is shaped by our individual life experiences and therefore is unique to every clinician, it will include the collective knowledge of the individual clinician’s community and culture and one’s personal values, assumptions, beliefs and attitudes may facilitate or hinder the provision of optimal care. Personal knowledge creates the basis for our interpersonal interactions. As Siegel (2010) notes “Our presence as clinicians, the way we bring ourselves into connection with those for whom we care, is a crucial factor in supporting healing.”

Personal knowledge helps us determine what has meaning for each individual patient. This is essential to help patients reach their goals and provide patient-centered care. Given the same physical impairment, no two individuals will have exactly the same pain experience and behaviour because what has meaning for them is unique; “how they manifest their pain or illness is shaped in part by who they are” (Jones and Rivett 2004).

In order to be an effective clinician, therefore, we need multiple types of knowledge from a wide variety of sources.

“Understanding and successfully managing the patient’s problems requires a rich organization of all three types of knowledge. Propositional knowledge provides us with theory and levels of substantiation by which the patient’s clinical presentation can be considered against research-validated theory and practice. Non-propositional professional craft knowledge allows us the means to use that theory in the clinic while providing additional, often cutting-edge (albeit with unproven generality) clinically derived evidence. Personal knowledge allows a deeper understanding of the clinical problem to be gained within the context of the patient’s particular situation and enabling us to practice in a holistic and caring way” (Jones & Rivett 2004).
Knowledge is dynamic and knowledge in any one category can be translated into another category. “In practice all three types of knowledge are modified for and through practice– different types of knowledge are combined, extended, converted from one form to another, and most importantly, made specific to the patient and context in both time and space.” (Higgs, Fish and Rothwell 2008). It is the process of clinical reasoning that facilitates integration of all three types of knowledge. Pattern recognition also plays a role as it provides a link between biomedical knowledge and the specific patient context (Edwards and Jones 2007).

What influences our beliefs about what knowledge is and how we use knowledge in clinical practice?

We also need to be aware that what we understand as knowledge, what we value as knowledge and how we use knowledge in clinical practice is highly influenced by sociocultural and political factors (Larsen, Loftus, Higgs 2008). Professional practice knowledge is located within the wider history of ideas and the broader knowledge of society (Larsen, Loftus, Higgs 2008). In modern Western culture societal beliefs that scientific method is the best way to discover truth have influenced physiotherapy culture and practice. Many would like to think that science is a unified procedure that secures and guarantees our knowledge (Kennedy 2008) and yet in reality science is a kaleidoscope of diverse, constantly recomposing parts (Kennedy 2008). Science is also held as objective and free from bias, however philosopher Thomas Kuhn (1970) argues that there is no observation without a paradigm that directs the observation, thus the type of knowledge obtained from research is dependent on the paradigm in which the research is conducted. Similarly, the type of knowledge desired is influenced by how the research question is posed (Higgs, Jones, Titchen 2008) and the moment we interpret and discuss research data our conclusions are influenced by our social and cultural context (Shapin 2008) which means that the people reporting their scientific results shape the conclusions they produce.

The high value placed on the empirical scientific method is reflected in what evidence-based practice (EBP) has come to represent since its introduction in the early 1990’s. Sackett and colleagues (2000) defined EBP as the integration of best research evidence with clinical expertise and patient values. Integration is defined by the Oxford English Dictionary as the combining of diverse parts into a complex whole suggesting equal value from research evidence, clinical expertise and patient values. Indeed, in 1996 Sackett wrote “Good doctors use both individual clinical expertise and the best available external evidence, and neither alone is enough”.

It seems, however that there are different views of what EBP is, specifically with regard to what counts as evidence and whether some evidence is more valuable than others. Evidence hierarchies have emerged and since 2006 over 60 grading systems have been proposed (Worrall 2010). These hierarchies share the central feature that evidence from RCTs is among the highest rankings and that clinical opinion ranks last. For many the research evidence component from Sackett’s original definition of EBP has come to mean only using findings from RCTs or meta-analysis of RCTs.

This is problematic from a variety of perspectives. Firstly, it could be argued that these positions are contrary to
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Fig. 2. Sackett and colleagues' original intent. In the 1996 article “Evidence based medicine: what it is and what it isn’t” they state that evidence based medicine is not restricted to randomised trials and meta-analyses, that external evidence can inform but can never replace individual clinical expertise and it is this expertise that decides whether the external evidence applies to the patient at all and, if so how it should be integrated into a clinical decision. Secondly, while the RCT has a high degree of internal validity and methodological strengths it is weak in external validity which limits direct application into clinical practice (Milanese 2011; Worrall 2010). By design RCTs can only provide a narrow type of knowledge in the broad spectrum required for clinical practice. The notion that evidence can be reliably placed in hierarchies is illusory. Hierarchies place RCTs on an undeserved pedestal for, although the technique has its advantages it also has significant disadvantages (Rawlins 2008). Austin Bradford Hill (1966) notes that any belief that the controlled trial is the only way would mean not that the pendulum had swung too far but that it had come right off the hook. Furthermore, one of the strengths of the RCT is that it controls for factors other than the intervention being tested by matching groups for known confounding variables based on background knowledge. For many physiotherapy techniques we have limited background knowledge about the underlying mechanisms and we are, therefore, likely to be missing unknown confounders when matching groups in RCTs (Worrall 2010). We need more mechanistic studies to design the best RCTs, and by carrying out RCTs without sufficient background knowledge we risk producing findings that are actually quite far from the truth. Clearly it is time to reconsider the amount of emphasis that has been placed on the RCT in physiotherapy (Milanese 2011) and to recognise that knowledge from other types of research are equally as valuable in contributing to best practice. Every type of research has its advantages and disadvantages and different types of research best serve different purposes (Higgs, Jones, Titchen 2008).

Another concerning trend is clinicians being pressured to use clinical guidelines developed from RCTs as a replacement for comprehensive assessment, clinical reasoning, and individualised treatment based on patient values and goals. The use of hands-on techniques is being discouraged taking out the healing effects of touch because science is unable as yet to research it well; a limitation of science not of the effects of skilled touch. In some places EBP has become effectively a top-down approach where findings from multiple RCTs are used to create clinical guidelines which are being implemented as the only solutions in clinical practice. Statements such as “We should not start using interventions until there is sufficient evidence for them” often made directly following the presentation of Sackett’s definition of EBP (M. Van Tulder, WCLP Nov 2010, Los Angeles, USA) are commonplace at conferences. This is not integration of science and clinical expertise and should not be called EBP and the belief that knowledge only comes from research and then flows into clinical
practice ignores, disrespects and invalidates the wealth of knowledge gained in the clinical lab. Since its origin our profession has grown and been strengthened largely due to the contributions from the experiences and innovation of clinical leaders. In contrast in a very short time this top-down clinical guidelines approach is causing physiotherapy to lose ground, for example, the trend for NHS commissioners to exclude physiotherapists from tendering for musculoskeletal services in favour of osteopaths and chiropractors who continue to use touch and manual techniques that have little "evidence". However, their patients respond to and desire these interventions.

Professional craft knowledge developed in the clinic can provide innovative, cutting-edge evidence (Edward, Jones 2007; Higgs, Fish, Rothwell 2008). There are countless situations and problems faced daily by clinicians for which there is limited scientific evidence. In these situations clinicians use principles from multiple fields - anatomy, physiology, psychology, neurology – and a library of clinical experiences to create new solutions which are adopted and modified according to the patient's responses. Clinical practice is another source of knowledge and evidence (Higgs, Fish, Rothwell 2008). While science can provide us with an abundance of knowledge to challenge, refine, reshape and validate our clinical practice it cannot provide all the knowledge we need and it can never predict with 100% accuracy what is required in any individual patient encounter in a future time, space and context. Restricting clinical practice to only what science can test is a guaranteed route to stagnation for our profession.

Clinical expertise has been defined as having the ability to do the right thing at the right time (Ericsson & Smith 1991) and this requires two components: skill acquisition and clinical reasoning. Therefore, to move our profession forward we need to pursue ways to increase both skillful touch and clinical reasoning abilities.

Many patients who have seen a variety of physiotherapists will report that some clinicians have the touch and others, despite being highly knowledgeable and personable,don't. What is the difference in the ways that touch can be used? How is touch developed? Can we teach all physiotherapists to have the touch? These are relevant questions that science can help explore and help us better understand what the healing art of touch can do in physiotherapy. This is a much better alternative to simply removing touch from what we do and simply evolving into exercise advisors.

The problems that patients bring to us in every day practice are complex and multidimensional so that solutions are not definite; we need knowledge beyond science to best provide quality client-centred professional services (Paterson & Higgs 2008). Clinical reasoning takes us beyond recipe treatments to treating the whole person encompassing physical, emotional, cognitive and sociocultural realms. It is a critical skill in the health professions, central to the practice of professional autonomy and it enables practitioners to take wise action, meaning taking the best judged action in a specific context (Higgs & Jones 2008).

How do we increase the ability of physiotherapists to make wise decisions? Interestingly wisdom is complex and hard to characterise and in Stephen Hall's (2010) exploration of the history and neuroscience of wisdom he describes it as "the ability to exercise good judgment in the face of imperfect knowledge" and "to do the right thing ethically, socially, and personally". Research is revealing that far from a purely logical, rational process wisdom requires emotional and intuitive contributions. In reasoning we now know that emotion plays a major role in how we reason and wisdom may have a lot to do with knowing when emotion is helpful and when it is not (Stephen Kosslyn quoted in Hall 2010).

"Finally, intuition can be seen as how the middle prefrontal cortex gives us access to the wisdom of the body. This region receives information from throughout the interior of the body, including the viscera – such
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as our heart and our intestines – and uses this input to give us a ‘heartfelt sense’ of what to do or a ‘gut feeling’ about the right choice. This integrative function illuminates how reasoning, once thought to be a ‘purely logical’ mode of thinking, is in fact dependent on the non-rational processing of our bodies. Such intuition helps us make wise decisions, not just logical ones.” (Siegel 2010).

Making wise decisions is multidimensional and complex. Research is needed to help us understand wise decisions and the best ways to develop robust clinical reasoning skills and expertise. But science needs to include and value the clinical voice in the research process. We need better platforms, environments and mechanisms to increase respectful clinician–researcher dialogue in order for this to occur. This is well recognised as a need and yet also as a persistent gap that has yet to be bridged, requiring creative solutions. Perhaps the vehicle for both clinicians and researchers is to increase their personal knowledge so that we are all better equipped to take the journey together. A focus on developing mindfulness in our interactions, being conscientious and intentional, being open and creative with possibilities, or being aware of the present moment without grasping onto judgment enables us to be flexible and receptive and have presence (Siegel 2010). By better understanding ourselves we are better equipped to understand others and respect the unique knowledge that both the clinician and researcher bring to physiotherapy.

Summary

Having explored several concepts around knowledge, science and clinical practice in physiotherapy, we need to consider how we value different types of evidence and the role of science in directing clinical practice and develop a more balanced view that values the insights that is uniquely derived from clinical practice. We need both research and clinical expertise to provide us with new knowledge and both research and clinical practice should drive developments in each other. It is not suggested that we discard the pursuit of science to support and examine what we do, only that the pursuit of science needs to be balanced with a respect and value for the clinical voice and the experiential evidence clinicians provide. Knowledge gained from clinical experience is not more important than science but it certainly is no less important. We also need to invest equal resources into the pursuit of how to best develop and raise the level of clinical expertise across the profession. Overall, maintaining an open mind, developing inner knowledge (Siegel 2010) and keeping a broad perspective will assist both scientists and clinicians to discover how best to work together. It is time for the pendulum to swing back to a place that will truly move us forward as a profession and facilitate better care, better outcomes and better health for our patients.

A last word on knowledge, from one of the greatest scientists: “Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world.” Albert Einstein

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