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Contents

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Executive summary

In medical education as in other health professions, the terms ‘competency’, ‘competency-based training’ and ‘competency frameworks’ are increasingly used, but have not been clearly defined. An increasing interest in competency-based approaches in the health professions is driven by a number of emerging challenges to health care delivery internationally and domestically, with a competency-based approach suggested by some as a solution that might offer a reduced training time and greater workforce flexibility.

The Australian Medical Council Ltd (AMC) is an independent national standards and assessment body for medical education and training. Its purpose is to ensure that standards of education, training and assessment of the medical profession promote and protect the health of the Australian community. It is essential for the AMC to evaluate the impact of the adoption of competency-based approaches on medical education across the continuum.

The use of competency-based education in Australia has particularly developed in the Vocational Education and Training (VET) sector where the focus is on the development of discrete skills or elements of knowledge. Each skill or knowledge element is known as a ‘competency’, with performance at a nominated approved level in all the competencies constituting proficiency, virtually by definition, as a qualified tradesperson, artisan, or specialist worker. This approach to competency assumes that overall competence can be broken down into smaller elements of defined knowledge and skills.

These two assumptions do not apply with the same force to assuring professional competence and standards in which high levels of professional judgment are required. A variety of ‘competency frameworks’ or ‘standards’ have been introduced widely in the last 10 years in the health professions. However, these competency standards are not in the form used within the VET sector but are in the form of broad frameworks, with the numbers of competencies or units relatively small by comparison. The term “competencies” as defined for use within the Australian VET sector clearly have a definite place in medical education but overall competence is seen as greater than the sum of these individual competencies.

The AMC framework for competence-based education outlined in this paper recognises that the development of expertise in professional education occurs across the continuum of training.

Underpinning the proposed AMC framework are the concepts of codified and tacit knowledge. **Codified** knowledge, sometimes referred to as explicit or propositional knowledge, refers to knowledge that is transmittable in formal, symbolic language. Some skills and knowledge within medicine can be codified and it is at this level that detailed lists of competencies can be and have been defined. However, knowledge is acquired throughout medical education and training that is not able to be made fully explicit. This knowledge forms the basis of judgements required for dealing with complex clinical problems and the uncertainty that is often present in clinical situations where patients rarely present in a standard way. This type of knowledge is characteristic of, and critically important to, the practice of most professions and is referred to as **tacit** knowledge. Time is an important element here, as the multiple experiences and the reflection required to build tacit knowledge cannot occur without time and adequate experience.

Key concepts of the AMC framework are:

- Overall competence is built on the accumulation of both codified and tacit knowledge;
- The development of tacit knowledge is dependent on the quality of the learning experience and on the opportunities for feedback and reflection;

- Observed performance reflects underlying competence;
- Observed performance goes beyond preparedness and takes into account case specifics;
- Individual circumstances and system factors can, and do, influence performance;
- Experience over time is the key to the development of tacit knowledge leading to performance improvement, subject to the influence of individual circumstances and system factors, and eventually lead to the development of more codified knowledge.

While defined competencies have a role in medical education and are readily measurable, especially in procedural areas such as endoscopy, maternity services and surgery, the AMC proposes that medical education can only at best be partially conceptualised as based on obtaining competencies and that the coarse-grained concept of competent professional practice, where observed performance is more than the sum of the set of competencies used, should be retained. The development of tacit knowledge requires time and quality experience, with exposure to numbers of cases, variability of cases and contexts, and to multiple practitioners as role models. While the tacit knowledge itself is neither readily definable nor measurable, the outcome of good clinical decision- making is observable and assessable. Doctors need to acquire skills and learn facts and protocols but on their own these will not guarantee competence. This requires higher order thinking, reasoning and adoption of professional qualities, the complexity of which goes beyond the specific.

Background

In medical education as in other health professions, the terms ‘competency’, ‘competency-based training’ and ‘competency frameworks’ are increasingly used but have not been clearly defined. This paper reviews the use of competency-based training in education, and proposes a revised framework for the adoption of competency-based approaches within health professional education. It will articulate and extend the Australian Medical Council’s (AMC) understanding of the terms ‘competence’, ‘competency’ and ‘competency-based training’, building to an outline of an AMC framework that will guide the AMC’s accreditation of medical programs across the continuum from undergraduate to continuing education, and the assessment of International Medical Graduates (IMGs) for eligibility for general registration and entry into the workforce.

Health professional education is inextricably linked to professional practice within the health care system. An increasing interest in competency-based approaches in the health professions is driven by a number of emerging challenges to health care delivery internationally and domestically. The central concept underpinning the AMC framework is that overall competence is dependent on the development of discrete competencies but also on the development of tacit knowledge and that overall competence is dependent on the stage of training, the context and varies over a professional’s working life. This paper proposes that the approach to competency-based training as used in the Australian Vocational Education and Training (VET) sector is not always suitable for application in all areas of medical education and training.

The Australian Medical Council

The AMC is an independent national standards and assessment body for medical education and training. The purpose of the AMC is to ensure that standards of education, training and assessment of the medical profession promote and protect the health of the Australian

community. In the accreditation of undergraduate and specialist medical education programs, the AMC fulfils this purpose by setting standards for phases of medical education and training, and assessing medical training programs against these standards (AMC 2008, 2009). The AMC recognises diversity of approach as a strength of medical education and training in Australia, and AMC accreditation processes support diversity, innovation and evolution in approaches to medical education.

In setting standards for particular stages of medical education and training, the AMC describes in broad terms the knowledge, skills and attributes required of graduates, and sets standards relating to the design, resourcing, delivery and monitoring of the curriculum and program. The AMC does not prescribe core curriculum content or any particular model of training.

The impetus for the AMC to develop this position paper comes externally from the support expressed for the development and implementation of competency-based training in the Australian health sector in a number of recent national health system reviews and proposed health workforce reforms. In addition, the AMC accreditation assessments, particularly of specialist medical training programs, have raised questions of the definition and aims of outcomes of competency-based training. In April 2009, the AMC hosted a workshop on competency-based training in medical education. This workshop highlighted the need for a common understanding of what is meant by competency-based training and to understand how it affects the medical education continuum. It is essential that the AMC evaluate, through its standard-setting lens, the impact of the adoption of competency-based approaches to medical education on the AMC's accreditation and assessment functions.

The use of competency-based education and training in Australia

Over the last two decades in particular, training in the VET sector of education in Australia has progressively shifted in its orientation towards the development of discrete skills or elements of knowledge. Each skill or knowledge element is known as a 'competency'. Considerable care is taken to ensure that, as far as possible, the identification of competencies is comprehensive. **The basic assumption of this approach to training is that performance at a nominated approved level in all the competencies constitutes proficiency, virtually by definition, as a qualified tradesperson, artisan, or specialist worker. The majority of competencies can be taught explicitly, and reaching the minimum acceptable level requires effort and practice.**

Part of the rationale for this progressive shift in training orientation has been the realisation that the focus should be directly on the student's own learning – specifically, what they know and are able to perform at the completion of training – rather than on length of time served under a master in a master-apprentice relationship. Comprehensive identification of skills and knowledge elements is intended to provide a strong direction for training, explicitly assessable elements, and ultimately a greater confidence in the resulting certification or qualification.

In practice, the breakdown of overall 'proficiency' to detailed competencies in many areas of VET has taken what seems to many people to be an extreme path. Underlying this development is the belief that the greater the specificity, the fuller the training and assessment regime, and the more the standing of the qualification is assured. This in turn has sometimes meant that students are coached in each of the discrete elements separately, until the student complies with the requirement (that is, performs satisfactorily). Disinterested

observers have noted that this tendency towards finely grained training can leave a student technically satisfying all the requirements for a qualification but not able to 'get all the pieces coordinated'. To illustrate this, consider the case example about the student's diagnosis of appendicitis in a patient with abdominal pain, shown later in this paper (see page 14).

The changing context of health care

In Australia, significant reports and reviews on the health sector over the last five years (Productivity Commission 2005; DPMC 2008; DoHA 2009; Preventative Health Taskforce 2009; NHHRC 2009) have described pressures for reform of the health care system stemming from factors such as consumer expectations for safe and high quality health care (particularly with the emergence of e-health), changes in the models of care, pressures for health care to be cost effective, increased rates of chronic disease, pressures on hospitals to reduce both the number of admissions and the time spent in hospitals, greater equity of access to primary health care, renewed focus on prevention, changes which technological advances impose on how care is delivered, the distribution of health care practitioners and closing the gap between the health of Indigenous Australians and non-Indigenous Australians.

A further key element is the ageing population in Australia and the ageing of the health workforce. In its report *Australia's Health 2008*, the Australian Institute of Health and Welfare (AIHW) notes that 13% of the Australian population is aged 65 years and over, compared to 8.4% in 1956. For the medical profession, the AIHW estimates that in 2006, there were 21% of general practitioners and 26% of medical specialists aged 55 and over. Concurrently, the working hours and patterns of work for doctors of all ages are changing (AIHW 2008), leading to a demand for more doctors to be trained and for training time to be reduced. Faced with greater consumer expectations for safe and high quality care, and increased government expenditure on health care, governments are also keen to increase accountability in the health care system.

A consistent theme in the response to these challenges is to explore the development of a more flexible, multi-disciplinary and team-based approach to health care either by developing new roles such as physician assistants or by expanding existing roles such as nurse practitioners (DPMC 2008). This in turn challenges traditional health roles, skills definitions and models of care and leads to increased blurring of the roles of health professionals. The nature of these boundaries and of this blurring varies somewhat due to demands of geography or specific service tasks.

All these pressures lead to increased demands on the health workforce to deliver safe, high quality cost effective care in a range of settings in urban, rural and remote areas of Australia, for clarity about how we know that this level of care is being delivered, and for an assurance that new graduates are equipped to perform in the health care environment on graduation and into the future. Increasingly, a competency-based approach is seen as a possible solution and one that might offer a reduced training time.

The use of a competency-based approach in health professional education

In health professional education, the concept of competency itself is complex and ill-defined because of varying contextual factors and philosophical approaches. An understanding of competency is further compounded by ad hoc use of terminology (Albanese et al. 2008). In

the relevant medical education literature, the terms clinical competence, competency, clinical proficiency, clinical judgement, clinical reasoning and performance are often used interchangeably. Albanese et al. (2008) cites McGaghie et al. (1978) who argue that 'any effort to find a universal definition of competence will inevitably fail' because definitions of medical competence are 'bound to local political, social and economic circumstances, to health needs, to availability of resources, and to the structure of the health care system'.

Despite this lack of clarity in terminology, 'competency frameworks' have been introduced widely in the last 10 years in the health professions, with nursing almost completely adopting competency frameworks worldwide (e.g. Hendry et al. 2007). The number of competencies or units is generally small, for example the Dieticians Association of Australia lists 9 units of competency, Podiatry has 6, Radiography has 5, Physiotherapy has 9 standards and the Nursing and Midwifery standards are organised into 4 domains. These standards or domains are then divided into more detail. Some professions explicitly state that these standards or competency units are broad areas of professional activity and do not imply 'isolated steps in the process of practice' (Speech Pathology Australia 2001).

However, it is important to note that the competency standards and framework used by Australian health professions are occupationally focused and are most often focused on standards relevant to entry as a health practitioner. Safe practice is a non-negotiable condition. The competency standards are not in the form used within the vocational education and training (VET) sector but are in the form of broad frameworks intended to inform:

- **current and future members of the profession of the scope of knowledge skills and attributes required for effective practice for an entry level practitioner;**
- **practitioners seeking to re-enter the profession;**
- **universities and other organisations responsible for training;**
- **employers; and**
- **assessment processes for overseas qualified practitioners.**

A report prepared for the then Victorian Department of Human Services, *Competency Standards for Health and Allied Health Professionals in Australia* (DHS 2005), found that most health and allied health professions, although not the medical profession, adopted the National Office of Overseas Skills Recognition (NOOSR) format for competency standards (i.e. an integrated model of competency including attribute and performance factors). The full NOOSR competency standard format comprises a Unit of Competency and its derived segments of: elements of competency, performance criteria, range of variables statement, evidence guide/cues. However, there has been individual modification and reworking over time. **This study also found that there is no uniform agreement about the meaning of 'competency' across industry, professions and training institutions and that competency statements are not structured as separate, detailed, explicit listings of specific underpinning knowledge, skills or attitudes**.

Definitions and terminology

For the purposes of this discussion paper, the AMC has adopted the following definitions for use in this paper. Some of these were developed by the International Competency-based Medical Education Collaborators Group (Frank et al. 2010).

Competency: An observable ability of a health professional, integrating multiple components such as knowledge, skills, values, and attitudes. Since competencies are observable, they can be measured and assessed to ensure acquisition by a professional. Competencies can be assembled like building blocks to facilitate progressive development. (Frank et al. 2010)

Competence: The array of abilities across multiple domains or aspects of physician performance in a certain context. Statements about competence require descriptive qualifiers to define the relevant abilities, context, and stage of training. Competence is multidimensional, dynamic and changes with time, experience, and setting. (Frank et al. 2010)

Progression of competence: For each aspect or domain of competence, the spectrum of ability from novice to mastery. The goal of medical education is to facilitate the development of a physician to the level of ability required for optimal practice in each domain. At any given point in time, and in a given context, an individual physician will reflect greater or lesser ability in each domain. (Frank et al. 2010)

Competent: Possessing the required abilities in all domains in a certain context at a defined stage of medical education or practice. (Frank et al. 2010)

Incompetent: Lacking the required abilities in all domains in a certain context at a defined stage of medical education or practice. (Frank et al. 2010)

Performance: What a doctor actually does in practice.

The development of competency frameworks internationally in medical education

In medical education, broad competency frameworks are increasingly used at postgraduate and undergraduate level. These frameworks interpret the term ‘competency’ as broad domains of practice and usually describe a small number of ‘competencies’. The release of the CanMEDS framework in 1996, with an update in 2005, was effectively a watershed for the adoption of competency frameworks in medicine. The essence of CanMEDS is the consideration of clinical competence as seven domains of which ‘Medical Expert’ is the core. All other six roles integrate to contribute to and create a synthesis of clinical practice and include: communicator, collaborator, manager, health advocate, scholar, and professional.

Since 1996, this model, which is specifically targeted at specialist training, has been adopted by many colleges around the world including the UK (London) Royal College of Physicians and the Royal Canadian College of Family Physicians. See http://rcpsc.medical.org/canmeds/index.php.

Adoption of CanMEDS in Australia has been cautious and diverse. In its accreditation role, the AMC has required the specialist training organisations, the medical colleges, to develop learning objectives related to the general roles and multifaceted competencies that are inherent in medical practice, as well as the role of clinical or medical expert in a specific discipline. All the medical colleges have considered the CanMEDS seven roles; some have adopted this framework while others have amended it to reflect the nature of their discipline. There exist other examples of competency frameworks, which have varying degrees of similarity to CanMEDS, for example those from the Faculty of Occupational Medicine (UK) (http://www.facoccmed.ac.uk/edtrain/ugresrce/r_compf.jsp), and the Royal College of Paediatrics and Child Health (UK) (http://www.rcpch.ac.uk/Training/Competency-Frameworks).

The Accreditation Council for Graduate Medical Education (ACGME), responsible for accrediting training programs for post-MD doctors within the United States, has defined 6 broad areas in which residents must obtain competencies: Patient Care, Medical Knowledge, Practice-Based Learning and Improvement, Interpersonal and Communication Skills, Professionalism and Systems-Based Practice (http://www.acgme.org/outcome/comp/compCPRL.asp).

In Australia the postgraduate medical councils have developed the Australian Curriculum Framework for Junior Doctors (http://www.cpmec.org.au/Page/acfjd-project) which melds work from a number of different frameworks around the world, including the Foundation Year 1 programme in the UK (the first postgraduate year)and the Australian Quality and Safety Curriculum Framework.

Attempts have been made to compare different frameworks in the same discipline, or to integrate or ‘map’ ones for different disciplines. This has proved difficult because of the subjectivity involved in many frameworks (despite efforts to make them evidence based) and the lack of appropriate tools to structure the mapping, (there is no morphological system available) (Ellaway et al. 2007). The rigorous comparison of competency frameworks across disciplines is currently beyond the scope of this paper, but has been recommended as a potential way of rationalising scope of practice (Reeves et al. 2009). As these authors point out:

> The creation of competencies may also be regarded as an effort by professions to define certain activities that 'belong' to them. This is particularly relevant in health care where resources are limited and professions seek to demonstrate their unique roles in order to secure and legitimize their places on health teams.... Given these difficulties, research could begin to compare competencies across professions to see what gets categorized as 'unique' to each group and what is regarded as 'common' (pp. 452–53).

Another reason for the interest in competency frameworks is the potential for globalisation of standards for health professions (Stern et al. 2005). The European 'Tuning' project has attempted to distil essential medical competencies from a myriad of sources so that European harmonisation or 'tuning' can take place (Cumming 2008). This project has attempted to make a distinction between learning 'outcomes' and competency frameworks, as have other authors (Harden 2002).

However the differences are not clearly discernible except by making somewhat arbitrary distinctions among things that, superficially at least are not normally distinguished. Such distinctions have been made to make some conceptual progress but, in practice, they are difficult to sustain and apply. Ellaway et al. (2007, p. 630) suggested that a core reason for the difficulty is that

> the most useful semantic distinction is to consider learning outcomes as pertaining to an education programme and as such are defined by the educators, whereas competencies belong to and can be demonstrated by the graduate.

In fact many of the source documents present 'outcomes' in much the same way as others present competencies. For example, one 'outcome' from the Scottish Doctor Level 2 Clinical Skills domain is expressed as:

> The new medical graduate should be able to demonstrate competency in a range of clinical skills unsupervised and to a predetermined standard.

The degree of overlap of these terms in the literature can be further illustrated by considering an example describing communication skills from three different frameworks.

The US 'outcome framework' from the Accreditation Council for Graduate Medical Education (ACGME) Outcome Project for residency education (http://www.acgme.org/Outcome/ uses the rubric 'Common Program Requirements: General Competencies'. The communication competency is described overall as: 'Residents must demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals'. The Scottish Doctor (http://www.scottishdoctor.org/) Level 2 outcome for communication is described as 'All new graduates must be able to demonstrate effective communication skills in all areas and in all media e.g. orally, in writing, electronically, by telephone etc.' The CanMEDS Competency Framework defines the Communicator Role: 'As Communicators, physicians effectively facilitate the doctor-patient relationship and the dynamic exchanges that occur before, during, and after the medical encounter.' In this context the 'competency' from CanMEDS, seems to be a broader concept than the 'outcomes' from the other frameworks.

Scheele et al. (2008) describe the relative ease with which competency based frameworks have been used in postgraduate training across one entire country (The Netherlands). They conclude:

> A competency based assessment strategy that distinguishes between ongoing development and proficiency in specific tasks is in line with clinical demands. (p. 248)

This view is almost diametrically opposed to others from the USA (Huddle and Huedebert 2007) who rebut the insistence of the ACGME on competency frameworks and their assessment through rigorous observation because:

> We will argue that the measurable bits of performance that follow from anatomizing clinical competence according to discrete learning objectives do not and cannot add back together to constitute the skill and ability of the competent physician. (p. 537)

The strategy of combining multiple competencies in any performance (e.g. work-based assessment) or outcome is suggested by ten Cate and Scheele (2007) to obviate the restrictions imposed by anatomising (micro-measurement of) competencies (Huddle and Huedebert 2007). This may be because this combination is readily seen by experienced professionals to add value to the information contained therein. It may be more than or different from the sum of its parts. And, even when those parts may evidence individual competency, the sum may be disappointing, when compared to other 'expert' performances.

Development of the AMC framework for competence-based education

(i) Understanding the doctor's role and the development of expertise

Any recommendation on the place of a competence-based approach in medical education must take into consideration the doctor's role including all its facets, with a focus on what doctors do in practice. It should acknowledge the education, training and experience required to build the necessary breadth and depth of knowledge and expertise. The role of a medical or other health professional is complex and includes individual and societal responsibility, decision-making in ambiguous situations, dealing with uncertainty and the development of personal attributes required across the continuum of training.

De Cossart and Fish (2005), in considering professionalism within the discipline of surgery, argue against the conception of a profession as a 'masterable practice' and emphasise the importance of 'complex decision making and elements of professional judgement and practical wisdom guided by moral principles'. Schön (cited in de Cossart and Fish 2005) describes two views of professionalism: the Technical Rational view and the Professional Artistry view. The latter view emphasises that professionals exercise their own judgement about their actions and are then morally accountable for those actions. This view aligns with the Aristotelian view of medicine as neither an art, nor a science, but a combination of these with practical wisdom and that it is '…impossible to reduce it to art or science, or both, without dismembering it' (Widershoven-Heerding 1987).

Statements on the role of the doctor vary internationally, but central to all definitions is the ability of a doctor to collect appropriate information from a patient (through history, physical examination and investigations) and to synthesise available information to formulate a diagnosis and to identify appropriate management options. However a doctor's role is recognised as being broader than direct acute patient care. The Consensus Statement on the Role of the Doctor (UK) (Medical Schools Council 2008) focuses on the broad range of doctors' responsibilities to include:

- both individual patients and populations;
- the required essential knowledge in basic and clinical sciences;
- the ability to advise on both treatment and prevention;

- the intellectual skills and grasp of scientific concepts required;
- the ability to make decisions in the face of ambiguity and uncertainty and take responsibility for those decisions; and
- work effectively as members of health care teams.

Doctors respond to societal needs. The BMA Health Policy and Economic Research Unit (2008, p. 5) stated on the role of the doctor:

> The role of the doctor is intimately linked to social attitudes and norms. The professional status of doctors carries with it a recognition that doctors have a contract with society. As such a doctor's role is closely allied to a sense of civic duty and a responsibility to shape their practice in response to societal expectations as well as the advance of science. Most recently, this evolving relationship with society has been driven by a number of particular social trends which in combination have determined a significant shift in expectations, behaviour and practice amongst sizeable sections of the population.

To meet the demands of their role in the health care team, doctors must excel in a broad range of skills including cognitive and affective domains (Rikers and Verkoeijen 2007). Dhaliwal (2009), in discussing the complexity of defining expertise in medicine, suggested:

> Each highly regarded doctor excels to different degrees in knowledge, diagnostic skills, procedural competency, management decisions, communication skills, bedside manner and ethical conduct.

Expertise develops with education and training and evolves and changes in an individual in different contexts and environments. Considerable research has been conducted on how expertise develops from a novice to an expert and this research provides insight into the appropriate educational model for medicine.

It is recognised that doctors use different forms of reasoning at different stages of their training. Initially they may use underpinning biomedical knowledge to analyse a patient's signs and symptoms and to then formulate hypotheses. Here, reasoning occurs from evidence identified forward to a diagnosis. With the progression to being expert, a doctor can reason through a case by comparing the observed symptoms with cases encountered in the past (Norman et al. 2007; Eva 2004). This progression from novice to expert takes time, experience and the understanding and assimilation of numerous exemplars (Moulton et al. 2007).

Learning to support the development of any professional expertise involves learning in the workplace, either as a student in a placement or, in the example of medicine, continuing during vocational training as an employee. A number of theories exist about how people learn, many of which are based on a notion of learning as an active rather than a passive process, which requires both time and experience. Situated Learning Theory proposes that knowledge needs to be presented to learners in authentic contexts and that social engagement and collaboration are important aspects to learning. This theory proposes that engaging within a 'community of practice' is essential to learning (Lave and Wenger 1990).

Similarly, the introduction of problem-based learning into medical and health professional education was linked to the notion of constructivism, which proposes that learners construct new knowledge, and build on previous knowledge, thorough active experiences (Schmidt et al. 2009). Other learning theories propose similar concepts, where social interaction and experience are important to the learner. Kolb's experiential learning theory proposes four stages of learning: concrete experience, observation and reflection, formation of abstract concepts, and testing in new situations (Kolb 1984). The model of progression

proposed by Dreyfus and Dreyfus (1986) describes the path from novice to expert as involving the intermediate stages of advanced beginner, competent and proficient. At the start of this progression, a learner may initially depend on taught rules. Through the progression to expert, situational understanding develops and intuitive decision-making occurs, with many of these developments being tacit (cited in Eraut 1994).

One of the legacies of competency-based approaches, as applied in the Australian vocational education sector, is the assumption that that any developed capability, regardless of its complexity and the context, can be broken down into smaller elements of knowledge or skill which can be developed and tested individually. The conjecture is that a high level of command over the individual elements literally constitutes the 'parent' capability, which can also be called competence. In other words, it is assumed that the whole is – meaning no more and no less than – the sum of the parts. A companion assumption is that the various competencies can be codified, that is, expressed in a fully explicit form (such as verbal descriptions, rules, diagrams and numbers) and thereby be made transferable across situations and contexts. The validity of both assumptions is rarely tested explicitly; it is usually seen as a matter of simple logic.

The two fundamental assumptions (the whole amounting to the sum of the parts, and the technical possibility of the codification of all knowledge) are flawed. This assertion is based on a range of considerations which include the works of a succession of theoretical researchers (including Wittgenstein, Polanyi, and Dreyfus and Dreyfus), in-depth analyses of manifest expertise (Benner), and empirical research studies into scientific and commercial knowledge transfer. **The argument is not that individual competencies are unimportant, or that a particular collection of them is never sufficient to 'define' certain high-level skills. It is that the two assumptions taken together are far too sweeping to serve as the basis for assuring professional competence and standards.**

(ii) The initial element of the framework: the relationship of competency and competence

The initial element of the AMC framework considers the relationship of competency and competence. Underpinning this is the development of codified and tacit knowledge. **Codified knowledge**, sometimes referred to as explicit knowledge, refers to knowledge that is transmittable in formal, symbolic language (Edmonson et al. 2003). Codified knowledge includes declarative knowledge (describing something), procedural knowledge (how to perform a task), and causal knowledge (why something occurs) (Zack 1999). Some procedures can be completely codified. An example is shown below.

Example 1

One of the Australian standards for sterilising reusable medical instruments (a process standard) requires that the instruments first be packaged and placed in a standardised way (including minimum clearances on all sides) within in a steam steriliser (constructed and tested to a separate standard). They must then be kept at or above a stated temperature and a stated pressure for a minimum period of time, and finally unloaded and stored according to fixed protocols. It is not necessary to test instruments which have been sterilised according to the standard procedures each time they are sterilised to see whether residual pathogens are present. This is because the sufficiency of the procedure has been established through extensive testing as sufficient to purpose. Any person with the appropriate equipment and capable of following the specifications can sterilise instruments to the required standard. The process is reproducible at will. All aspects are clearly observable and measurable; no qualitative judgments are involved.

How to interpret standards statements is one thing; but how to interpret practical situations and know what to do in the circumstances is an order of magnitude more complex. In many professional fields, medicine included, patients and their situations are rarely standardised. Rule-based systems are adequate in some cases, inadequate in others.

Coming to a knowledge of the how to deal with complexity requires appropriate experience of a certain kind, with exposure to a multiplicity of cases, in the company of an expert able to explicate certain aspects of the shared experience. Within a given professional context, words that are quantifiers, qualifiers and hedge words can take on fairly specific interpretations, but learning appropriate interpretations typically requires exposure to extremely large numbers of concrete cases, with different symbols that refer to objects or conditions that are positive or negative instances, and ways of referring to objects or conditions whose properties are not categorical but lie along a continuum. When different practitioners are thoroughly inducted into these 'guild' meanings, and apply the same descriptors to the same concrete instantiations, they come to share what has been termed 'tacit knowing'. This is deeply rooted in the practitioners' being. **Tacit knowledge** 'is subconsciously understood and applied, difficult to articulate, developed from direct experience and action, and usually shared through highly interactive conversation, storytelling, and shared experience' (Zack 1999) and through role modelling. It is portable, drawn on for previously un-encountered situations, and unable to be made fully explicit. This type of knowledge is characteristic of, and critically important to, the practice of most professions. An example to illustrate the concept of tacit knowledge is shown in Example 2.

Example 2

A typical generic illustration of tacit knowledge can be found in the work of a competent barista. There are a number of technical requirements for the creation of a great cappuccino. These include the beans, the roast and grind used, the temperature and 'wetness' of the steam , the length of drip time to produce, and the strength, quantity, and crema associated with, the initial espresso, and finally the making of the milk foam and its insertion into the cup. Any one of these features, if not precisely right, can absolutely destroy a good cappuccino. The foam itself must not be overheated or over steamed and the temperature must be within a very narrow range. Producing an apparently 'hot' cup of coffee with the required characteristics is actually a very skilled process. The novice barista will have a long stemmed thermometer poking out of the jug, will start the various operations in disjunctive timescales, will appear rushed, and will have a very limited capacity to create both the quantity and the quality of product required. But the experienced barista will just be able to 'feel' when that foam is exactly right, will be able to adjust the steaming process to produce the appropriate homogeneity and viscosity of the milk and moreover will 'know' when this is optimal by using a range of senses. Touch, sight, sound, and smell are all being deployed instantaneously and simultaneously. Getting it all together is more than following a set of rules; it involves 'know-how', and a feel for the process that defies codification. A good barista draws on a store of tacit knowledge, and that is an essential component of professionalism.

The importance of experiential learning in the development of tacit knowledge was highlighted in a study by Pope et al. (2003) who explored the acquisition of knowledge in anaesthetic practice and differentiated between 'explicit' and 'tacit' knowledge. Using qualitative methods, this study demonstrated that explicit knowledge alone was insufficient for anaesthetic work and affirmed the importance of the apprenticeship model in the transmission of tacit knowledge and the building of expertise. Tacit knowledge is important in clinical practice. For example, a surgeon may be technically competent with assessed

codified knowledge but needs tacit knowledge, built up through experience, to do the correct operation at an appropriate time to achieve a satisfactory outcome. The following two examples further illustrate the importance of tacit knowledge.

Example 3

In assessing infants with fever and no apparent source of infection, an experienced paediatric practitioner often relies heavily on an intuitive sense of the likelihood of serious illness in addition to quantitative data or specific test results. Junior medical staff with less experience are expected to follow formal institutional protocols which prescribe investigations and therapy but still fail on occasions to identify severe bacterial infection such as meningitis, especially on initial presentations. The codified knowledge relevant to this issue is identical for student, trainee or specialist and is well encapsulated in practice guidelines and texts. Despite this, the experienced practitioner is most likely to make a more reliable judgement of the probability of serious infection when assessing an unwell infant by incorporating intuitive reasoning informed by that experience.

Brennan et al., British Journal of General Practice, 2003, 53, 626–631

Example 4

The framework may be illustrated by the development of skill at the diagnosis of appendicitis as this skill is frequently seen in medical students. Initially the student learns the symptoms of appendicitis including Right Iliac Fossa (RIF) pain, anorexia, and nausea or vomiting. Initially, students will usually not differentiate the relative importance in the history of pain, anorexia or vomiting. This can lead to over diagnosis where they rely heavily on vomiting as a dominant symptom. Students are less likely than experienced clinicians to consider the overall accumulation of data supporting a diagnosis and so rely more heavily on one or two significant features in the history. Repeated guided clinical exposure to patients with a variety of conditions presenting as abdominal pain allows the development of this tacit knowledge required for more accurate diagnosis. The clinical signs of RIF tenderness, guarding and rebound associated with moderate fever are learned. Even with multiple normal abdominal examinations, the student is unlikely to identify rebound or guarding accurately without guided exposure where they personally examine patients with a variety of presentations, including gastrointestinal or urinary tract infections and constipation or diarrhoea. Rebound can be a subtle and variable sign. The fact that the sign is variable can be transmitted in a tutorial or bedside lesson, but only repeated exposure and tactile experience will lead to an understanding of the sensations associated with the clinical sign. Both codified and tacit knowledge are then used in making a performance decision. The overall perception of the patient as unwell is an important factor in a clinician's decision to admit to hospital or discharge home even when the diagnosis remains unclear. A list of the features of an unwell patient is clearly codified knowledge. The perception (or feeling, like the barista) of 'unwellness' develops by repeated observation of patients and by correlating these observations with the subsequent clinical course of the patient. The clinical decision is often based not just on the collation of symptoms and signs but on the clinician's 'feeling' about the patient. The patient, family and locality (access to care if required e.g. in rural areas) all become factors in the final (performance) decision about admission or discharge for this patient. This performance builds upon the codified knowledge as applied through experientially developed skills in reasoning and physical examination.

Some seminal work by the influential curriculum writer Laurence Stenhouse (1975, p. 80) can further add to the understanding of this issue. Stenhouse has defined four functions of education:

- **training**
- **instruction**
- **induction**
- **initiation.**

Training applies most readily to the acquisition of skills, particularly psychomotor skills. Instruction refers to learning of facts, protocols and procedures. Induction is of a higher order. It involves thinking, reasoning and making judgements. Finally initiation refers to the assimilation of social norms and values. In the medical education context this includes the learning of professionalism and the legal and ethical context of health care.

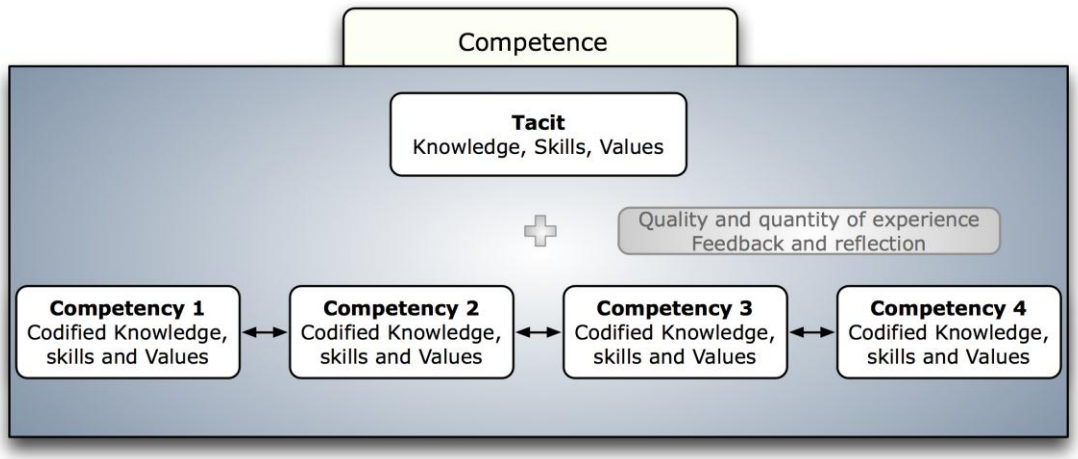
In the same way that Stenhouse claimed that training and instruction were the only functions in which behavioural objectives could be applied, these are the functions that most readily lend themselves to be defined as competencies. **The process, contextual and constructivist dimensions of induction and initiation prevents their reduction into discrete competencies. The outcomes of thinking and judgement processes or socialisation into professional values are not always predictable or capable of precise definition.**

These concepts are illustrated in the first element of the AMC framework, shown in Figure 1 below. Key concepts for this element of the framework are:

- Overall competence is built on the accumulation of both codified and tacit knowledge.
- The development of tacit knowledge is dependent on the quality of the learning experience and on the opportunities for feedback and reflection.

The traditional view of competencies begins at the level of codified knowledge, skills and professional values. In the first instance, knowledge is acquired then skills and professional values are introduced and are beginning to be practised. Tacit knowledge is also required for the development of overall competence. As an individual acquires more experience, tacit knowledge is acquired, skills are perfected and professional values are demonstrated.

Figure 1: The relationship between competence and competencies



This approach uses a coarse-grained concept of competent professional practice and retains this as a strong coordinating theme for development of all the component competencies, and

recognises that the whole should amount to more than the sum of the parts. This allows for the whole to be adaptable and take various forms according to the problem to be solved. The 'forms' reflect different selections, emphases and configurations of the various competencies depending on the context. That is what is meant by the use of the term 'competence' in the context of medical education. **The use of 'competence' as a term does not relegate the development of specific competencies to a lower-status role. It is simply a different, and potentially more accurate, way to perceive them within professional education**.

This view of 'competency' is consistent with the definitions from the International CBME Collaborators Group who concluded that 'the contemporary vocabulary related to a physician being "competent" would need a 21st century update' and have proposed a series of definitions for terms commonly used (Frank et al. 2010).

(iii) Completing the framework – The relationship between competence and performance

The discussion of the development of competency frameworks for the medical profession, the competent doctor, the development of expertise, and the nature of codified and tacit knowledge outlined above, provides the basis for now considering the relationship between ***competence*** and ***performance*** in the medical context.

Previous frameworks for clinical assessment have distinguished between competence and performance. In 1990, Miller described a framework for clinical assessment with four levels: knows; knows how (competence); shows how (performance); and does (action). The ability to acquire information from multiple sources and synthesise that information into a diagnostic or management plan was described as the 'knows how' or 'competence' level of the framework; and applying that knowledge in a patient encounter the 'shows how' level. Miller points out the difficulty of measuring the final level of the framework (action) and that measuring the lower levels of the pyramid (knowledge and competence) may not predict the achievement at more complex levels. Rethans et al. (2002) further elaborate the differences been competence and performance in proposing the Cambridge Model, extending and refining Miller's concepts. The authors argue that competency-based assessments measure what doctors do in controlled testing situations and that the 'shows how' level in Miller's model should thus be regarded as demonstrating competence rather than performance. Performance in the Cambridge model refers to what a doctor does in practice and it is argued that it is situated at the 'does' level in Miller's pyramid. The Cambridge model inverts Miller's diagram, recognising that competence underpins performance but that the relationship between competence and performance is complicated by system-related influences and individual factors.

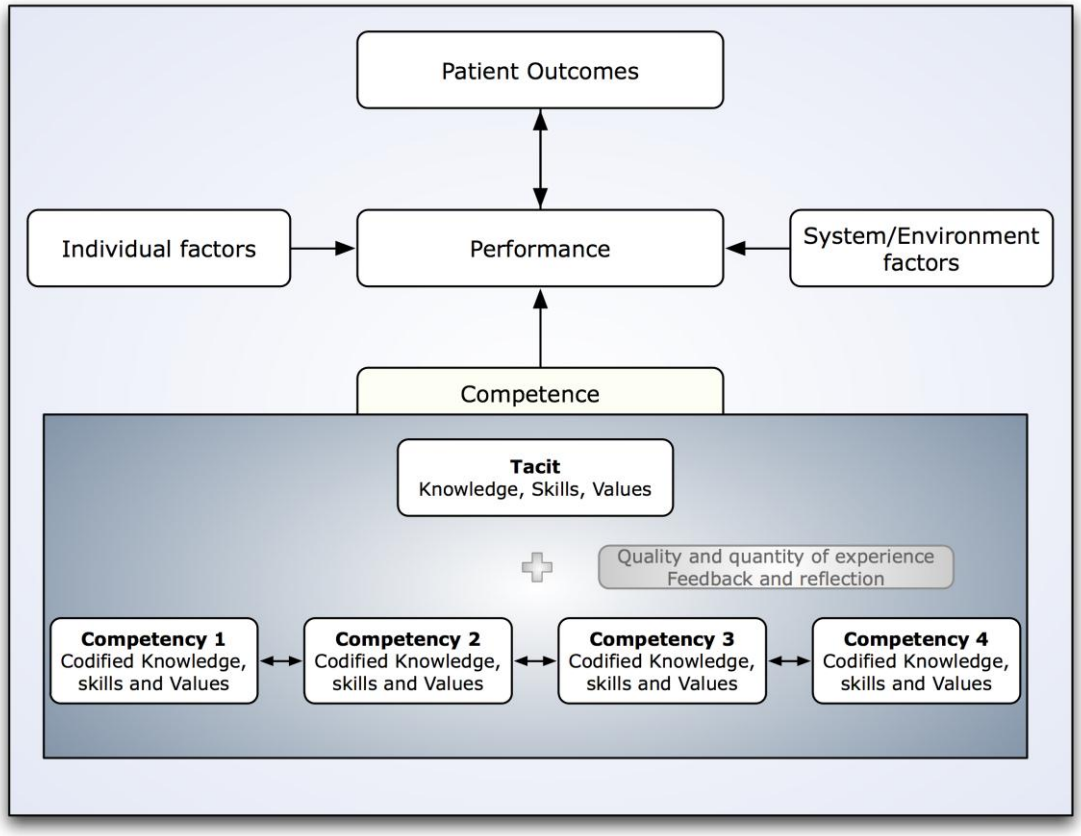
In the AMC Framework, **competence** in the medical context is not seen as a steady state, having different meanings at different levels of medical education. For example, 'safe and effective practice' as a medical student, intern, vocational trainee and specialist are not the same. The sets of competencies that must be combined for safe and effective practice change as a doctor moves through different career stages. So does the complexity of decision-making and judgement required and accountability for these rests increasingly with the individual doctor as he/she becomes more senior. Competence does not, per se, ensure that the individual practitioner will perform in any particular way in response to a clinical situation.

Performance relates to actions taken in practice. It goes beyond preparedness and is observable. Underpinning observable practice is a reservoir of codified and tacit knowledge, accumulated through experience that adds to competence over time. The tacit knowledge is important for making the professional judgements required for complex clinical problems and

dealing with uncertainty. Time is an important element here, as the multiple experiences and the reflection required to build tacit knowledge cannot occur without the time dimension.

The final framework, including all of the elements, is shown in Figure 2 below. This figure is designed to show the basic relationship between the conceptual elements and is not intended to show an individual's sequential development. The complex interaction between all of the elements shown in the figure is recognised and it does not attempt to show all of these interactions.

Figure 2: Conceptual Framework for Competence-Based Medical Education



Key concepts of this framework are:

- Overall competence is built on the accumulation of both codified and tacit knowledge;
- The development of tacit knowledge is dependent on the quality of the learning; experience and on the opportunities for feedback and reflection;
- Observed performance reflects underlying competence;
- Observed performance goes beyond preparedness and takes into account case specifics;
- Individual circumstances and system factors can, and do, influence performance; and
- Over time, tacit knowledge can lead to performance improvement, subject to the influence of individual circumstances and system factors, and eventually lead to the development of more codified knowledge.

For more experienced practitioners, therefore, observed performance reflects more than just a clinical reasoning process that ends at 'the right thing to do generally' in response to a complex clinical problem (de Cossart and Fish 2005, p. 137). The actions taken reflect a

professional judgement of what is best, given the specific circumstance of the case. Performance can also be influenced by system factors, and individual practitioner factors that are overlaid on underlying competence (de Cossart and Fish 2005, p 137). For example, a doctor may perform differently when sleep deprived than when well rested.

Challenges and assessment

A broad competency-based approach to medical education has been in operation in Australia since 2000 in a number of Specialist Colleges who have adopted and modified the CanMEDS model to underpin their training programs. To date these models have followed a high-level, coarse-grained approach to defining competencies and have avoided the descent into the tick-box approach to the assessment of competencies that have characterised a number of the previous attempts to implement competency based training and assessment in medical education.

A number of models of the competency based training that have been developed overseas, such as the 2003 Modernising Medical Careers approach in the UK (Tooke 2008) and the Accreditation Council for Graduate Medical Education competencies project in the US, have highlighted the shift from instruction to assessment that appears to follow the introduction of training built around defined competencies. By its very nature competency-based training requires effective assessment to ensure that the appropriate competencies are achieved, more so if the overall training time is to be reduced. In the UK the effectiveness of the competency-based training in the Foundation Year is currently under investigation due in part to concerns about the effectiveness of the workplace-based assessment system that was implemented to support the Foundation Year program.

An effective competency-based training model requires the interaction of a number of complex variables, including the:

- prescribed set of competencies;
- number of trainees involved;
- range of clinical settings;
- sequence of training components;
- set of assessment instruments required to match the competencies;
- adequate assessor time to assess the competencies; and
- provision of remediation where competencies are not achieved.

This requires a substantial investment in resources to undertake its associated assessment and remediation requirements, and in information management to track and monitor the implementation of the competency training.

Despite the difficulties of developing appropriate assessment models to support competency-based training, it would be incorrect to say that appropriate assessment is not feasible in this area. Work in the US has shown that investment in the design and administration of assessment instruments, together with regular monitoring and alignment of the competency standards, curriculum and assessment can mitigate the problems that have been experienced with assessment in a broad competency training framework for medical education, using a portfolio approach. (Dannefer and Henson 2007).

However, as a cautionary note, it is important to recognise that some propose that an advantage of competency-based medical education is the potential to reduce the overall time of training. This may constitute a barrier to its implementation. It is well recognised that

individuals learn at different rates and that, within a model of education based solely on competencies, would be expected to complete their training at different times. It is likely that the constraints of today's managed health care systems may not have sufficient flexibility to accommodate trainees completing their programs at different times. This needs to be factored in to any plans to implement competency-based training and assessment in medicine.

The AMC framework recognises that achieving defined competencies based on codified knowledge is critically important in medical education but put simply, the collection of competencies cannot constitute the whole. Knowing how to pull everything together as and when needed for particular patients and in particular contexts points to the necessity of a deeper level of knowing. The development of tacit knowledge underpins overall competence, and takes time and experience to develop. The implication of the framework for an assessment program is that overall competence and performance should be assessed as well as assessing the individual underpinning competencies. In the example of a barista making coffee (Example 2), the consumer can judge the quality of the overall product of a cup of coffee even though they cannot codify or judge the nature of the experience and tacit knowledge required to produce a high quality product. In Example 3 on page 14, the ability of a doctor to make good clinical management decisions is assessable, even though the underpinning tacit knowledge is not. These aspects of competence and performance are likely to be assessed best by methods such as workplace-based assessment made by competent clinical assessors where decision-making can be judged over a period of time and in different contexts.

Conclusion

The complexity of the doctor's role, the changing nature of that role as flexible team-based care becomes the norm, and the experience necessary to develop expertise argue against applying the concept of competence as simply a collection of discrete competencies. The AMC endorses the view that observed performance reflects underlying competence, but goes beyond preparedness, takes into account case specifics and has implications for how medical education is structured.

The AMC framework recognises that the following issues should be considered in relation to a competency-based approach to medical education:

- It would be wise to retain the coarse-grained concept of competent professional practice referred to earlier, where observed performance is more than the sum of the set of competencies used.
- Where learning and assessment of individual competencies is undertaken, this should be within the context of practice situations where relevant clinical performance can also be observed.
- Adequate experience for induction, initiation and the development of tacit knowledge appropriate to the level of practice required should be provided. This exposure to numbers of cases, variability of cases and contexts, and to multiple practitioners and their situational performance will require a time vector. However a preoccupation with mere time serving defeats the purpose.
- The perceived advantages of competency-based training tend to focus on the potential to shorten the length of training rather than on the quality of the experience in training. Time spent in training is not representative of the experience gained. There needs to be a focus on the quality of the experience and ensuring that the right experience is

gained in the time available. Time invested specifically to facilitate wide exposure to, and experience with, complexity is likely to show a good rate of return.

As indicated in this paper, defined competencies clearly have an important role to play in medical education, especially in training for procedural areas such as endoscopy, maternity services and surgery. However, conceptualising medical education as based entirely on obtaining competencies will at best be partial. There is a risk in adopting such an approach that educational functions, which cannot be translated into competencies, will be ignored. It is **induction** and **initiation** that ensures that medical education is more than a sum of competencies, that the whole is greater than the sum of the parts. Doctors need to acquire skills and learn facts and protocols but on their own they will not guarantee competence. This requires higher order thinking, reasoning and adoption of professional qualities, the complexity of which goes beyond specific competencies.

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AMC—*see* Australian Medical Council.

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