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Medical competence: The interplay between individual ability and the health care environment

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Abstract

Competency-based education in the health care professions has become a prominent approach to postgraduate training in Canada, the Netherlands, the United Kingdom, the United States, and many other countries. Competency frameworks devised at national and international levels have been well received, and in many cases mandated, by governing bodies. However, the teaching and assessment of competencies pose questions of practicality, validity, and reliability. In this article we propose that competence and competencies be approached in the context of the particular clinical environment, such that the assessment of competence is tied to a trainee's performance of essential clinical activities that define the profession. Competence is implicit in the eventual entrustment of trainees to perform these professional activities. Competencies and "entrustable professional activities" (EPAs) relate to each other as two dimensions of a grid in which each EPA can be mapped back to a number of competencies. This backward visioning from EPAs to competencies is proposed as a guide to curriculum planning and assessment. The authors discuss experiences with this conceptual model in research, curriculum development and learner assessment.

Introduction

Medical educators face the never-ending challenge of finding the best ways to organize teaching, learning, and assessment. In this article, we outline how current concepts of physician competence fail to account for the essential interplay between competencies and the contexts of practice, and propose an enhanced construct that stimulates further thinking about competency-based postgraduate medical education. We propose that the result of judging that a trainee is a competent practitioner can be to entrust him or her with the execution of critical professional activities. This entrustment is not an abstract assessment, but implies a judgment related to the clinical environment in which the trainee actually practises. We present the theoretical framework on which this model is based and propose new approaches to learning and assessment that can serve to advance competency-based medical education.

What matters in competency-based medical education is the outcome. The framework for clinical skills assessment, as described by Miller (1990), laid important groundwork for the integration of outcomes in models of medical education. Miller's framework is depicted as a pyramid. Working upward from the base, the learner first "knows" something, then "knows how" to use that information, and then "shows how" to use it. Finally, at the apex, the learner "does" – that is, he or she performs the acquired skills in actual clinical practice. The program evaluation model proposed by Kirkpatrick and

Practice points

- Competence entails more than the possession of knowledge, skills and attitudes; it requires the ability to apply these in the clinical environment to achieve optimal results.
- In teaching and assessing competencies, it is helpful to work backward from "entrustable professional activities" as a starting point for setting the objectives of competency-based training and assessment.
- Competence is not simply a feature of the individual; it is the product of the interplay between the individual and the practice setting. Assessment of competence should take into account the constraints and characteristics of the local environment.
- Trainees are part of a team and a wider organizational structure. The assessment of competence should involve intercollegial input.
- The ultimate outcome of competency-based medical education extends beyond measurable attributes of the individual; rather, it is directly linked to better care for individuals and society.

Kirkpatrick (2005), widely used in the training field, also emphasizes educational outcomes, which might be summarized as follows:¹ (I) reaction – learner satisfaction with education; (II) learning – effects on the learner measured in

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Table 1. Kirkpatrick hierarchy versus Miller hierarchy.

Kirkpatrick	Miller
Results (outcome and impact)	–
Behaviour	Does Shows how
Learning	Knows how Knows
Reaction	–

terms of knowledge and skills; (III) behaviour – observed changes in behaviour; and (IV) results – witnessed effects of behavioural change on a relevant environment. To date, most educational research has targeted outcomes pertaining to level I and II by using program evaluation, tests, and skills assessments. Levels I to III focus on outcomes for the individual being taught. Level IV focuses on the effect of education on the environment rather than on the individual. Table 1 shows how the Kirkpatrick hierarchy would “map” onto that proposed by Miller (1990). As becomes apparent, the Miller hierarchy leaves out both the lowest level in the Kirkpatrick hierarchy (the learner’s satisfaction) as well as the highest level (results of changed behaviour on the environment, the system, etc.).

Although both the Miller and the Kirkpatrick hierarchies are helpful, they have been criticized for their lack of utility in addressing the fundamental challenge of educators and front-line teachers, which is the ongoing, daily evaluation of the learner on a problem-by-problem or task-by-task basis in the clinical learning environment. To address this fundamental need, we propose that competence be described in the context of the interplay between the individual learner and the clinical environment. This approach is guided by three assumptions: (1) competencies are most relevant when they are defined in the context of the clinical environment; (2) competence varies as the environment changes; and (3) although it is important to assess what a physician knows or can do, it is more important to assess and predict the results of those actions within the clinical environment. This approach is one step beyond the traditional focus of outcomes-based education, where the outcomes considered are often limited to a set of end-characteristics of the physician, such as abilities, approaches to health care, and professionalism (cf. Harden et al. 1999; Simpson et al. 2002).

Competence in health care and the concept of entrustment

If we try to translate “results of behaviour” (Kirkpatrick hierarchy level IV) to the interplay with the health care environment, it is important but not sufficient to know that the “right person” does “the thing right” in a “professional manner” – terminology taken from the Scottish doctor model (Harden et al. 1999; Simpson et al. 2002). We want to know that the outcome of the behaviour – that is, what happens to the patient as a result – at least meets accepted performance standards. For example, a patient undergoing a procedure

should feel confident that a physician who is competent to perform that procedure (the “right person”) will explain and adeptly perform the mechanics of the procedure as well as describe and address any complications (the “right thing”), and will accomplish all of this in a professional manner. However, using “results” such as patient outcomes to assess the competence of individual doctors poses a formidable psychometric challenge (Norcini 2005) and is complicated by the potential for attribution errors. However, teachers continually make implicit judgments about whether trainee behaviours produce expected results in the clinical learning environment. These judgments can be framed in terms of the concept of “entrustment.”

A teacher or supervisor needs to judge whether a trainee or a doctor can be entrusted with critical clinical tasks. To entrust – to “assign a responsibility to” or “to put (something) into someone’s care” (Compact Oxford English Dictionary) – is predicated on the belief that the desired outcome will result. When a physician or trainee is asked to carry out a critical activity, a supervisor, colleague, or patient would want to trust that “the thing will be done right.” Entrustment decisions take place every day in health care environments. For example, supervisors of residents on a night shift must decide whether to be present in the hospital in case problems arise. Even outside a training situation, the strong interdependence of professionals in high-quality health care constantly requires mutual trust.

The distinction between appraising “competence” as traditionally defined using Miller’s pyramid, independent of local environment and circumstances, and appraising “results of behaviour” as in the Kirkpatrick hierarchy, may sound like a subtle semantic detail. It is not. Given the changes that health care and medical education have undergone in the past decades, “results of behaviour” are increasingly difficult to predict from “competence” as assessed in examinations – even in highly structured formats such as the OSCE (observed structured clinical examination). In addition, outcomes are the product of the integration of many competencies and sometimes require that the learner or practitioner compensate for competencies that are relatively weak by drawing on resources within the practice environment. For example, a physician with knowledge gaps in specific content areas but superb reflective skills might deliver high-quality care if, being aware of his or her limitations, he or she compensates by consulting others. A highly successful physician in a familiar clinical department may stumble in an unfamiliar context. These examples illustrate the interplay between competence and context in the determination of patient care outcomes.

A century ago, the physician could be considered to have acquired, during a limited number of years of formal education, all knowledge and skills necessary for a lifetime in practice. This is not the case now. Current and future physicians must deal with constant changes in health care, developments in science, rapid evolution in standards of care, new rules and protocols emanating from regulatory bodies, organizational and systems change, increased patient demands and increasingly well-educated and informed patients. These changes are compounded by other factors that affect the clinical learning environment, including duty-hour limits,

decreased length of hospital stays, a change in inpatient diagnostic mix such that more chronic disease is seen, increased severity of disease, and increased multidisciplinary of care. The end result of these changes is more frequent and critical hand-offs. In such complex circumstances, one must be able to trust that the physician will interact effectively with the context. This trust is based not only on current knowledge and skill, but also on the capability to compensate, as needed, for a *lack* of ready knowledge and skill (Fraser & Greenhalgh 2001). Almost by definition, competence is then established as arising from the interplay between ability and the clinical environment.

Operationalizing competency-based education with entrustable professional activities

The competencies of medical specialists and physicians have, in general, been well documented in several models, such as CanMEDS (Frank 2005), the standards of the US Accreditation Council for General Medical Education, and the “Tomorrow’s Doctors” initiative in the UK (General Medical Council). The CanMEDS 2005 model, developed by the Royal College of Physicians and Surgeons of Canada and increasingly being used worldwide, describes the physician’s seven “roles” or “domains of competence.” Most of these roles have been widely welcomed as important qualities that physicians should cultivate in addition to the core domain of medical expertise. Communication, collaboration, health advocacy, management, scholarship, and professionalism are considered qualities that need new or renewed attention in the training and daily practice of physicians. One pedagogical strength of this framework is that seven is the magical number of separate entities that people can readily retain in their working memory (Miller 1956). The model is easy to remember and to reproduce, which increases the likelihood that it will be integrated and internalized by relevant stakeholders.

However, thinking in terms of competencies can be confusing. The CanMEDS roles are often called “competencies” or “core competencies.” The CanMEDS 2005 framework makes further distinctions between “key competencies” and “enabling competencies.” Although the full framework impresses as a thorough, thoughtful document, too much detailing of roles into subcategories can lead to misunderstanding. For example, “Work collaboratively with others in their organizations” is listed as Enabling Competency 1.1 under the “Manager” Role. Although this seems logical, many readers will expect this competency to appear under the “Collaborator” Role. This example demonstrates the interconnectedness of these competencies. The Dutch translation of the seven CanMEDS Roles uses the word *competentiegebieden*, “fields” or “domains” of competence, stressing that they are *facets* of competence, rather than competencies in themselves.

Competency-based education in secondary and vocational training in the Netherlands has acquired a negative connotation, to the point where an investigative parliamentary commission has voiced strong criticism of this approach (Dijsselbloem Committee 2008). One basis for this criticism is a tendency to describe general competencies in exhaustive

detail, leading to bulky, fragmented documents that lose practical value for education as they become less and less connected with the real world. Secondary and vocational schools have faced many problems with the implementation of competency-based education. A disconnect exists between the aim of meaningfully shaping education and assessment and the strategy of extensively detailing general competencies to achieve that goal. A recent review shows that the meaningful assessment of *separate* competencies is difficult to achieve (Lurie et al. 2009). This review deals with competencies formulated by the US Accreditation Council for Graduate Medical Education, but likely applies to similar models such as CanMEDS. In addition, the sum of what professionals do is far greater than any parts that can be described in terms of competency (Grant 1999). Meaningful assessment lies in determining whether someone is a good doctor, and this is contingent on his or her ability to integrate a myriad of competencies to provide optimal patient care. Focusing solely on the perceived superior objectivity of checklists over global assessments by experienced clinicians, for example, may lead us away from meaningful assessment (Schuwirth & Van der Vleuten 2006). This can have the effect of atomizing competencies, increasing bureaucracy, and moving away from expert opinion and from what really matters in day-to-day clinical practice (ten Cate 2006).

Paradoxically, however, competence and competency are often defined as *integrative* qualities that combine knowledge, skill and attitude (Van Merriënboer et al. 2002). CanMEDS Roles are usually carried out in combination. Being able to do “the right thing in the right way” requires this integration (Simpson et al. 2002). The object of competency-based education had, therefore, better be these “things,” i.e., concrete professional activities in daily practice. Such “things” require the integration of skills and attributes necessary for good medical practice. A strong distinction among or separation of the seven Roles in medical education is therefore somewhat artificial. In daily clinical practice, roles are intertwined, and it is likely that they should be taught and assessed in an integrated manner: that is, integrated with each other and integrated into the task at hand (Rousseau et al. 2007).

This leads us to the use of the professional activities of daily practice as the starting point for competency-based education (ten Cate 2005). Does this approach, directed at professional activities, conflict with the distinction of roles or competencies? Not at all. Both approaches can be viewed as two dimensions of the competency grid presented in Table 2 (cf. ten Cate & Scheele 2007).

The accuracy of the examples given in cross-section in Table 2 may vary, and greater emphasis may be given to some competency domains or roles than to others, but the general idea presented is of a task or series of tasks in which a number of roles are expressed. Professional activities almost invariably reflect several, and often most, domains of competence, often with different weights. This means that in training, observing, and assessing professional activities and their outcomes we implicitly address multiple domains of competence. Curriculum development efforts in health care in the Netherlands have shown that it is possible to map medical

Table 2. The competencies-activities matrix.

Professional activities	CanMEDS roles						
	Medical expert	Communicator	Collaborator	Scholar	Health advocate	Manager	Professional
Performing a venipuncture	•	•					
Performing an appendectomy	•	•	•				
Signover at morning report after a night shift	•	•	•	◦		◦	
Developing and implementing a patient management plan	•	◦	•	•	•	•	
Chairing a multidisciplinary meeting		•	•			•	•
Requesting an organ donation	◦	•			•	•	•

Closed circle = competency is absolutely needed. Open circle = competency is needed, but to a lesser extent.

specialties in such two-dimensional matrices (Wijnen-Meijer & ten Cate 2006; Scheele and colleagues 2008; Spengelink-Schut et al. 2008). The approach in curriculum construction used in these examples was to analyze a specialist’s professional work and to list all those activities that can be called an “entrustable professional activity” (EPA). Thus, EPAs are tasks that should be entrusted only to those individuals who have adequate competence to carry them out. More specifically, EPAs have been defined as forming part of essential professional work in a given context; requiring adequate knowledge, skills and attitudes, which are generally acquired through training; leading to recognized output of professional work; usually confined to qualified personnel; independently executable within a time frame; observable and measurable in their process and their outcome; and reflecting one or more of the competencies to be acquired (ten Cate 2005).

Using EPAs in curriculum development

The EPA concept has been used in conjunction with CanMEDS competency domains in Dutch training for public health physicians (Wijnen-Meijer et al. 2006), subsequently in several clinical specialties (Scheele & Schutte 2008), and recently in workplace curriculum planning for physician assistants (Mulder et al. 2009).

This last example merits some elaboration. The physician assistant (PA) is a new health care professional in the Netherlands; he or she is a non-medical professional who provides medical care by taking over specified clinical tasks from specialists (Spengelink-Schut et al. submitted). The entrustment principle is relevant in this context. The Utrecht PA workplace curriculum is currently being built around tasks that medical specialists consider suitable to be entrusted to well-trained PAs. A pilot project in urology revealed that a spectrum of critical urological tasks can be identified as suitable EPAs for PAs. These tasks range from performing cystoscopies and rectal biopsies to organizing and planning multidisciplinary meetings and teaching patients (Spengelink-Schut et al. 2008). Part of this project is the establishment of a competencies-activities matrix validated by urologists. PAs should be well trained in a limited area of medical expertise, and the use of EPAs in building a workplace curriculum for PAs has been particularly useful. The PA students who enroll

differ with respect to background, training, and experience; also the specifics of the clinical learning environment in which they train differ, and consequently the speed at which they attain competence in EPAs. All of these variables must be taken into account. PAs therefore finish the course with a *personal attainments portfolio* that reflects the EPAs that have been mastered and formally acknowledged. An attainments portfolio might include a very different set of EPAs for another PA, trained at another clinical location (Mulder et al. 2009). This example illustrates how EPAs and competencies can be elegantly combined and how readily the EPA approach to competency-based training can be accepted and understood by medical specialists.

Using EPAs in the assessment of competence

It is difficult to conduct a meaningful assessment of competencies derived from a competency framework (Lurie et al. 2009). Ask a clinical supervisor to assess a trainee’s competence in one of the CanMEDS roles: difficulties with validity and accuracy become manifest. Ask the supervisor to assess the process or outcome of a practical activity that is an EPA: chances are that this assessment will be much more accurate and efficient (ten Cate 2006).

The EPA concept nicely fits into the philosophy of competency-based education. Once a trainee has shown sufficient competence for a specific activity (EPA), the acknowledgement of this milestone can lead to formal entrustment decisions. Currently, licensing for practice implies formal acknowledgement of competence for all relevant professional activities at the same time. The goal of competency-based education should be linked to observed competence, rather than to the current proxy measure, length of training. As educators, we should recognize that all trainees do not reach the same level of competence for all activities at exactly the same time. Figure 1 shows the general curvilinear growth of competence for a skill, staged with the terminology of Dreyfus and Dreyfus (1988), which has been used elsewhere in relation to competency-based medical education (Carraccio et al. 2008). Several studies show how this curve generally reflects skill development in medicine (Konrad et al. 1998; Tassios et al. 1999; Liberman et al. 2001; Hayashino et al. 2006). “Competence” could then be viewed as the threshold

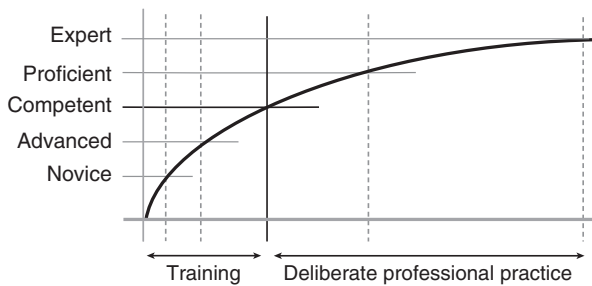


Figure 1. General curve of skills acquisition, using the stages of Dreyfus and Dreyfus (1988). Dotted lines signify hypothetical moments at which a trainee reaches a competence threshold level for a given activity.

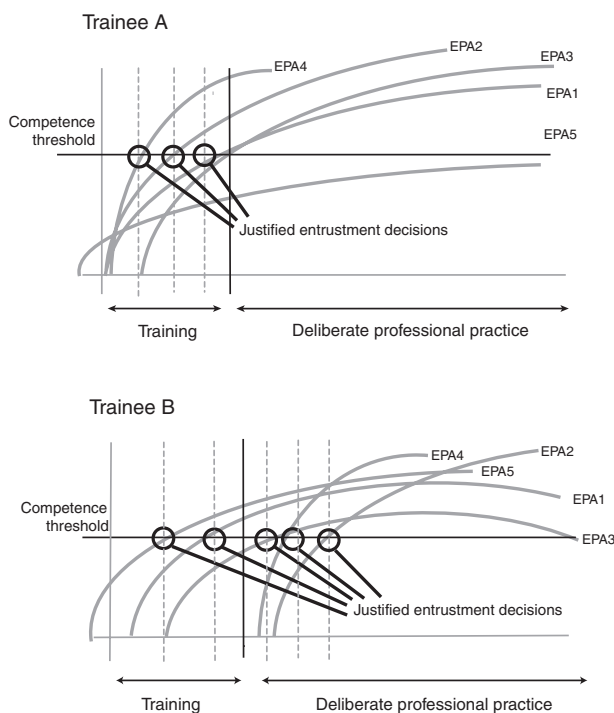


Figure 2. Hypothetical learning curves for two trainees as they acquire competence in six entrustable professional activities (EPAs). Dotted lines signify hypothetical moments at which a trainee reaches a competence threshold level for different EPAs, showing intra- and inter-trainee variation.

level in the development of expertise that permits unsupervised practice.

Figure 2 shows schematically how intra-trainee variation in learning curves occurs across various EPAs, and from one trainee to another. These diagrams are meant to illustrate that competence for professional skills is reached at different moments within trainees and between trainees, and that the decision of when to entrust, acknowledge, and perhaps even license, should vary accordingly.

The recommended practice in Dutch postgraduate training programs is (a) to use five levels of entrustment for EPAs and (b) to formally acknowledge when a resident is considered competent to carry out an activity without supervision

Box 1. Levels of entrustment.

- I Resident has knowledge and some skill, but is not allowed to perform the EPA independently.
- II Resident may act under proactive, ongoing, full supervision.
- III Resident may act under reactive supervision, i.e., supervision is readily available on request.
- IV Resident may act independently.
- V Resident may act as a supervisor and instructor.

EPA = entrustable professional activity.

(Scheele & Schutte, 2005; ten Cate & Scheele 2007; Scheele et al. 2008). These levels of entrustment or proficiency are shown in Box 1.

Level IV reflects the attainment of full entrustment or acknowledgement of competence. This acknowledgement has been called a “statement of awarded responsibility” (STAR) for an EPA and should find its way to an attainments portfolio of the resident (ten Cate & Scheele 2007).

Working with EPAs and such formalized entrustment decisions during residency training provides an opportunity to acknowledge differences between residents and to operationalize one of the major characteristics of true competency-based training. Neither input, length of training, nor recorded experience alone should determine when overall competence is reached; rather, this decision should be based on the set of individual EPAs attained. Residents at the end of their formal training may be characterized by the number and quality of EPAs mastered, and they may differ as a result of their effort and ability. Mastery of EPAs may continue after the completion of formal structured training and could be considered steps toward maintaining specialty certification. Working with EPAs may therefore be a more flexible and transparent approach than working with single diplomas and uniform registrations.

What this discussion has not yet addressed is the question of how to assess the levels listed in Box 1 for any given EPA. In practice, entrusting residents with responsibilities for critical tasks probably depends on four groups of factors: (1) the estimated ability of the resident; (2) the approach and skills of the supervisor; (3) the nature of the EPA; and (4) local circumstances or context, such as time of day, whether the activity is being done in an emergency situation, and resources or personnel available (ten Cate & Scheele 2007). Three recent (qualitative and mixed-methods) studies confirm the existence of these four groups (Kennedy et al. 2007; Dijksterhuis et al. 2009; Sterkenburg et al., submitted).

In reality, decisions of entrustment are based much less on the estimated competence of residents than one would like to believe. Sterkenburg et al. (submitted) show how clinical staff differ in their opinions as to what residents should be able to do, specifically at early stages of training, and how they tend to assign tasks at higher levels of responsibility than they generally find suitable.

If competency-based medical education is to be structured around EPAs and formalized entrustment decisions, a pressing question is how to structure assessment in a way that supports the validity of these decisions. Despite their increasing popularity, in-training assessments have drawbacks. Although the Mini Clinical Examination Exercise (MiniCEX)

was introduced by the American Board of Internal Medicine on the grounds that it would yield more reliable assessment than the traditional end-of-term CEX (Norcini et al. 1995), currently the MiniCEX is viewed as a formative more than summative instrument (Norcini & Burch 2007). Developments in in-training assessment have led to serious concerns about validity and standards (Albanese 1999, 2000).

A pragmatic approach that is currently being tested with the PA project in Utrecht is a proposed rule by which formalized entrustment decisions are not the sole responsibility of a given supervisor, but should be signed by two independent clinicians who have had the opportunity to observe the trainee. These judgments are made in addition to judgments made using other assessment procedures (such as MiniCEX, simulated skills assessment, etc.).

This area still requires considerable thought and research. Assessment at the workplace demands a different approach, in which subjective judgment is viewed not as a problem to overcome, but rather as a necessary part of assessment (Schuwirth & Van der Vleuten 2006). However, medicine has always been viewed as a prototype of a “profession” in the original sense. Its members have knowledge and autonomy, and they are expected to behave responsibly and ethically in return for the privilege of self-regulation. Even with scientific evidence, guidelines, protocols, rules, and regulations at hand, professionals must constantly make personal, independent decisions, and the public must trust that they do this well. Almost by definition, professionals cannot be judged on objective measures alone, as they may have good reason to differ in their convictions about optimal care. With this context in mind, judging professional skills and behaviour requires intercollegial appraisal of trustworthiness to exercise one’s professional role and the critical activities within it, and this appraisal should include an assessment of the process and results of these activities. This approach appears to be a promising approach to assessing competence.

The interplay

In this discussion, competence is viewed not only as the possession of knowledge, skills, and attitudes, but rather as the ability to use these in the clinical environment to effect desired results for patients. First, we have argued that the problem with a reductionist approach that assesses and teaches separate competencies does not allow us to determine whether someone is a good doctor; the latter requires the integration of competencies in the context of the clinical environment. Envisioning this process by working backward from EPAs provides a more meaningful starting point for competency-based training and assessment. Second, it is helpful not only to view competence as a feature of the individual, independent of the impact on the environment, but also to look at achieved results. Taking into account what is being accomplished in health care within the constraints and characteristics of the local environment may be more useful than assessing individual ability alone. Third, trainees in health care are part of a team and a wider organizational structure. Decisions pertaining to the division of labour in this organization include trainees. Many of these decisions involve entrustment of

professional activities, and therefore implicit judgments about competence. These elements force us to view medical training and assessment of competence within the context of the interplay between individual ability and the clinical environment.

Eventually, the medical profession must be trusted to achieve the best possible results, given the complexities of the patients we serve and the constraints posed by hospitals, medical associations, legislation, scientific advances, and other features of the environment. Competence is therefore not confined to a measurable attribute of the individual, but should be viewed with the context of the interplay between ability and the environment. This will require aiming higher than the apex of Miller’s pyramid, to ensure that competence is directly linked with better care for individuals and society.

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Note

1. The Best Evidence Medical Education (BEME) collaboration has subdivided two of these levels to guide literature searches. For reasons of clarity we utilize the original four levels.

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