Fitness for purpose in anaesthesiology: a review

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The purpose of this review is to explore how fitness for purpose can be defined for anaesthesiology graduates and to delineate the parameters of this concept for anaesthesiology. Newly qualified anaesthesiology graduates experience difficulties with the transition from trainee to specialist, with perceptions of unpreparedness especially in non-technical skills. This may be deleterious to the individual, the patient, colleagues and the workplace. It is possible that graduates may be deemed competent yet are unable to fulfil all their specialist roles. Fitness for purpose and its relationship with competence, expertise and excellence in anaesthesiology have been poorly defined in the literature. These concepts are not synonymous but provide a hierarchical framework for the development of a specialist from a beginner to an expert. The uncertainties surrounding competence are numerous, with generic competency frameworks not addressing all aspects unique to anaesthesiology. The applicability of such frameworks in areas outside which they were originally designed and, in particular, in anaesthesiology, is questionable and requires further investigation. Defining fitness for purpose in anaesthesiology will assist training departments, curriculum designers, assessors and regulators to produce specialists that are experts in their chosen field without any deficiencies and thus able to perform all their required roles.

Keywords: anaesthesiology, fitness for purpose, medical education

Introduction

Anaesthesiology is a dynamic speciality with an ever-increasing scope of practice. For anaesthesiologists to function optimally as perioperative physicians, it is essential that graduates perform adequately in all their professional roles. The aim of this review is to explore how fitness for purpose can be defined for anaesthesiology graduates and to delineate the parameters of this concept.

Fitness for purpose in medicine

Fitness for purpose has been studied extensively in non-medical professions such as architecture and construction, business, consumerism and aviation. The Oxford English Dictionary (OED) defines it as 'suitable for the intended use; fully capable of performing the required task'.[1] In legal terms, it may mean 'appropriate, and of the necessary standard or quality, for its intended use or purpose'.[2] From a consumerism perspective, it implies that the product created is suitable for its intended purpose and possesses qualities that are ideal for its expected use, situation and customers. The newly qualified specialist as a 'product' would thus need to meet a suitable standard and be deemed appropriate for use by consumers to be considered fit for purpose. Any effective production process must take into account the expectations of society as well as of the system into which the product will be placed.

Several studies illustrate that new specialists across varying disciplines often feel unprepared for aspects of their roles as specialists.[3–5] Junior doctors have felt unprepared or have been assessed as such by their seniors[6–15] with preparedness rates as low as 42%.[8] This also applies to postgraduate training, with perceptions of unpreparedness experienced by both trainees[16] and specialists.[5,17] Studies of newly qualified specialists suggest that some are more deficient in generic non-technical skills (NTS), for example management[5] or leadership,[18–21] compared with their technical abilities.[3,4,19,20,22,23]

As with newly qualified junior doctors,[24] recently graduated specialists who are less well equipped for their work roles have reported varying but higher degrees of anxiety, stress and burnout compared with their older or more experienced colleagues. This may culminate in decreased quality of patient care and diminished job satisfaction.[5,19,22,25,26] Such issues should be addressed to ensure practitioner well-being and quality patient care.

Defining fitness for purpose in anaesthesiology

A clear understanding of fitness for purpose is necessary to determine whether new anaesthesiologists are ready for independent practice. Related themes that arise from relevant literature can be grouped conceptually into two categories:

(1) The good doctor;
(2) Competence, expertise and excellence.

The good doctor

Since the original oath of Hippocrates, doctors have striven to adhere to its principles, despite its inevitable modernisation.[27,28] The application of expert clinical knowledge and care that are scientifically sound forms a thread throughout the oath. However, the 'art' of medicine is strongly advocated as a virtue for all good clinicians. The multiple roles that good doctors fulfil has long been recognised.

In defining a good doctor, perspectives vary among patients, the profession and regulatory bodies.

Patients' views

How patients prioritise doctors' skills and attributes is inherent in their satisfaction with the healthcare system to which the doctors belong.[29] The European Task Force on patients' evaluations of General Practice (EUROPEP) revealed that patients

rate a doctor's 'humanness' as the most important aspect of patient care, followed by 'competence/accuracy', 'patient involvement in decisions' and 'time for care'.[29] Studies on patients' views, including an African perspective,[30] highlight the concurrent desire for clinicians to be technically skilled,[31] adept at maintaining interpersonal relationships and communication,[31] and able to meet appropriate levels of competence.[29,32,33]

Learners' views

In a study addressing learners' views, students emphasised that 'humanism in medicine' cannot be neglected by striving for academic excellence alone. The need for 'relational intelligence' was highlighted with the 'good doctor' embracing ongoing learning and the formation, nurturing and assessment of relationships with the patient, colleagues, learners, society and the profession.[34] Student views consistently rank non-technical skills (NTS) such as listening, compassion, informative communication, non-discrimination and empathy as priorities[35,36] in good doctors.

Anaesthesiologists' views

In determining what constitutes a good anaesthesiologist, the opinions of anaesthesiologists themselves are invaluable. Components such as excellence[37–41] and professionalism[42–45] have been explored; however, there remains a paucity of available literature on what anaesthesiologists believe a good or holistic practitioner should look like. Anaesthesiologists believe that their technical prowess alone is not sufficient and their NTS are important and need to be assessed[46] in order to prevent adverse outcomes.

Regulators' views

Regulatory authorities provide practitioners with guidelines for good medical practice. These comprise rules of professional conduct and ethical principles against a country's legal framework, to which all good doctors must adhere.[47,48] Several specialist training and regulatory authorities have practice guidelines for specialists, which do not necessarily imply that specialists will be exceptional. They do, however, ensure that specialists at least meet a minimum standard deemed appropriate for that country to obtain licensure to practise.[49–51]

Competence, expertise and excellence in anaesthesiology

In exploring whether the concept of fitness for purpose extends beyond just being a good doctor, it is important to describe terminologies that are sometimes used interchangeably.

Competence

Competence refers to 'sufficiency of qualification; capacity to deal adequately with a subject' and implies that a competent individual is sufficiently trained to manage his/her subject matter.[52] Various medical and educational definitions of competence exist with predominant features of the knowledge, skills, core values (attitudes) and behaviour that an individual should possess to perform the task for which he/she is trained.[53–55] Matveevskii, Moore and Samuels consider competence to be contextual, emphasising the role of the situation.[44] Competence comprises not only knowledge and skills, but a true understanding of work and the work environment with intuitive expert knowledge.[56,57]

Larsson suggests that providing an 'all-encompassing' definition of competence is difficult and that one should, rather, look at how it is used to better describe it.[56] Five dimensions of professional competence of anaesthesiologists are proposed:

- Knowledge (theoretical)—encompassing a deeper approach to understanding rather than pure factual recall;[56]
- Skills (practical)—dependent on a 'trained hand … a trained eye … and the ability to understand a situation in a holistic way';[56]
- Anaesthetic non-technical skills (ANTS);[56]
- An understanding of the work being done—helping the patient and managing their physiology whilst leading the perioperative team and supporting the system;[56]
- Expert knowing that is intuitive in nature—having tacit knowledge that is primarily determined by knowing HOW rather than by knowing WHAT.[56]

Expertise

An expert is 'one whose special knowledge or skill causes him to be regarded as an authority; a specialist'.[58] Expertise is defined as 'expert opinion or knowledge' or 'the quality or state of being an expert'.[59] Work experience alone may not be sufficient in becoming an expert, although it may contribute if it is reflective. Becoming an expert needs to include a context and process of learning and training within a given social role, thereby enabling one to become technically and non-technically adept. The expert makes use of fast thinking that is based on integrated tacit knowledge used subconsciously and without deliberation.[56,60] Expert action is therefore spontaneous and frees up the individual to spend more time on tasks for which he/she has no expertise.[60]

Excellence

Excellence is defined as 'the possession chiefly of good qualities in an eminent or unusual degree; surpassing merit, skill, virtue, worth, etc.; … , eminence'.[61] In anaesthesiology, excellence implies transcending a minimum standard and is a goal towards which many aspire. Excellent anaesthesiologists are more than competent and effectively combine all their skills[41] to become specialists that are exceptional rather than merely mediocre.

Glavin suggests that many tacit components of excellence have already formed part of the practice of anaesthesiology without explicit recognition.[41] He, like others,[37,40] argues that several NTS may promote excellence in anaesthesiology, as these become more explicit and are effectively used in complex decision-making. However, many NTS have already been incorporated into competency frameworks, thereby implying their contribution to competence rather than to excellence. The question of what sets the excellent anaesthesiologist apart from the expert one thus arises.

Smith, Glavin and Greaves, in their UK-based Delphi-designed study of anaesthesiology experts, attempted to define excellence in anaesthesiology and considered possible ways to promote its practice in the discipline.[39] They suggested that excellence encompasses not only superior skills and knowledge, but also a group of personal attributes (personal qualities and personality functions) and their relationship within the work environment. The commonest distinguishing feature in their proposed definition was the continual desire to seek challenges and to learn from them, fostering an environment conducive to the pursuit of excellence.[39] However, this is what Larsson calls competence rather than excellence.[56] Smith and Greaves suggest that excellence may be defined as having an

understanding of work,[40] although this again is what Larsson considers competence.[56] Smith proposes that excellence may be that elusive 'something' that binds all the components of a specialist together.[38] Defining the 'something' is difficult. It may refer to the way in which an excellent anaesthesiologist processes, integrates and incorporates the copious number of influences in a scenario to produce a favourable outcome. It may refer to an area of tacit knowledge that has not been fully elucidated, which allows one to have excellent results all the time. There remains, however, very little knowledge regarding markers or assessment of excellence to help embed it in anaesthesiology.

Competence, expertise and excellence are often used interchangeably when describing the process of attaining skills in specialist training; however, they are not synonymous but, rather, hierarchical. Competence can be seen as the minimum required to practise effectively, expertise as established capability with experience, and excellence as acknowledged superlative performance. Use of these terms often poses ambiguity, because of the various definitions of competence and its comparatives that exist in the literature, but it is important to remember that these concepts are distinctive.

Competence is the commonest term used when describing the training of specialists. As a threshold that all trainees must cross successfully, it requires further discussion to clarify not only the ambiguity associated with the term but also the ways in which training for competence has been approached, and various possible limitations of competency-based training.

Competency frameworks

Competence is contextual in nature.[44] The competences of a worker become more specialised as his/her scope of practice narrows (see Figure 1).[54] A hierarchy of competences thus exists, and the core generic competences found in all doctors should be present in all specialists. Specialists, however, develop a new set of competences unique to that discipline that are deemed a minimum requirement to perform designated tasks.[54]

Figure 1: The hierarchical nature of competency acquisition according to Walker and Russ[54] (reproduced with permission).

Traditionally, competency was thought to be achieved after an appropriate, fixed contact time was spent in the relevant discipline, the so-called time-based or apprenticeship model. Recent insights have questioned the validity of this concept. All 'products' will not necessarily emerge from the process fully competent after a set time.[62] Trainees are exposed to different materials and assimilate information at different rates.[53] There is a move towards a competency-based training model, where individuals are trained and assessed in roles deemed appropriate for performance as independent practitioners. This outcomes-based approach considers assessment less subjective if concise, well-defined objectives are specified.[53]

The Accreditation Council for Graduate Medical Education (ACGME) in the United States and the Royal College of Physicians and Surgeons of Canada oversee the training and teaching of their respective specialist trainees. Such oversight attempts to assure the public and medical community of the production of safe and competent practitioners. There has been a growing demand from all stakeholders for increased accountability of specialists resulting in organisations challenging their own standards and quality of training programmes to ensure that graduates remain fit for purpose. It was thus necessary to further formalise training with the goal of attaining minimum core technical and non-technical competences in a competency-based model. The ACGME, together with the American Board of Medical Specialties, established a set of six core competences upon which all their specialist training is based (see Table I).[53, 63, 64] Likewise, the Royal College of Physicians and Surgeons in Canada in 2005 created seven recently updated CanMEDS (Canadian Medical Education Directives for Specialists) competences[65] (see Table I) for specialist training.

The ACGME and CanMEDS systems incorporate milestones considered as key components of a competent specialist. Achievement of these milestones is mandatory for trainees during their period of specialisation. Miller's pyramid of clinical assessment (see Figure 2) suggests that cognitive processes are reflected by knowing and by asking why.[66] Assessing behavioural and psychomotor aspects of learning involves actual performance of a task, i.e. 'shows how' and 'does' (see Figure 2), and are more relevant to the application of knowledge after attaining competence.

The Dreyfus five-stage model of skill acquisition describes how a beginner can progress through a period of training to become competent, proficient and ultimately an expert.[44,53,67] This was expanded by Park (see Figure 3) to include the absolute beginner stage.[67] According to Eraut, the early and mid-stages involve situational understanding of pattern recognition.[58] The latter

Table I: Core competences of medical specialists according to ACGME (Accreditation Council for Graduate Medical Education)[63] and CanMEDS (Canadian Medical Education Directives for Specialists)[65]

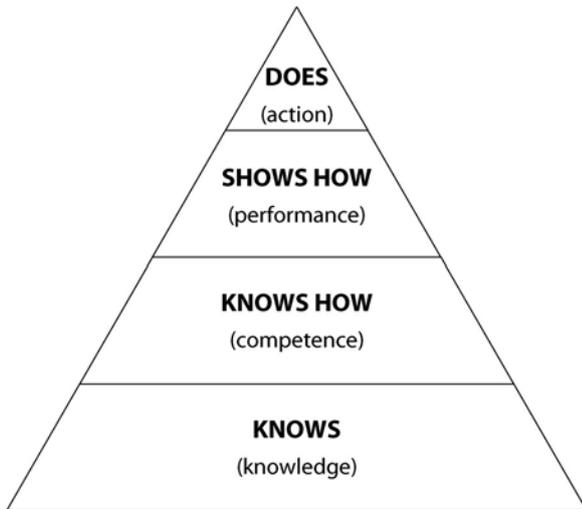| ACGME	CanMEDS
Professionalism	Professional
Communication and interpersonal skills	Communicator Collaborator Leader
Systems-based practice	Health advocate
Practice-based learning and improvement	Scholar
Medical knowledge Patient care skills	Medical Expert (central role)

Figure 2: Original pyramid of clinical assessment by Miller.[66]

stages of 'proficiency' and 'expertise' consist of tacit knowledge acquisition and work understanding during the course of training in various clinical scenarios, a concept shared by others.[44,57] This pinnacle of expertise (see Figure 3)[67] originally described by Dreyfus and Dreyfus[60] must be attained at specialist graduation when one is granted licensure.

Core competences of an anaesthesiologist deemed a minimum requirement by patients, peers and training institutions can be broadly classified as technical and non-technical. Technical skills (knowledge and practical components of anaesthesiology practice) are generally well taught and emphasised in most postgraduate training programmes. However, the less taught but increasingly important NTS of anaesthesiology practice (attitudes, behaviours, attributes) have been considered 'softer' components and not emphasised as much during training.[68] Suggested reasons for this de-emphasis are that NTS are harder to teach and/or assess and form part of the so-called 'hidden curriculum', implying that they are learned from mentors and role-models rather than through formal teaching. If specialist anaesthesiologists are to become experts who are fit for purpose in every aspect of their practice, then the focus
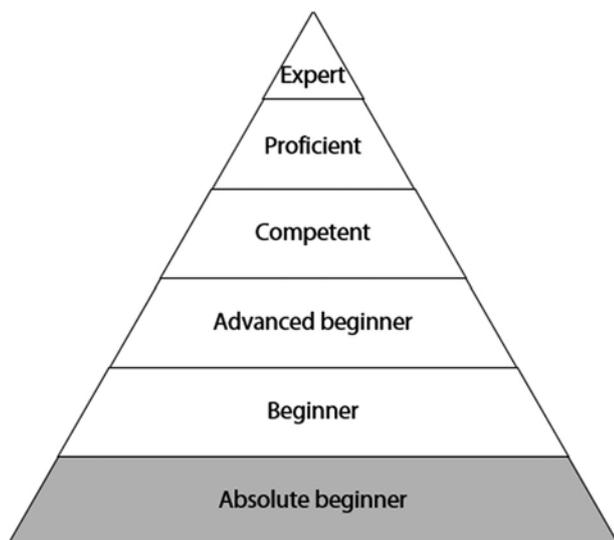

Figure 3: Modified Dreyfus model.[67]

of teaching, training and assessment should balance technical with non-technical skills to avoid any deficits at graduation.

Limitations of competency frameworks and competency-based training

Context specificity

The ACGME and CanMEDS outcomes-based competency frameworks have been adopted by anaesthesiology regulators within the US and Canada respectively. Both frameworks' component milestones establish the mandatory minimum for their anaesthesiologists. The practitioner who achieves these milestones is deemed competent. However, these milestones may be only contextually applicable since the frameworks were designed for these specific countries. Educators design training programmes according to the outcomes deemed appropriate for a specific set of needs. In high-income countries (HIC) it may be appropriate to focus on the needs of the individual consumer; however, in resource-poor low- and middle-income countries (LMIC), the needs of a nation may be prioritised over those of the individual. Training of anaesthesiologists needs to consider this, together with considerations of national demographics, education levels, ethnic groups and cultural practices of communities. North American models and milestones may not necessarily be applicable to other countries with their unique needs that drive production of anaesthesiologists.

Validity for anaesthesiology

Anaesthesia is a dynamic discipline and unique in some respects, as it involves integration of advanced technology, critical safety and complex tasks, and may, in certain scenarios, have a lot more in common with aviation than with other medical disciplines.[40] Interactions with patients are shorter and less complex but more intense than in other disciplines.[42] Competence in anaesthesiology cannot necessarily be assessed by means of attaining generic milestones[40] suitable for all specialists. Milestones should be evaluated to include aspects unique to anaesthesiology before adoption.

Content and context

Learning in anaesthesiology requires the acquisition of technical and NTS. Unlike technical skills, NTS cannot be as easily subdivided into milestone components, and are therefore formally taught or learned less readily. Similarly, NTS cannot be assessed using the same tools as for technical skills[69] or be assessed out of their relevant contexts. The importance of NTS is, however, clear as indicated by patients' opinions.[29–33]

Competency frameworks assume that competence is reached upon attainment of all individual milestones. The assumption that the individual is able to perform a task if he/she can perform the components of the task is not necessarily correct. Competences may be interdependent, and this may be missed by separating complex ones into individual components.[40,70] Competences involving complex tasks that interrogate the integration of skills, especially if non-technical in nature (e.g. decision-making), cannot always be reduced to single tasks or to questions in an exam.[71] Since this is a dynamic process, they may be poorly assessed by current means.[71] Many of the competences are considered to be 'meta-competences' or highly complex competences that can be applied to several activities.[70] The reductionist nature of the milestones approach thus places anaesthesiologists at risk of merely being proficient in individual core components in their own work environment with their own patients according to their own assessors and

standards. The possibility exists that one may be creating only parts of a whole product[62] and that these 'competences in context'[72] do not always ensure that anaesthesiologists will become experts.

Ultimately, anaesthesiologists do not all work in the same environment, preferring either the public or private sectors, or an urban or rural setting. This may result in differing emphasis on particular competences (e.g. management of healthcare funders for the private practitioner); however, it is imperative that all specialist anaesthesiologists graduate with all the core competences that are necessary for independent practice irrespective of their subsequent placement.

Measuring competence in anaesthesiology

The ACGME and CanMEDS models are two of the currently accepted and accredited competency frameworks used, despite their potential limitations for anaesthesiology. Determining whether a trainee has attained clinical competence has been more achievable with traditional tools of assessment.[62] However, the non-technical bouquet of social, cognitive and personal skills is often missed, which subsequently led to the development of the anaesthetists' non-technical skills (ANTS) rating scale in Scotland (see Table 2).[73]

Based on crew-resource management in the aviation industry, a hierarchical behaviour marker system and rating scale was devised to assess NTS unique to anaesthetists comprising four main categories (see Figure 4).[73] Each category comprises several elements with behavioural identifiers against which the individual could be rated. This model has limitations since it may not be appropriate in its entirety to particular scenarios, institutions or cultures, and has thus been modified by some,[74] requiring validation and reliability testing. The search for universally relevant tools for assessing NTS in anaesthesiology has been ongoing and has given rise to the consideration of simulation.[62] Simulation in anaesthesiology is growing in popularity, in part because it allows assessment of both technical and NTS simultaneously, as well as the ability to standardise scenarios, which is ideal for assessment. It also allows debriefing to take place, an important component of trainee instruction and learning that enables the trainee to modify his/her future behaviour(s). Attempts have already been made to combine milestones with simulation, but the latter requires validation.[62] Simulation has been used predominantly as a teaching rather than as an assessment tool[62] and its validity and reliability in summative testing has not been established, thus requiring further investigation. The cost of simulation, especially in LMIC where resources are limited, may be prohibitive.

Smith and Greaves regard competence as an unfortunate term implying that the individual is completely capable of performing the whole task, which is not always the case.[40] Regulatory authorities using competency frameworks do not always state explicitly that practitioners meeting the criteria to obtain licensure are 'competent' but this is often inferred. Unpacking specialist roles or meta-competences into their components on which the individual is assessed does not imply that the overall role can be performed. This can result in a 'component-competent' specialist who, unfortunately, is incompetent in the overall task required.[40] *Competence* in this context thus implies only that the individual has sufficient skill to perform components of a task. Larsson, however, suggests that by appreciating the *context* of the task, by having an *understanding* of the work and its environment and by combining them with *intuitive knowledge*,[56] the individual evolves beyond the traditional understanding of competence. The evolution from competency to proficiency and beyond, as described by Dreyfus and Dreyfus,[60] results in the creation of the *expert* who can apply multiple competences to complex tasks in any context in anaesthesia without having to stop and deliberate (intuitive knowledge). If frameworks such as CanMEDS have medical expertise at the core of all their roles (see Figure 4)[65] then those passing their assessments should be considered *experts*, as suggested by Dreyfus and Dreyfus[60] (see Figure 3),[67] rather than 'competent' since competence forms part of expertise. According to CanMEDS, the definition of the Medical Expert is a physician who 'integrates all of the CanMEDS roles, applying medical knowledge, clinical skills and professional values in their provision of high-quality and safe patient-centred care. It is the central physician role in the CanMEDS framework and defines the physician's clinical scope of practice.'[65]

It is important to note that despite the progression of a practitioner from competent to expert, NTS may still be deficient.

Table 2: Components of the anaesthetists' non-technical skills (ANTS) system[73]

Category	Element
Task management	Planning and preparing Prioritising Providing and maintaining standards Identifying and utilising resources
Team working	Coordinating activities with team members Exchanging information Using authority and assertiveness Assessing capabilities Supporting others
Situation awareness	Gathering information Recognising and understanding Anticipating
Decision-making	Identifying options Balancing risks and selecting options Re-evaluating

Figure 4: The CanMEDS (Canadian Medical Education Directives for Specialists) Roles. Copyright © 2015, Royal College of Physicians and Surgeons of Canada. http://rcpsc.medical.org/canmeds. Reproduced with permission.

We suggest that an anaesthesiologist who is *fit for purpose* is an expert without any deficiencies in either technical or non-technical skills.

Excellence however, surpasses fitness for purpose. What constitutes excellence in a specialist deemed fit for purpose requires further research. It may encompass an indication of the manner in which a specialist practises, or the ability to practise exceptionally well all the time. It may also relate to superlative patient outcomes, or the ability to innovate. As suggested by Miller,[75] excellence may make use of creativity, vision and leadership to explore uncharted waters and to surpass preconceived boundaries.

Conclusion

Fitness for purpose and its relationship with competence, expertise and excellence in anaesthesiology have been elusive concepts and poorly defined in the literature. Rather than being considered synonymous, they provide a hierarchical framework for the development of a specialist from a beginner to an eventual expert. The uncertainties surrounding competence are plentiful, with current generic competency frameworks perhaps not addressing all aspects of competence (e.g. NTS). Their applicability for the South African context, and validity for anaesthesiology, is questionable. These need to be explored before these frameworks can be used in environments outside North America. Since deficits in NTS exist in some graduates, these anaesthesiology experts are not currently fit for purpose despite qualifications citing licensure for practise. In order to protect both patients and practitioners, further exploration into fitness for purpose in anaesthesiology should be considered. Once fitness for purpose is attained by every graduate, then anaesthesiologists should set their sights on excellence, not only for maximal benefit of their patients but in pursuit of attaining their maximal human potential.

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