

FITNESS FOR PURPOSE OF SOUTH AFRICAN ANAESTHESIOLOGISTS

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Supervisors' approval

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Dedication

To my parents, who sacrificed everything for me,
and who taught me all that really matters.

Declaration

I, Nicola Ann Kalafatis declare that

(i) The research reported in this dissertation, except where otherwise indicated, is my original work.

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Date: 23 November 2020

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Co-author contribution statements

The three designated authors (Kalafatis, Sommerville, Gopalan) meet all four criteria for authorship recommended by the International Committee of Medical Journal Editors (ICMJE) ¹, including:

1. “Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work”;¹
2. “Drafting the work or revising it critically for important intellectual content”;¹
3. “Final approval of the version to be published”;¹
4. “Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved”.¹

There were four publications in total, listed as follows:

Paper 1: (Chapter 2, Part 2.1) Nicola Kalafatis, Thomas Sommerville and Pragasan Dean Gopalan. Fitness for purpose in anaesthesiology: a review. Southern African Journal of Anaesthesia and Analgesia 2018; 24(6):148-154.

This paper constituted a review and was conceptualised as a collective by all three authors. The author drafted the article and both Dr Sommerville and Dr Gopalan made significant contributions to its intellectual content and provided critique of the paper. Both co-authors provided final electronic approval prior to submission to the journal for consideration.

The author made amendments in response to reviewers’ queries and suggestions which were reviewed by the co-authors prior to final submission for publication.

Paper 2: (Chapter 3, Part 3.1) Nicola Kalafatis, Thomas Sommerville and Pragasan Dean Gopalan. Defining fitness for purpose in South African anaesthesiologists using a Delphi technique to assess the CanMEDS framework. Southern African Journal of Anaesthesia and Analgesia 2019; 25(2): 7-16.

This paper was conceptualised by all three authors. The author managed the survey and Delphi process as well as all data collection. The author drafted the article and Dr Sommerville and Dr Gopalan contributed to its content and provided a critique thereof. The article was approved by all three authors prior to submission to the journal. The author made amendments in response to the journal reviewers' comments and queries. All changes were approved by the authors prior to final submission for publication.

Paper 3: (Chapter 4, part 4.1) Nicola Kalafatis, Thomas Sommerville and Pragasan Dean Gopalan. Are South African anaesthesiologists fit for purpose? A comparison of opinions of graduates, teachers and examiners. Southern African Journal of Anaesthesia and Analgesia 2020; 26(6): 272-278.

This paper was conceptualised by all three authors. The author managed the survey and data collection and drafted the article. Dr Sommerville and Dr Gopalan made significant contributions to the content of the paper and also provided a critique thereof. All authors approved of the final changes prior to submission to the journal for consideration.

The author made changes in response to queries and comments made by the reviewer. These amendments were approved by all three authors prior to submission for publication.

Paper 4: (Chapter 5) Nicola Kalafatis, Thomas Sommerville and Pragasan Dean Gopalan. Do South African anaesthesiology graduates consider themselves fit for purpose? A longitudinal study. (Manuscript)

This paper was conceptualised by all three authors. The author managed the survey and data collection. Dr Sommerville and Dr Gopalan made significant contributions to the content of the paper and also provided a critique thereof with suggestions and amendments. All authors approved of the final changes prior to submission to the journal for consideration.

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References

1. International Committee of Medical Journal Editors. Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals. <http://www.icmje.org/> (accessed 27 October 2020).

Abbreviations

ACGME: Accreditation Council for Graduate Medical Education

ANTS: Anaesthetists' non-technical skills

CanMEDS: Canadian Medical Education Directives for Specialists

CASA: College of Anaesthetists of South Africa

CMSA: Colleges of Medicine of South Africa

Covid-19: Coronavirus 2019

EI: Emotional intelligence

EPA: Entrustable professional activity

FCA: Fellowship of the College of Anaesthetists of South Africa

FnFP: Fitness for purpose

FFP: Fit for purpose

HIC: High income country

HPCSA: Health Professions Council of South Africa

LIC: Low income country

LMIC: Low- and middle-income country

NTS: Non-technical skills

RCPSC: Royal College of Physicians and Surgeons of Canada

SA: South Africa

SASA: South African Society of Anaesthesiologists

UK: United Kingdom

USA: United States of America

WHO: World Health Organisation

WFSA: World Federation of Societies of Anaesthesiologists

Abstract

Anaesthesiologists, like all medical specialists, should be able to function independently and appropriately to provide the service beneficial to those whom they serve. However, difficulties have been experienced with the transition from trainee to specialist, posing potential adverse effects to the patient and the practitioner. To avoid these negative occurrences, it is necessary to ensure that graduates are well prepared for their specialist roles and are fit for purpose (FFP).

The practice of a medical specialist incorporates various clinical and non-clinical roles; such roles include medical expertise, scholarship, communication, collaboration, management and leadership, professionalism, and health advocacy. Graduates have reported feeling better prepared for some of these roles and less prepared for others, with deficiencies noted particularly in those that are predominantly non-technical in nature. In anaesthesiology, there is a paucity of evidence in the literature with respect to fitness for purpose (FnFP), and there has been no assessment of whether anaesthesiologists internationally or in the South African context are FFP.

The aim of this step-wise study was to develop and define the concept of FnFP and explore its nature in the South African anaesthesiology context. The first step provides a literature review of FnFP, and proposes how FnFP relates to current terminologies. Step two attempts to define FnFP in the South African anaesthesiology context, culminating in a list of defining competences useful as a tool to conceptualise, and possibly to gauge FnFP henceforth. Once FnFP has been defined for South African anaesthesiology, the next step is to establish whether local (South African) graduates are considered FFP using the derived criteria. This is undertaken by exploring opinions of FnFP by teachers, examiners and graduates. The final step in this thesis assesses the temporal nature of graduate self-assessment of FnFP.

This study explores and highlights contemporary terminologies in postgraduate medical education and proposes refinements that suggest consideration, and inclusion, of the concept of FnFP as a means to enhance graduate readiness for practice. Fitness for

purpose in the South African anaesthesiology context is explored with the aim to ultimately address and minimise graduate deficiencies in specialist practice.

This work contributes to new knowledge in the field by conceptualising and defining FnFP for local anaesthesiology, and, through the proposal of a useful list of criteria, with an accompanying graphic, defines and illustrates the concept of the FFP anaesthesiologist. It also proposes an educational tool that can be used to dynamically monitor the progress of trainees during the learning process, which may assist in addressing and remediating deficiencies timeously. Similarly, after highlighting where deficiencies in local graduates are perceived to lie, this work proposes how these may be addressed and should be explored in future research to enhance the preparedness of graduates in anaesthesiology.

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Chapter 1: Introduction and Overview

Background

Globally, anaesthesiologists are a scarce commodity and this, together with shortages of surgical and obstetric clinicians, impacts negatively on the healthcare of billions of people.¹ The World Federation of Societies of Anaesthesiologists (WFSA) estimates a global deficit of 1 million surgeons, anaesthesiologists and obstetricians, and that an additional 2.28 million will be required by 2030 to address the escalating global surgical demands.^{2,3} Data from the World Health Organisation (WHO) Global Surgical Workforce Database indicate that the total number of anaesthesiologists worldwide was 550 134 in 2014, servicing a global population of 7.29 billion.^{1,4} According to the WFSA, South African numbers are 16.18/100 000 population.⁵ This would be comparable to Europe and higher than the 12.42/100 000 for Canada⁵ were these numbers accurate. Actual numbers are significantly lower, with current estimates of 2.04/100 000 patient population.⁶(personal communication, South African Society of Anaesthesiologists, 2 December, 2019)

Recommendations from the Lancet Commission on Global Surgery, launched in January 2014, aim to improve access to safe, affordable and accessible healthcare.⁷ This focus of the Commission falls particularly on vulnerable populations in low-income (LICs) and low-middle-income countries (LMICs).⁷ Addressing the inequities of healthcare that affect the majority of the world's population requires a massive multifaceted approach and commitment from various national and international role-players. What is evident from the report is that trained anaesthesia providers will have a significant impact on global healthcare and the economies of poor countries.

It is necessary then to significantly increase the numbers of anaesthesiologists globally to meet the targets set out by the Commission. This will not only benefit high-income countries (HICs) where ageing populations present potentially sicker, more complicated patients with comorbidities⁷ but those in LMICs like South Africa (SA) as well. However,

it must be noted that since anaesthesiologists are needed in resource-limited settings, they are likely to work in healthcare facilities that are not adequately staffed, supervised or equipped.^{1,7,8} They will be entering clinical scenarios that demand immediate leadership, a commitment to teaching and training, expansive perioperative responsibilities, and large clinical workloads. The demands dictate that training should result in self-sufficient, high quality specialists who have an acute awareness of their population's needs. Training of anaesthesiologists in SA not only has to increase in quantity but must be appropriate and contextual, ensuring that quality is not sacrificed.⁹ It is essential that clinicians are appropriately trained for the purposes for which they are required and responsible, and accountable to the public they serve.¹⁰ If this is achieved, anaesthesiologists would constitute an investment rather than a cost.⁷

Anaesthesiologists, like other medical specialists, are expected to function independently as specialists after they have completed their prescribed training and passed their respective examinations. However, graduates have experienced difficulties with the transition from the role of trainee to specialist,¹¹ potentially resulting in adverse effects for the individual, the patient, colleagues, other trainees, the workplace and society. Affected graduates are at risk of developing job dissatisfaction and job stress that may result in eventual burnout or substance abuse.¹¹⁻¹⁵ To avoid such adverse effects, and to meet the demands placed on them, it is necessary to ensure that graduates are well prepared, and have the skill, knowledge, attitudes and behaviours to embrace all the clinical and non-clinical aspects of their multifaceted roles as specialists.

Medical specialists, in general, are expected to be competent in various medical/clinical roles as well as in many non-technical roles. Some suggested roles with associated competences include Scholar, Communicator, Collaborator, Leader, Professional, and Health Advocate that all intersect with the central and integrating role of Medical Expert.^{16,17} Other specialist training frameworks incorporate the competences of Professionalism, Communication and interpersonal skills, Systems-based practice, Practice-based learning and improvement, Medical knowledge and Patient care skills.¹⁸ Attempts have been made to address the multifaceted role of the graduate, and there

has been an increasing focus on training specialists who are competent in the various roles to improve patient outcomes. Several studies evaluating the training and skills acquisition of trainees in various disciplines have shown that some graduates feel better prepared for some of their roles and less prepared for others.^{12, 13, 19-24} This suggests that despite graduates having qualified, they may have deficiencies in aspects of their practice that translate into their work as a specialist. In the discipline of anaesthesiology, there is a paucity of evidence on fitness for practice. A few aspects have been addressed, but there seem to have been no holistic assessments of anaesthesiologists internationally or in the South African context.

A benchmark is needed against which all graduates should be measured. In order to do so, we need to understand what is being measured, discern whether it is relevant to South African anaesthesiology, and how it can be measured.

Personal Motivation

Over a period of a decade as a specialist in anaesthesiology, the author was involved in teaching trainees preparing for their qualifying examinations. During this time of clinical and non-clinical teaching, the author became aware of trainees' competences – and those that they lacked despite having completed their prescribed training. For those who then progressed to sit the exit examinations, it was sometimes a surprise to learn of the unsuccessful results of candidates who were generally considered worthy of passing. It was even more surprising, and concerning, when some candidates, perceived to be unprepared for practice as a specialist, passed. This became a growing concern, since it is assumed that once a trainee progresses through a training programme and completes the requirements for specialist registration, they can do what they are supposed to do in the workplace. In the author's opinion, this was not the case with all local graduates and it prompted the pursuit of an appropriate target for graduation and certification that would address concerns about graduate unpreparedness.

The author understood that these new graduates might be expected to be at the peak of their training, but also at the beginning of their experience. This alludes to their not being typical of the South African anaesthesiologist, whose memory of training decreases as experience increases. Training and experience may therefore have differing effects on anaesthesiologists' practice.

Problem Statement

Graduates appear to have deficits in various competences that preclude them from performing all the functions of an anaesthesiologist. This, in itself, poses potential harm to not only the patient but also to the practitioner, society and the profession itself. In order to improve the quality of graduates to ensure that they are able to cope with the multiple and variable demands that they will face in various situations as a specialist, they need to be appropriately trained and better prepared for practice. Training fit-for-purpose graduates could present a solution to the problem of graduate unpreparedness; however, one needs to explore this concept in its entirety to understand the term and investigate its relevance to this context. Of note, FnFP has been used predominantly in reference to products, services, programmes and tools. It has been used less often in the context of professionals and their abilities, despite a suggestion by Burch and Reid in reference to South African undergraduate training programmes.²⁵ The author proposes that since FnFP reflects functionality, the term would be useful to describe professional anaesthesiologists.

Rationale

Accepting that graduates may be unprepared for practice suggests that anaesthesiology faculties must reconsider how graduates are being taught. By understanding that FnFP of graduates should be achieved, emphasis should be placed on how to define it, aim for it, and gauge whether it has been achieved by the various role-players who participate in the training of specialist anaesthesiologists.

Objectives

- To review and define the concept of FnFP in general and in medicine.
- To determine whether the general concepts of FnFP and the CanMEDS competences with their attendant components are relevant to the South African anaesthesiology context.
- To determine whether senior anaesthesiologists consider graduates as FFP.
- To determine whether graduates consider themselves FFP, and if their perceptions change with time.

Structure of the thesis

This is a PhD by publication, including desktop research with three component studies interrogating the concept of FnFP in a step-wise manner, presented as chapters made up of various parts.

- **Chapter 2: Review of fitness for purpose**

The literature review for this study consists of two parts and a corrigendum.

- **Part 2.1: Paper 1 – Fitness for purpose in anaesthesiology: a review**

This review of the literature provides a background of and motivation for this research and its contextual relevance. Paper 1 offers a review of FnFP through the introduction of the concept in various vocations to assess what it means and how it may be defined. Thereafter, FnFP in medicine and in particular, anaesthesiology, is reviewed. The aim of this review is to assist with conceptualisation and relevance of FnFP in postgraduate training.

- **Part 2.2: Corrigendum (Paper 1)**

- **Part 2.3: Addendum to Paper 1**

Since the initial review of the literature was limited by restrictions by the publisher, the author felt it necessary to expand the review by adding an addendum. This addresses various concepts that require more detailed explanation than those proffered by Paper 1, and expands on several ideas that assist in the overall understanding of FnFP.

- **Chapter 3: Modification of a competency framework to address fitness for purpose in South African anaesthesiology.**

Having explored FnFP, this section focuses on its applicability in the South African context.

- **Part 3.1: Paper 2 – Defining fitness for purpose in South African anaesthesiologists using a Delphi technique to assess the CanMEDS framework**

Paper 2 defines FnFP of local anaesthesiologists in the context of the currently-used CanMEDS framework. It explores whether the framework can be improved or modified to better define FnFP in the local anaesthesiology context. A panel of national experts determined, by means of a Delphi technique, what competences would be required as a minimum to ensure that all graduating anaesthesiologists in South Africa are FFP. Paper 2 culminated in the provision of an illustration to capture the essence of a FFP South African anaesthesiologist.

- **Part 3.2: Postscript to Paper 2 and Corrigenda**

After gaining considerable insights into FnFP and its related terminologies whilst extending the literature review, the author felt it necessary to further define terms important to this research.

- **Part 3.3: Addendum to Paper 2**

This expands on the results from Paper 2 by classifying the enabling competences added by local experts in the context of the CanMEDS framework. This part also provides insight to the suggested rating (of relative importance) and weighting (of relative time allocation) of meta-competences by local experts. A detailed examination of the differential ratings gave rise to an amendment to the FnFP illustration from Paper 2 that may have utility as an educational tool for trainees.

- **Chapter 4: Perceptions of local anaesthesiology graduate fitness for purpose according to seniors and graduates.**

After reviewing and defining FnFP for South African anaesthesiology, graduate FnFP is now gauged according to the list of competences created by the panel in Paper 2 by interrogating opinions of senior anaesthesiologists (teachers and examiners) as well as of graduates themselves.

- **Part 4.1: Paper 3 – Are South African anaesthesiologists fit for purpose? A comparison of opinions of graduates, teachers and examiners**

Paper 3 attempts to establish whether South African anaesthesiology graduates are considered FFP. This paper compares the opinions of senior colleagues involved in the teaching and assessment of trainees with those of graduates' self-assessment at time of graduation.

- **Part 4.2: Corrigenda (Paper 3)**

- **Part 4.3: Addendum to Paper 3**

This addendum provides a more detailed review of the competences for which graduates were considered deficient. Seniors and graduates had congruent and incongruent views of the level of unpreparedness of graduates. These are examined in more detail, and reasons for the deficiencies are suggested.

- **Chapter 5: The effect of time and/or experience on graduate self-assessment of fitness for purpose.**
 - **Part 5.1: Paper 4 (manuscript) – Do South African anaesthesiology graduates consider themselves fit for purpose? A longitudinal study**

Paper 4 investigates graduate FnFP further by exploring opinions at two separate times, and assesses changes over the intervening interval. The perceptions of the graduates at each assessment are compared to establish whether they differ at different times.
 - **Part 5.2: Postscript to Paper 4**

- **Chapter 6:** This final section incorporates synthesis of the research findings and highlights their contribution to the current body of knowledge. It highlights the implication of the study's findings and outlines recommendations to current South African anaesthesiology faculties to research further.

All published papers have been included in their published pdf format.

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Chapter 2: Literature review of fitness for purpose

Part 2.1: Paper 1- Fitness for purpose in anaesthesiology: a review

This article was accepted and published by the Southern African Journal of Anaesthesia and Analgesia.

Nicola Kalafatis, Thomas Sommerville and Pragasan Dean Gopalan. Fitness for purpose in anaesthesiology: a review. Southern African Journal of Anaesthesia and Analgesia 2018; 24(6): 148-154.

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 trainees¹⁶ and specialists.^{5,17} Studies of newly qualified specialists suggest that some are more deficient in generic non-technical skills (NTS), for example management⁵ 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 excellence³⁷⁻⁴¹ and professionalism⁴²⁻⁴⁵ 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 assessed⁴⁶ 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 practice.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 skills⁴¹ 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 Russ⁵⁴ (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) competences⁶⁵ (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)

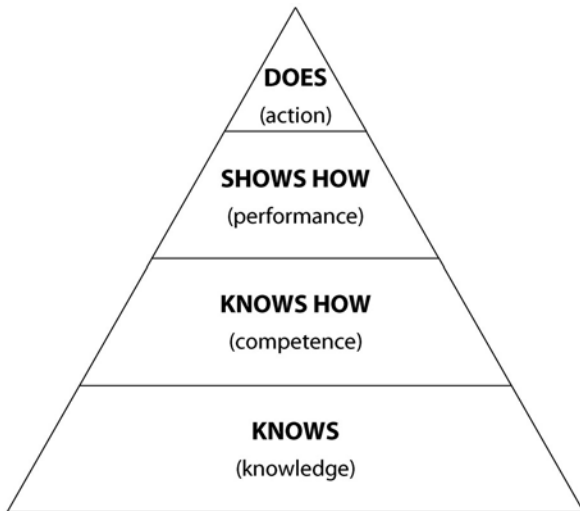


Figure 2: Original pyramid of clinical assessment by Miller.⁶⁶

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 Dreyfus⁶⁰ 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 post-graduate 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

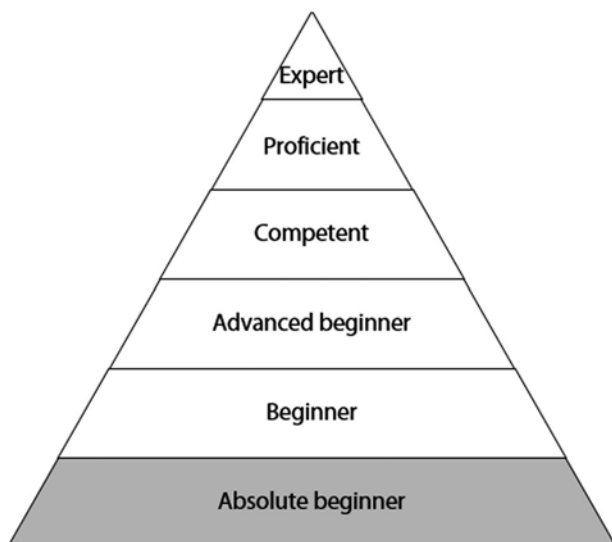


Figure 3: Modified Dreyfus model.⁶⁷

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 milestones⁴⁰ 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 skills⁶⁹ 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 product⁶² 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 tool⁶² 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 Dreyfus⁶⁰ (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) system⁷³

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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Part 2.2: Corrigendum – Paper 1

An error was noted in Paper 1 after publication.

p17, left-hand column, paragraph 4, line 4 should read “(see Table 2)” rather than “(see Figure 4)”

Part 2.3: Addendum to Paper 1

After publication of the first part of the literature review, the author reconsidered aspects that had been omitted for publication brevity. Some were deemed worthy of further explanation and expansion, to enhance the understanding of the concept of FnFP. Additionally, subsequent developments have been made in many of the concepts alluded to previously that warrant further exploration.

Is Fitness for Purpose necessary?

In 1954, Maslow described a modality for understanding human behavior,¹ depicted in Figure 1. An individual experiences five hierarchical levels of needs in their lifetime, and as each need is met, so the individual attains satisfaction and is likely to progress to the next level. The most basic needs are physiological; subsequent levels include personal safety, social desires, self-esteem and finally self-awareness and self-actualisation.¹⁻³ The work environment may be analogous and the model was adapted by Maslow and others for the workplace.³ (Figure 1)

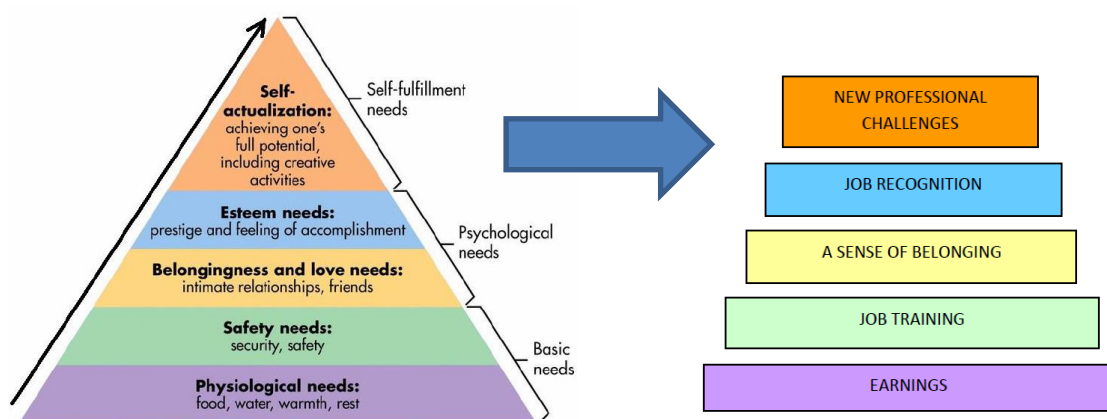


Figure 1. Maslow's hierarchy of needs (left)⁴ and modification for the workplace (right) (adapted from Benson and Dundis).³

Applying Maslow's hierarchy to medicine, as new doctors progress in their careers, so their individual needs change from rudimentary concerns of earning an income, to safety; and job satisfaction, then a sense of belonging. Eventually, doctors will seek out professional challenges by engaging in issues relating to self-esteem and self-realisation. Should their needs not be met, they will fail to progress as individuals and as professionals.

Under- and postgraduate doctors transitioning from one career phase to another may experience difficulty, and feel unprepared⁵⁻¹⁰ or be assessed as such by seniors.¹¹⁻²⁰ Reasons for this in HICs in Europe may be the limitations of the European Working Time Directive²¹ that confound attempts to gain sufficient experience. In LMICs/LICs, the burdens of vast inequalities in supply and demand of financial, medical and human resources may be contributory. Poor social or professional support in the new work environment may also impact the newly-qualified specialist negatively.²² (Figure 2) The resultant burnout and job dissatisfaction may limit professional progression. (Figure 1). Anaesthesiology is not immune to this phenomenon, with up to 50% of specialists and trainees reporting burnout.²³

According to follow-up studies of specialist trainees pre- and post-graduation, the sense of preparedness increases with time as the individual evolves into the specialist role.²⁴ However, one cannot rely on the passage of time for a clinician to become suitable for the purposes that are required immediately for practice as a specialist. It is evident that some specialists, despite certification, feel unprepared for areas of practice and may therefore not be FFP. Since this may have a negative impact on their patients and themselves and, according to Maslow, may impair their personal and professional progress, it warrants further exploration.

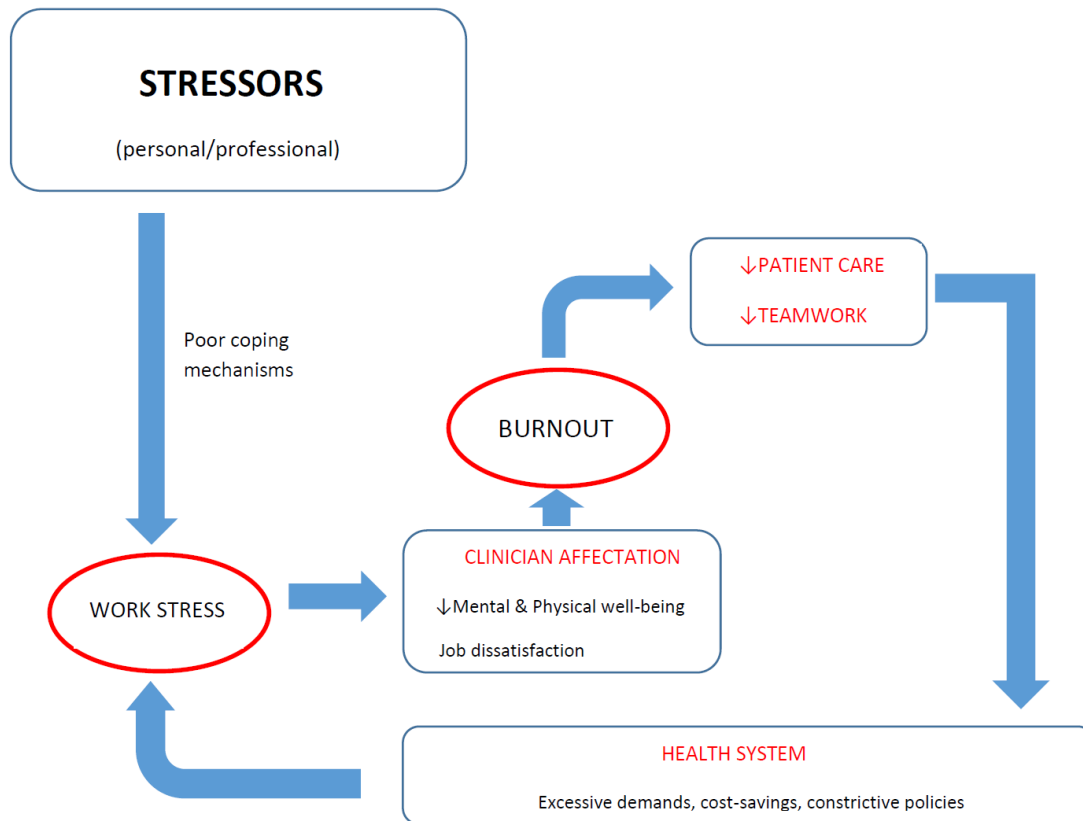


Figure 2. Interaction between stress and adverse effects on individuals and the healthcare system. Adapted from Rama-Maceiras, et al.²

Defining Fitness for Purpose in Anaesthesiology

The principle of striving to be a good doctor is one that is inculcated at the early stages of development of a clinician. However, being a good doctor means different things to different people, which confounds a universal approach to training FFP specialists. Paper 1 highlighted that patients and students emphasise the importance of NTS* and assume that the practitioner is already technically adept. Clinicians sometimes focus more on technical prowess at the expense of NTS. Therefore, being a ‘good doctor’ does not necessarily imply FnFP and preparedness for specialist practice, since different stakeholders define ‘good’ in different ways.

* NTS (non-technical skills) describe the social (communication, teamwork), cognitive (decision-making, situational awareness) and personal resource skills (coping mechanisms to reduce stress/fatigue) required to support and complement one’s technical abilities.^{25,26,27}

Exploring beyond being 'good', which is expressed by various measures according to various stakeholders, to being FFP, which should include 'good' by all measures, has not been addressed in anaesthesiology. For decades, anaesthesiology trainees have been taught to become specialists, presumably able to perform all their specialist roles. However the presumption may not be correct, since new graduates still report unpreparedness^{6,28-30} and may not be FFP. One has to interrogate why this is so, and what surrogates for FFP have and are being used.

Historically, postgraduate trainees learnt by means of apprenticeships (of variable time frames) which resulted in inconsistent development and transfer of skills.³¹ Subsequently, time-based teaching was introduced, initially focusing on service rather than education. As more clinicians joined programmes, it became apparent that training had to become more educationally sound. Formal testing, examinations and certification were introduced into fixed time-based training programmes.³¹ These eventually evolved into the current outcomes-based competency programmes, the current means by which most postgraduates are taught and assessed. There is a paucity of evidence evaluating whether competence and competency frameworks are suitable surrogates for FFP. In the absence of a recognised definition of FFP in anaesthesiology, an attempt is made to explain what it is through further expansion and exploration of the following concepts:

2.3.1 Competence

2.3.2 Expertise

2.3.3 Excellence

2.3.4 What 'purpose' and according to whom?

2.3.1 Competence

As mentioned in Paper 1, several definitions of competence exist; “sufficiency of qualification; capacity to deal adequately with a subject”,³² as well as inclusion of a contextuality to the expert knowledge, skills, understanding that it requires.^{33,34} Additionally, *competence* may refer to a specific skill required to perform a task, with practitioners trained to possess multiple competences to perform tasks effectively.³⁵ *Competency*, on the other hand, describes an ability that implies one can perform the required task.^{36,37} *Competence*, as a term used often in postgraduate medical educational literature, has generally been used to describe the overall ability of an individual, for example a competent anaesthesiologist. However, Brooks points out inaccuracies with the acceptance of this interpretation of the term.³⁸ He argues that competence relates to something one *does*, a verb, (not knowledge) and therefore describes a task rather than personal features that describe someone generally. He proposes that a clinician would be described as competent at a particular task or set of tasks rather than as a doctor. The author agrees with Brooks that there is a distinction between what has generally been accepted as ‘overall competence’ or macro-competence that describes a practitioner and the actual description of competence in terms of actions and tasks at hand, or micro-competences. For the purposes of this research, *competence* refers to individual actions or micro-competences that anaesthesiologists perform as part(s) of their specialist roles. On the other hand, the macro-competence or overall competence of a clinician who can perform all the specialist roles in all contexts will be referred to as *fit for purpose*.

During the process of acquiring skills, and expanding on Miller’s original pyramid (Figure 3, p16), Dreyfus proposes that the novice initially learns through a process of instruction.³⁹ Tasks are deconstructed into components which can be easily taught and attained. Advanced beginners then gain experience through practice and start to recognise patterns. Competence is achieved after sufficient experience is obtained, allowing the learner time to contextualise their skill and learn an hierarchical approach to decision-making. Progressing towards proficiency, the learner performs the skills with

fewer active thought processes and makes fewer emotional decisions. Once having performed the skill enough times and in varying situations, the learner finally attains expertise. At this stage, the expert can perform the skill in any scenario without needing to waste time on analysis before acting. (Figure 3, p16)

The pinnacle of the skills acquisition hierarchy, the expert, has been suggested as the stage at which a learner should qualify and be licensed to practise.⁴⁰ (Figure 3, p16) Considering the emphasis that patients place on NTS,⁴¹⁻⁴⁵ one would assume that all these skills would be a priority in teaching and assessment in anaesthesiology. However, the author's impression is that this is not the case, and the imbalance of technical and NTS places into question the application of competency frameworks used by various organisations such as ACGME and CanMEDS.

Limitations of competency frameworks & competency-based training

The several limitations of competency frameworks identified in Paper 1 require further exploration. Other limitations also require consideration and together, these may represent disadvantages that should be considered prior to the wholesale adoption of competency frameworks in postgraduate training. These limitations include the following:

- 2.3.1.1 Validity for anaesthesiology
- 2.3.1.2 Context specificity
- 2.3.1.3 Content
- 2.3.1.4 Translation into practice
- 2.3.1.5 Curriculum design and buy-in by faculty
- 2.3.1.6 Assessment
- 2.3.1.7 Trainee selection

2.3.1.1 Validity for anaesthesiology

Medical practice has changed in response to consumerism, regulations, financial imperatives and explosions in consumer medical knowledge.⁴⁶ These variables prompted physicians to respond to remain relevant in the 21st century. The ACGME responded by incorporating core competences into trainee programmes with the subsequent inclusion of milestones.⁴⁷ Likewise, the RCPSC investigated the generic core specialist competences that would be required to meet the needs of a more demanding society.⁴⁸ These competences, of a pre-determined standard, attempted to address society's needs by providing quality health care, hence promulgating the RCPSC motto: "better standards, better physicians, better care".⁴⁸ This resulted in the creation of the CanMEDS framework, initiated over four separate phases. Each phase incorporated intensive research, framework development, pilot projects and faculty development.

One cannot assume that competency frameworks, like CanMEDS, designed as a generic model for all specialties, are valid for training anaesthesiologists. There may be elements in anaesthesiology that are unique and, as mentioned in Paper 1, more in common with aviation than other specialties as a result of comparable work environments and responsibilities.⁴⁹

In South Africa (SA), under the guidance of the Colleges of Medicine of South Africa (CMSA), anaesthesiologists are trained and assessed in accordance with the CanMEDS system. This competency framework was formally adopted by the CMSA and incorporated into the local anaesthesiology curriculum in 2014.⁵⁰ Formal assessment and validation of the CanMEDS framework for South African anaesthesiology has not been undertaken, presenting a large gap in current knowledge requiring investigation. One should first evaluate whether the framework is valid for anaesthesiology in SA, as demonstrated by Ortwein *et al.*, in Germany.⁵¹ Thereafter, one should investigate if the framework's milestones include those aspects of specialist functioning that are applicable to anaesthesiology. A one-size-fits-all approach may not be appropriate or sufficient for all specialties.

2.3.1.2 Context specificity

One needs to question whether the adoption of the AGCME or CanMEDS competency frameworks is suitable outside their domestic contexts and, in particular, in SA.

Evidence for the validity of CanMEDS outside Canada is sparse, and little is known about how the generic roles apply to various medical specialties.⁵² Ringsted *et al.* assessed and confirmed validity in Danish trainees and specialists.⁵² Similarly, Ortwein *et al.* validated a modified CanMEDS framework for local application in a German anaesthesiology department.⁵¹ Both studies^{51,52} also highlight the differential importance of the seven CanMEDS roles. Intra-specialty variation suggests that specialties rate importance not only according to discipline-specific but local/departmental needs and concerns. This supports the need for contextualisation of a generic framework within a specialty to ensure local applicability. Research also alludes to differential inter-specialty variations,⁵³ with various disciplines rating roles according to varying specialty-specific criteria. The importance of roles may also be dictated by variations in local medical care and medical educational policies.⁵² Societal needs may play a significant part in modifying the application of the generic framework to specific disciplines.⁵² Ideal, objective outcomes may evolve into ones that are “socially negotiated” by fitting into the needs of a particular society and profession at a specific time within a specific context.⁵⁴

In Canada, the CanMEDS framework evolved after several years of intense scrutiny and extensive research with the aim of ultimately improving clinician professionalism and accountability to patients.⁵⁵ Several countries have chosen to adopt it for anaesthesiology training and have made attempts to validate it for local applicability.^{51,52} However, most, including SA, have not gone through the same rigorous validation processes or needs assessment as the Canadians, potentially placing into question the applicability of such frameworks for local specialist training.

2.3.1.3 Content

In anaesthesiology, learning requires the acquisition of both technical and NTS, the latter, including ANTS, having been addressed in Paper 1. However, compared to technical skills, NTS cannot be as easily subdivided into milestones, and are less readily formally taught or learned.^{56,57} Despite training according to CanMEDS, some NTS such as managerial skills,^{58,59} leadership and health advocacy⁵⁹ are deficient in graduates. These are highlighted by the need for trainees, and often faculties, to participate in extra courses to address shortfalls.^{23,59-61} It is of concern that competency frameworks may be incorporated into postgraduate anaesthesiology programmes with unquestioning belief and hope of their being sufficient to train the required level of specialist.

Historically, competency was assumed after appropriate experience was obtained, the so-called apprenticeship model. This assumed that after a period of contact time, a trainee would become fully competent. Brooks suggests that these apprenticeship models are superior to competency-based ones.³⁸ He argues that competency arises from training (repeated actions) rather than from knowledge, and that competency falls short in the application of knowledge that is inherent in expertise.³⁸ He suggests that trainees can develop expertise only through managing patients under the supervision of experts, as opposed to meeting criteria on a checklist, the cornerstone of competency models. He proposes that apprenticeships teach more than just competence, and allow trainees to develop NTS and ethical practice.³⁸ According to Brooks, the top-down approach and content of competency frameworks are not equipping specialists properly for all the roles of their vocation. He suggests that this is not conducive to training specialists with the conceptual tools required in unusual or difficult scenarios for which checklist mentalities have not prepared them. This may engender the notion of trying to place patients in specific boxes when, in reality, not all patients fit snugly into boxes.

Complex competences or roles, that specialists regularly perform,⁶² are specifically structured combinations of technical and NTS deconstructed into component milestones. Taking into account this reductionist nature of milestones, one cannot ignore the major assumption that competency frameworks make that individuals will be

competent in the complex task if they have attained the component milestones. When learning to drive a car, an instructor teaches how to change gears, brake and stop at traffic lights. However, performing each of these individually does not imply that, in a busy street, the student driver can co-ordinate them safely and competently to avoid an accident. Similarly, the anaesthesiologist who is competent at performing, for example, spinal anaesthesia may not know how to perform it in a patient with major co-morbidities or in contexts in which it may cause harm. Being competent at performing spinal anaesthesia does not imply that the practitioner will perform it in the correct patient or in the correct scenario, implying that other skills such as insight and judgement cannot be assumed with competence. In keeping with this argument, Brooks reiterates that competence is not a term that should be used to describe someone or the knowledge that they have, but rather to describe their component actions.³⁸ Someone who is 'competent' may, by virtue of how competence has been taught and assessed, still have deficits and is not what would be referred to as having macro-competence or FnFP. Brooks proposes that "...competency is a minimum standard. A competent person is not worthy of commendation, but rather is judged capable—perhaps just capable— of performing a task".³⁸ Despite these limitations, previously-mentioned counter-arguments to that of Brooks provide the basis for the current worldwide adoption of competency- rather than time-based models in training.

In addition, to address the shortcomings of milestones, the existing CanMEDS framework has been modified to include entrustable professional activities (EPAs).⁶³ These EPAs are tasks or responsibilities allocated by a supervisor in the clinical setting once component competence is achieved, and may include several milestones.⁶⁴ They are allocated once the supervisor has developed trust in the trainee's abilities to perform these tasks, and senior supervision decreases as trainee abilities increase.⁶⁵ By combining milestones into an EPA, there is a suggested improvement in the ability of the modified CanMEDS model to prepare students for complex specialist tasks.⁶³

With these improvements, the CanMEDS framework was incorporated into the Competence by Design model launched by the RCPSC in 2015 (Figure 3). This proposes that specialist training occurs at various stages, each incorporating the seven CanMEDS roles with EPAs and their component milestones. This has been transitioned into Canadian specialty training, including anaesthesiology.⁶⁴

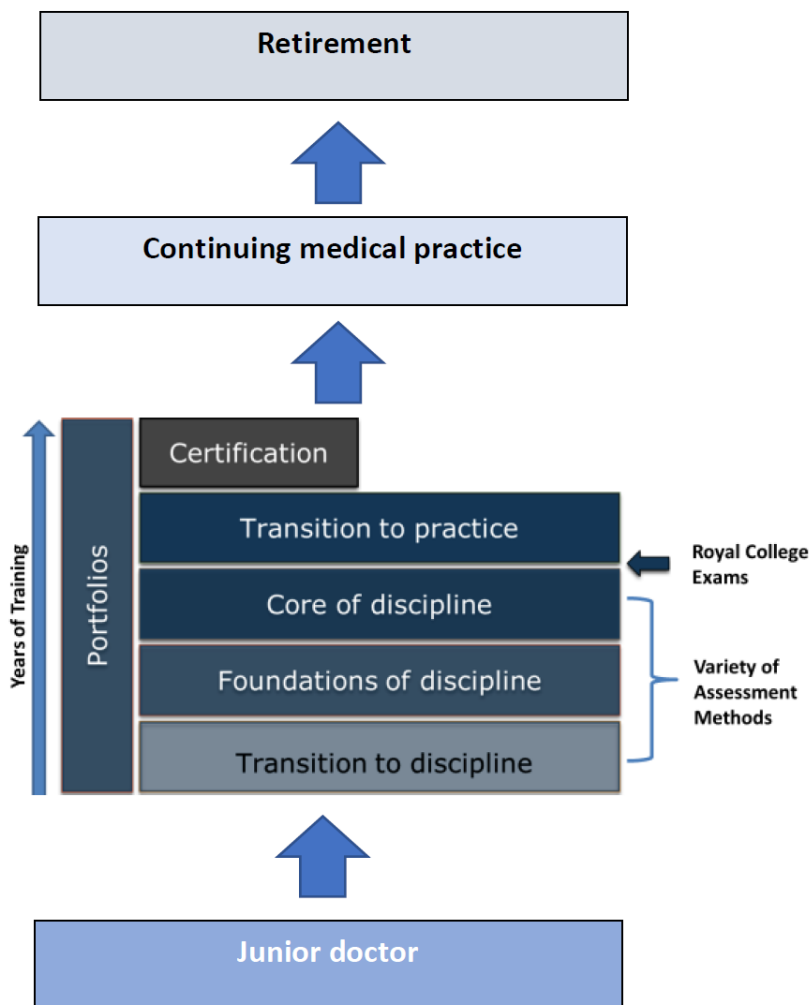


Figure 3. College of Physicians and Surgeons of Canada Competence by Design Conceptual Framework for Residency Training. Adapted from The Royal College of Physicians and Surgeons of Canada, with permission. (Accessed 11 April, 2020)(personal communication)

The generic core competences of CanMEDS and their individual milestones are assumed to be of equal importance (Personal communication, RCPSC, 22 May, 2018). Are all competences equal, and if not, how should they be ranked? This has not been explored

by CanMEDS, whose diagram implies equal weighting and importance of all seven roles (Figure 4, p17). Studies indicate that this equal weighting may not be appropriate.^{51-53,66} A survey of the perceived importance of the CanMEDS roles amongst Canadian clinicians revealed differences,⁶⁷ with Medical Expert rated most important, followed by Communicator and Professional. Health Advocate was rated least important, a finding echoed by others,^{51,52} that calls for considerable re-evaluation. An Italian court in July 2014 charged two anaesthesiologists with criminal negligence for having participated in palliative surgery ending in the demise of two patients, despite not having been involved in the decisions to operate.⁶⁸ The court charged the anaesthesiologists with “incautious reliance” on their colleagues’ incorrect judgements, and expected them to have extricated themselves from participation. Despite low ratings of Health Advocate by anaesthesiologists, patients and society expect it of them.

In considering patients’ opinions and the need for anaesthesiologists to be adept at complex specialist tasks, NTS cannot be neglected. They are unique not only in content but in context, in teaching and in assessment. This compels faculties to examine their curricula and place a renewed emphasis on these skills during teaching and assessment. Competency frameworks, although arguably better than time-based ones, struggle to fulfill all the content needs of training, especially of NTS, primarily due to their reductionist approach. This approach assumes that an aggregated assessment of individual competences would be equivalent to a global assessment of the learner’s competences. This assumption has been disputed⁶⁹ and reveals discordance between reductionism and global assessments, emphasising the failure of the reductionist approach to correlate well with entrustment decisions or graduate preparedness.⁶⁹ Competency frameworks also assume, despite evidence to the contrary, that specialist roles are equally weighted, which may misdirect trainers and assessors alike. South African perceptions in this regard are lacking, and would constitute important information to guide local curriculum design and assessment.

2.3.1.4 Translation into practice

Different disciplines and countries interpret CanMEDS in ways that are most appropriate for them in their given contexts. A critique of CanMEDS Professionalism and the lack of guidance from it as to the sensible incorporation into local curricula suggests that training is significantly affected by local environments.⁶¹ Haber and colleagues suggest that, despite its incorporation into the role of Medical Expert, the nebulous NTS component of Situational Awareness lacks an operational definition to allow for explicit teaching and assessment.⁵⁶ Similarly, Busari *et al.* propose that there is lack of clarity in the definition, interpretation and evaluation of the previous role of Manager, now a component of Leader, rendering it open to local interpretation.⁵⁹ Malling *et al.* suggest that although Danish academics consider all seven roles valid, the content and clarity of some, particularly Professional, are unclear,⁷⁰ and reiterate that local contexts and cultures may affect interpretation of CanMEDS. Several of the CanMEDS wordings and meanings were difficult to translate into comparable Danish and the language differences may result in slight differences in interpretations of definitions.⁷⁰

Translation concerns and lack of standardised interpretations of definitions make CanMEDS and other competency frameworks, even if relevant to community and specialty, vulnerable to variable interpretation, and thus subject to variations in achievable outcomes.

2.3.1.5 Curriculum design and buy-in by faculty

Despite implementation of the ACGME and CanMEDS competency-based models, teaching faculties in USA and Canada, and other countries,^{57,71,72} remain poorly prepared. This may be accentuated in countries who have been slower in adopting competency-based learning. Teachers no longer provide pure knowledge and skills training, but must facilitate deeper learning and critical thinking.⁷³ They need to also encourage learners to take responsibility for the content of their own learning.⁷²

Teachers face a multitude of non-educational demands in their daily functioning and may not be able to learn new skills⁵⁷ to facilitate effective learning of both technical and NTS. As a result, faculties may be resistant to change, and this, together with limited financial resources in some departments, may result in slow and poor buy-in.⁶⁷

The learning of NTS may be imparted to students via the so-called 'hidden curriculum' by means of role-modelling and mentorship.^{56,66,74-78} Here, learners may be viewing, processing, integrating and replicating behaviours and attitudes that may not be standardised or ideal. Seniors may be teaching without explicit knowledge of doing so and without formal training.⁵⁶

Supervisors may interpret CanMEDS within their own socio-historical backgrounds, influenced by belief systems and experiences, thereby potentially influencing practice-based activities.⁷⁹ At times when clinicians are pressured to address clinical loads, CanMEDS and its expectations may be pushed aside.⁷⁹ If universities wish to incorporate competency-based learning into postgraduate programmes, then educators need to be attracted to participate. This can be achieved by focusing on academic promotion, acknowledging educators and recognising excellence in teaching and assessment.⁷²

The global need for additional modules or courses^{23, 59-61} by graduates to compensate for training deficits acknowledges graduates' perceptions of unpreparedness. However, South African data in this regard are lacking. Do South African anaesthesiology graduates have deficits in technical and NTS, and if so, how can these best be addressed? Several courses are available globally to better equip trainees with non-clinical skills; however, these remain voluntary and may not be effectively used by all who may require them.

In medical education, there are clear benefits to producing FFP practitioners: a South African study exploring whether a FFP undergraduate medical curriculum contributes to patient and population healthcare affirms that, if curricula are improved to being FFP, healthcare systems will be strengthened.⁸⁰ There are few objective measures of NTS against which learners can be taught and assessed,⁸¹ potentially resulting in undetected deficits. Reliance on the hidden curriculum to teach NTS is fraught with controversy and is conducive to the unintended assimilation of negative components into practice.⁷⁶

Likewise, reliance on competency frameworks to address all the needs of a specialist will fail if not supported and promulgated by appropriately trained teachers and assessors. Failure to produce FFP specialists may be inevitable if training programmes and curricula are unable to accommodate NTS.

2.3.1.6 Assessment

Competency- or outcomes-based models, in theory, make assessment more feasible (although not necessarily more valid) due to the presence of testable skills/milestones within a clinical setting.⁶⁴ Non-technical skills however, cannot necessarily be assessed using the same tools for technical skills,⁵⁷ and there is no ideal tool to test the ability to integrate technical with NTS.⁸² Brooks advocates that objective criteria or outcomes are superfluous in assessment.³⁸ He, and others,⁸³ argue that experts should judge the trainee's ability to perform the task, and that should assessment require a checklist, anyone could perform the assessment.³⁸ In the absence of an ideal tool, a series of tools is often utilised, as well as consideration of alternative means of testing to address the concerns of NTS assessment.

There is currently no formal means to assess or determine FnFP of anaesthesiology trainees, something not unique to SA. Local and international trainers rely on competency frameworks to produce FFP graduates without evaluating the suitability of such a tool. Assessment in local anaesthesiology should also be guided by weighting and rating of the importance of specialist roles. It is not known whether South African experts concur with the validity and equal importance of the specialist roles proposed by CanMEDS⁴⁸ or with their differential ratings proposed by others.^{51,52,66} This information would not only appropriately align time for teaching and training with weighting of meta-competences but may assist assessors and curriculum designers alike.

Non-technical skills are an important component of the FFP anaesthesiologist. However, they continually challenge teaching faculties and assessors. This necessitates the exploration of other possible modalities to better address NTS and their interplay with technical skills in complex roles.

2.3.1.7 Trainee selection

Matveevski, Moore and Samuels suggest that since behavioural and personal attributes affect the quality of anaesthesiologists, applicants should be screened to ensure specialists are adept in both technical and NTS.³³ Competency frameworks cater for the general training of a specialist; however, they do not take into account trainee variations in ethical standpoints, behaviours, attitudes and personalities. It is possible that since personalities are not readily discernable and may respond differently to teaching inputs in various environments,⁶¹ the value of applying a generalised framework is unpredictable. Generic competency frameworks assume that all inputs are equivalent, thus ensuring predictable outcomes. This however, is not the case, since individuals, despite undertaking the same training, are unique. These frameworks fall short of accommodating such differences in individuals, rendering their outputs less predictable. Since NTS are an important component of the FFP anaesthesiologist, surrogates such as emotional intelligence (EI) may be useful in pre-selecting candidates who are more likely to become FFP specialists.

EI reflects the clinician's ability to monitor and discriminate between the emotions of self and others, and process the acquired information to guide his/her actions and thinking.⁸⁴ The selection of clinicians into training programmes has been strongly influenced by intellectual prowess and medical technical abilities. However, NTS such as communication, decision making, leadership and teamwork are important components of specialist practice that have been shown to correlate with EI.⁸⁴ Higher EI has also been associated with improved clinical skills and management of stress. If incorporated into anaesthesiology training programmes – possibly via simulation – this could be associated with improved patient outcomes and satisfaction.⁸⁴

'Competence' is a controversial concept in postgraduate medical education, primarily as a result of a lack of a universal definition. Although the definition is arguable, aiming at achieving competence through training and assessment by means of competency frameworks has been adopted by most departments worldwide. Such frameworks are

fraught with limitations which must be acknowledged in order to contextualise the specialists they produce. In most departments globally, there is a notable variability amongst anaesthesiologists that results in a range of abilities and, unfortunately, patient outcomes.⁸⁵ This variability may result in a spectrum of offerings to the patient from either an anaesthetic “superstar”, a dedicated worker bee or a below-average “dullard” who does the minimum to get by.⁸⁵ It is concerning that 50% of qualified anaesthesiologists are considered to be below average by their peers;^{85, 86} however, they have been deemed competent by licensing authorities. Like Brooks, we all know of a colleague with a certification reflecting ‘competence’ and yet we would not want them to treat us or our family because of concerns about their *incompetence*.³⁸ One may question whether it is appropriate or even ethical to permit such interprovider variability. Variability is inevitable, since no two clinicians are the same, and is acceptable if it does not adversely affect patient outcomes. Negative outcomes as a result of clinician variability in technical and NTS are not acceptable. Competence, therefore, as the requisite for qualification, should be interrogated to ensure that graduate variabilities, although bound to happen, do not adversely impact patients. We need to look beyond competence and consider whether expertise might be a more appropriate target for certification.

2.3.2 Expertise

The *expert*, as defined in Paper 1, is reflected by the modified five-stage Dreyfus model of skills acquisition (Figure 3, p16) as the ultimate stage of the hierarchical rise to independent practice. The expert relies on personal experience, intuition, and perception, interpretation and reflection on practice to improve patient care.³⁸ He/she also relies on both specialist knowledge as well as his/her non-technical abilities to perform task(s).⁸⁷ The expert is thus socially, practically and cognitively equipped to perform the task for which he/she was trained, and is able to apply and adapt his/her knowledge at times of uncertainty. Expertise also includes an understanding of work in various scenarios,^{33,36,87} and intuitive, instantaneous action. An ability to finely

discriminate sets the expert apart from the proficient anaesthesiologist.³³ In essence, the expert applies context-specific judgement to make instantaneous decisions, something the competent clinician has not yet mastered.⁴⁰ Oyeboode suggests that the focus of postgraduate training should therefore shift from a disproportionate stakeholder preoccupation with competence to that of expertise.⁴⁰ Attaining expertise rather than competence, as the pinnacle of skills acquisition for independent specialist practice, should ideally be the goal of trainees, training institutions and examining authorities. However, one also needs to acknowledge that expertise takes time and practice. If it becomes the target for certification, it is assumed that trainees would have obtained sufficient practice and spent enough time honing both their technical and NTS. But if expertise is the ideal target, where does excellence lie in the continuum of anaesthesiology practice?

2.3.3 Excellence

The author has attempted to define excellence previously. Several definitions exist that, at times, overlap with those of competence or expertise, despite the hierarchical and unique nature of these terminologies. There are suggestions that clearly defining an excellent anaesthesiologist is both difficult and unnecessary if adequacy denotes true competence.⁴⁹ But concerns from the Tooke report⁴⁹ and others,⁴⁰ on competency frameworks are that mediocrity and adequacy are being targeted by unbundling meta-competences into components.⁴⁹ The gap between competence (at graduation) and excellence may vary in different disciplines, licensing authorities or countries. However, a large gap, in part due to limitations of competency frameworks, is not ideal as graduates should not be far removed from excellence.

Despite several approaches to ascertain excellence in anaesthesia,^{49,88-91} one common finding is that experts in anaesthesia are in the best position to actually define what excellence in this field is, a perception largely due to self-awareness and self-assessment.⁷²

In summary, competence (which should necessarily embody a degree of excellence) refers to the minimum required for an anaesthesiologist to practice the assessed milestone(s) effectively. This acknowledges several flaws in competency frameworks and milestones-based training and assessments. The examination-competent specialist, for various reasons, may not be clinically competent in all technical and NTS, or may be competent only in components of complex tasks. These would result in the 'competent' specialist not being FFP.

Expertise refers to established capability that develops with training and experience over a period of time, allowing the development of tacit knowledge to assist with addressing complex roles. However, since one must be competent before becoming an expert (Figure 3, p16),³⁹ all the limitations of competence plague the expert as well. This places into question the proposal of the expert as the target for certification^{38,40} since any deficiencies that preclude him/her from performing the required specialist meta-competence(s) would result in his/her not being FFP. So expertise, *per se*, may not automatically confer or infer FnFP.

Excellence describes superlative performance that may be within, but often surpasses, competence and expertise. Although it may be what most strive to attain, excellence is not mandatory or even necessary in one's career in order to function as a FFP anaesthesiologist. Excellence may refer to an aspect of practice rather than describing the overall, holistic practice of a specialist. Excellence in a particular domain should also not compensate for the failings of other domains,⁴⁹ since these shortfalls would imply the practitioner is not FFP. Excellence, in itself, therefore may not guarantee or imply FnFP.

In contextualising FnFP, the author proposes that specialist training constitutes a continuum. The trainee commences with the development of competence in milestones or EPAs that constitute the meta-competences of a specialist. After a period of practice and the development of tacit knowledge, he/she attains expertise in these meta-competences and can perform them subconsciously without deliberation. Once expertise without any deficiencies in technical or NTS is reached, the trainee is considered FFP. Excellence in aspects of practice can exist at any stage in the continuum; however, it is not mandatory and may or may not be achieved. (Figure 4, below)

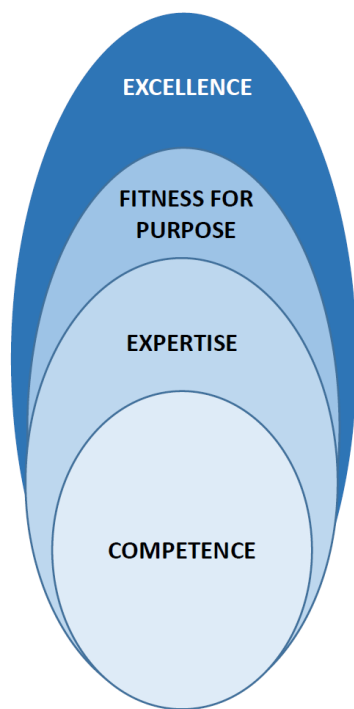


Figure 4. The continuum of specialist training.

2.3.4 What purpose and according to whom?

In the pursuit of understanding and defining FnFP in anaesthesiology, one refers back to the dictionary definition⁹² as “suitable for the intended use; fully capable of performing the required task”. It is important therefore to consider what the ‘use’ or the ‘task’ actually is, and according to whom, before deciding whether or not this has been

achieved. The use or purpose of the anaesthesiologist must be considered in the context of the national regulators/authorities and the end users, each of which consider different criteria emanating from varying perspectives.

2.3.4.1 Regulators & other authorities

In SA, the Health Professions Council of South Africa (HPCSA) dictates the rules and outlines the laws by which all anaesthesiologists must abide.⁹³ This council exists to guide the profession yet simultaneously protect the public and does not differentiate practitioners on the continuum of competence to excellence or FnFP. They issue practice guidelines for ethical and professional conduct for all qualified specialists. Details relating to differential quality and variable practice of competent practitioners do not concern the HPCSA, provided practitioners are practising within the stipulated ethical and professional guidelines. The South African Society of Anaesthesiologists (SASA), a non-regulatory professional organisation, helps to guide the profession of anaesthesiology in SA and issues guidelines for safe practice.⁹⁴ This association provides support to practitioners; however, it does not determine or differentiate quality of competent specialists practising within the legal and professional guidelines of SA. Quality assurance of practitioners remains the responsibility of the CMSA as the examining authority for anaesthesiology in SA. The subsidiary College of Anaesthetists of South Africa (CASA) determines criteria that trainees must attain in order to qualify. As mentioned previously, learners train and are assessed by CASA according to CanMEDS, and thus competency, in this context, is the goal that needs to be attained for certification. CASA does not differentiate between competence, expertise or FnFP in their criteria for qualification, necessitating further exploration if FnFP is to be the required target for qualification.

2.3.4.2 Patients

Around the world, patients have been shown to be ignorant of what their anaesthesiologist does perioperatively,⁹⁵⁻¹⁰⁸ suggesting that only half recognise that he/she is a physician.⁹⁵ Patients rely predominantly on their surgeons, with whom they have an established rapport, to manage them safely through the perioperative period.

This is often due to lack of education^{99,100,109} or lack of prior exposure to anaesthesiology.¹⁰¹ The opinions of South African patients have not been assessed and would provide important information. However, attempting to ascertain a 360 degree review to include patient opinions may be limited by potentially inaccurate patient perceptions, guided by personal, sometimes irrelevant, criteria rather than those that influence the practice of FFP specialists.

2.3.4.3 Surgeons

Similarly, obtaining the opinions of surgical colleagues would potentially provide insights into FnFP of anaesthesiologists since both work together as a closely-knit team. The state of the surgeon-anaesthesiologist relationship impacts directly on outcomes, for both clinician and patient. Research assessing presumed opinions of colleagues reflects a poor image of anaesthesiologists.¹⁰⁸ However, there is little evidence assessing what surgeons think of their anaesthesiology colleagues. Cooper suggests that surgeons' opinions are often negative, based on a set of priorities that are often not mutually shared and, sometimes, based on the negative opinions of anaesthesiologists towards surgeons.¹¹⁰ Therefore, criteria used by surgeons may not be relevant or appropriate and, having emanated from a surgical perspective, could be more specific to the discipline of surgery.¹¹⁰

For the purpose of this investigation, the author has chosen to limit studies to what anaesthesiology specialists themselves perceive to be the competences relevant to their profession.

2.3.4.4 Anaesthesiologists

There remains a paucity of evidence exploring FnFP from an anaesthesiology perspective.⁴⁹ This is an important concept to investigate and highlights a current gap in knowledge.

Anaesthesiologists acknowledge the need for graduates to possess sound technical and NTS, placing emphasis on the latter in curricula and assessment¹¹¹ to enhance outcomes.^{27,112} A cross-specialty study of graduate preparedness by seniors and

graduates revealed that deficits existed in several NTS such as leadership, resource management, managerial skills, and decision-making,³⁰ echoed in sub-specialty intensive care training as well.¹¹³ Managers and seniors however, felt that some graduates experienced difficulties not only with several NTS but also with understanding the complexities of their consultant roles.³⁰ Medical directors of healthcare organisations have reported similar deficiencies in new graduates.²⁴ Evidence therefore suggests that those in supervisory capacities rate some graduates less prepared than others, particularly in NTS. What are the perceptions of graduate preparedness according to South African anaesthesiology experts and seniors? Expert opinions of graduate preparedness may differ between teachers and examiners, taking seniority and experience into account. This would provide valuable information and insights into local FnFP.

In attempting to canvass opinions of FnFP from all relevant stakeholders, one cannot ignore the perceptions of the graduates themselves. If graduates do not feel prepared for their role(s) as specialist, then this is an important indicator of deficits in the training and/or assessment processes through which graduates progress. In studies evaluating the opinions of graduates' preparedness, none exists that interrogate self-assessments of FnFP as a specialist. Most graduates feel comfortable with their technical skills, with some evident deficiencies pertaining predominantly to NTS.^{22,114,115} Amin, Singhal and Cole revealed unpreparedness levels of recent (1-5 year) paediatric graduates in 25% of the assessed competences.⁹ Other studies highlight graduates' desire for extra courses to assist with deficiencies.^{115,116} Similarly, studies of new consultants' preparedness for practice reveal deficits in some clinical and managerial skills upon self-reflection.^{6,8,29,30,114,117} Data pertaining to local graduates do not exist and would be beneficial to inform faculties if any gaps are evident. Should gaps exist, contributory factors would warrant further investigation.

Not all graduates acknowledge their deficiencies despite contrary opinions of their managers and seniors.³⁰ Self-reflection is often poorly performed by graduates,¹¹⁸ possibly accounting for these disparate views. It would be expected that graduates who

have recently qualified, and have been assessed as 'competent' by their training authorities, will consider themselves at graduation as being ready for specialist practice. The euphoria of success after many years of sacrifice and hardship may cloud objective acknowledgement of any potential gaps in competences. It may be that only with time,²⁴ or in the case of a mature practitioner, with self-reflection and self-actualisation, that a graduate will notice or acknowledge any gaps. For this reason, graduate perceptions alone should not be relied upon to assess preparedness for practice. How others see what graduates are or should be doing, will also provide invaluable insights into FnFP and should be sought in South African anaesthesiology practice.

Do local graduates report any deficiencies and if so, what are they, and are they minimised after a period of experience or time? These warrant further exploration to determine whether there is a temporal component of FnFP.

Anaesthesiologists must be able to function optimally to provide safe and effective specialist anaesthesia. However, not all graduates feel or are considered prepared for their roles as a specialist. FnFP is an important, although not novel, concept to explore as a more appropriate target for certification than competence. However, FnFP remains poorly defined both in a LMIC and amongst anaesthesiologists. The CanMEDS competency framework, while not without its limitations, appears to provide a more structured approach to specialist training than a purely time-based apprenticeship. It may thus be more likely to produce FFP specialists.

The studies composing this research will seek to define, explore and understand the concept of FnFP as perceived by South African anaesthesiologists in terms of CanMEDS, by answering the following questions:

- Which of the CanMEDS competences and their attendant components are perceived by experts as important for the anaesthesiologist in SA?
- In terms of the CanMEDS competences and components, as appropriate for South African anaesthesiologists,
 - how do teachers and examiners view the preparedness for practice of graduates?
 - how does a recently graduated cohort of specialists view their own preparedness?
- Is there a change over time of the perceptions of graduate specialist anaesthesiologists of their preparedness for practice?

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Chapter 3: Modification of a competency framework to address fitness for purpose in South African anaesthesiology

After reviewing and conceptualising FnFP and proposing it, rather than competence, as the culmination of the journey of specialist training, the next step would be to address it in the local anaesthesiology context. Establishing how FnFP for South African anaesthesiology could be defined and gauged in a local context would be a useful first step in the process of determining if local graduates are FFP. There is currently no definition for local FnFP or tool with which it may be gauged in anaesthesiology graduates in SA. South African anaesthesiology trainees are taught and assessed according to the CanMEDS competency framework. In the absence of an alternative means with which trainees can train, and in order to determine the FnFP of local graduates, it is important to discern whether the current CanMEDS structure would constitute an appropriate source of FnFP in the local anaesthesiology context.

In so doing, the FnFP of CanMEDS is explored as a means with which graduate FnFP in South African anaesthesiologists can be gauged. This is dealt with in Paper 2, which defines FnFP in South African anaesthesiology through assessment of the CanMEDS framework.

Part 3.1: Paper 2- Defining fitness for purpose in South African anaesthesiologists using a Delphi technique to assess the CanMEDS framework

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Defining fitness for purpose in South African anaesthesiologists using a Delphi technique to assess the CanMEDS framework

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Background: Training of South African anaesthesiologists is based on the Canadian Medical Education Directives for Specialists (CanMEDS). However, the applicability of CanMEDS in this context has not been assessed. An expert panel participated in a Delphi process to create an appropriate expanded list of CanMEDS competencies that may be used in the future to assess fitness for purpose of local graduates.

Methods: This descriptive study comprised a representative panel of 16 experts surveyed electronically over three rounds to assess the importance of the existing CanMEDS roles and enabling competencies and suggested additions deemed applicable locally. The primary outcome was the creation of a list of competencies applicable to South Africa.

Results: There was a 100% response rate for all three rounds. Based on the existing seven CanMEDS meta-competencies (Medical Expert, Collaborator, Communicator, Leader, Scholar, Professional and Health Advocate), respondents scored the importance of 89 enabling competencies and 19 additional competencies. Seven CanMEDS enabling competencies did not achieve consensus and were excluded. Nineteen new enabling competencies and two new meta-competencies (Humaneness, Context Awareness) achieved consensus and were added. Median ratings of importance of meta-competencies showed highest scores for Medical Expert and Collaborator and lowest scores for Health Advocate. Weighting of meta-competencies revealed highest scores for Medical Expert and Professional with all others equally weighted.

Conclusion: This study has formulated an adapted CanMEDS list of enabling competencies with the addition of the two new meta-competencies of Context Awareness and Humaneness for use in South African anaesthesiology. This provides a means with which future graduates may be assessed for fitness for purpose.

Keywords: fitness for purpose, anaesthesiology, medical education

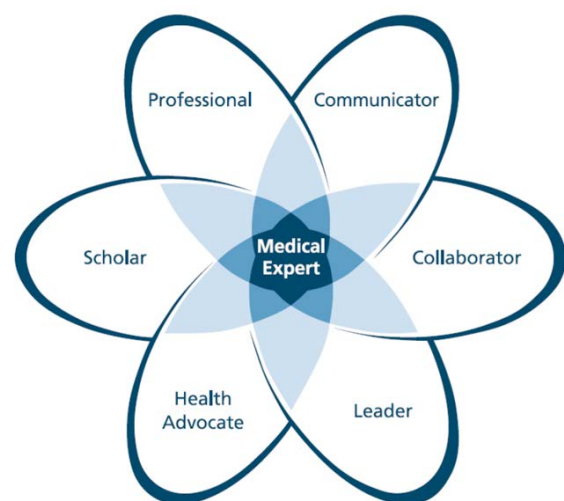
Introduction

In South Africa, anaesthesiologists are a scarce commodity with an estimated 2.89 per 100 000 population. (South African Society of Anaesthesiology, personal communication). Due to an ever-increasing demand, local anaesthesiologists do not necessarily remain in the public sector to evolve into their specialist roles. As in other countries, they have to function independently irrespective of their placement immediately postgraduation to address the large demand placed on the healthcare sector. The transition from trainee to specialist has been associated with adverse physician and patient outcomes, primarily due to the perception of newly qualified specialists of unpreparedness.¹⁻⁵ To alleviate this additional stressor, graduates need to be fit for purpose to function safely and appropriately.

Fitness for purpose (FFP) in anaesthesiology has been defined as an expert without any deficiencies in either their technical or non-technical skills.⁶ It has, however, not been addressed in the South African anaesthesiology context. This elusive concept is closely related to competence and expertise, however, it is imperative that distinctions are made to have a clear understanding of the expectations of graduating specialist anaesthesiologists.⁶

In South Africa, anaesthesiologists under the guidance of the Colleges of Medicine of South Africa (CMSA) are trained by university departments and assessed in accordance with the Canadian Medical Education Directives for Specialists (CanMEDS).

CanMEDS was designed by The Royal College of Physicians and Surgeons in Canada in 2005⁷ and has been recently updated⁸ (Figure 1). The CanMEDS competency framework guides and informs the teaching and training of medical specialists in order to achieve competence in their speciality whilst simultaneously ensuring societal accountability.⁷



ROYAL COLLEGE | CANMEDS
OF PHYSICIANS AND SURGEONS OF CANADA

Figure 1. The CanMEDS (Canadian Medical Education Directives for Specialists) Roles. Copyright © 2015 The Royal College of Physicians and Surgeons of Canada. <http://rcpsc.medical.org/canmeds>. (Reproduced with permission)

In Canada, CanMEDS evolved according to societal needs and stakeholders were intimately involved in the design and planning of the framework with specific competency outcomes in mind.⁹ However, other countries adopting CanMEDS have not necessarily gone through the same rigorous processes for their specific needs. This framework may not be inclusive enough for the distinctiveness of specific specialities and requires validation for anaesthesiology in the South African context.

Several studies have investigated the appropriateness of the adoption of CanMEDS for local specialist training. A Danish study assessed the validity of CanMEDS for the training of all specialities in Denmark.⁹ This study confirmed that despite considering CanMEDS mostly valid, it required internal validation for specific specialities, local societal needs and variations in local medical education and patient care. A study conducted in Germany adapted the seven CanMEDS roles for an anaesthesiology department by taking into account the specific needs of anaesthesia in that setting.¹⁰

The current South African anaesthesiology curriculum comprises 13 domains rooted in the existing seven CanMEDS generic meta-competencies. Several potential problems with CanMEDS exist. Firstly, it is a competency framework that, despite its many benefits to postgraduate training and improved patient outcomes, does not imply fitness for purpose.⁶ Each of the seven meta-competencies consists of several key and enabling competencies incorporated into milestones that the graduate must achieve.¹¹ However, not all meta-competencies or complex roles can be reduced to component milestones. Assuming that a graduate can perform a complex task based on their ability to perform the components of the task is not necessarily true.¹²⁻¹⁴

Secondly, several deficiencies have been demonstrated in non-technical components of the CanMEDS framework because they are more difficult to teach and therefore assess,¹⁵ rendering graduates deficient in these skills.¹⁶ The competence suggested by CanMEDS cannot assure fitness for purpose since not all non-technical skills are incorporated.

Aim of the study

The study's purpose was to determine whether CanMEDS was an appropriate framework for FFP in South African anaesthesiology as determined by local experts. Consideration was specific to what core roles and enabling competencies every anaesthesiologist in South Africa should possess, irrespective of their eventual placement in either the public or private sectors. This would assist in the ultimate creation of an appropriate list of criteria to assess fitness for purpose.

Methods

Ethics

This study received ethical approval from the Biomedical Research Ethics Committee (BREC) at the University of KwaZulu Natal (BE199/17). All participants provided informed consent.

Study details

A qualitative Delphi-designed study consisting of three electronic survey rounds (Survey Monkey[®]) was undertaken. The study sample comprised South African anaesthesiologists deemed to be experts in the field, representative of both the public and private sectors, and totalled sixteen. Half represented

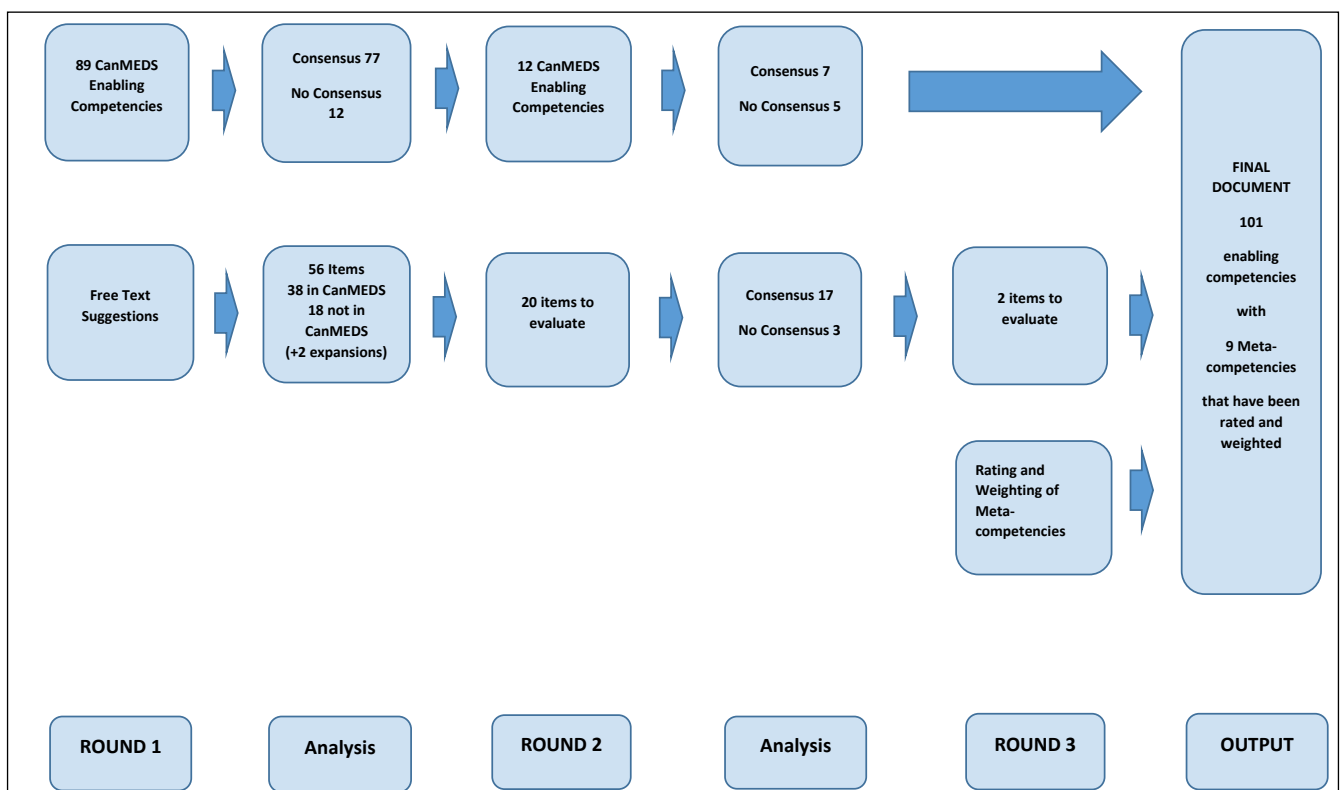


Figure 2. Overview of the multi-phase Delphi process

the public sector, comprising heads of the eight departments of anaesthesiology affiliated to the eight national medical schools. The other half represented the private sector in the geographical distribution of each academic department and were involved in teaching and training in their affiliated departments. All respondents remained anonymous to the other participants throughout the Delphi process.

An *a priori* consensus level was determined as 80% (N = 13) for scoring using a 4-point Likert scale (1 – not important at all; 2 – somewhat important; 3 – very important; 4 – absolutely essential). The investigators stipulated a two-round scoring process for each item. If consensus was not obtained after two rounds, the item was excluded.

In round one, participants scored the importance of enabling competencies of the seven existing CanMEDS roles in the context of South African anaesthesiologists working at any level in both the private and public sectors. Scores of 1 and 2 were considered unworthy of inclusion with items thus excluded, while scores of 3 and 4 were worthy of inclusion and thus retained. At the end of round one, respondents suggested any enabling competencies or new roles appropriate for South African anaesthesiology that had not been incorporated into the existing CanMEDS framework.

Round two required rescoring of items for which consensus had not been achieved in round one and scoring of the suggested additions made by respondents in round one. Round three required rescoring of the additional items for which consensus had not been reached in the previous round and also allowed respondents to rate and weight the importance of the various meta-competencies considered appropriate in the local context. Prior to the commencement of rounds two and three, respondents received feedback in the form of their score in relation to the median score of the panel from the preceding round.

The primary outcome was the creation of a consensus list of core meta-competencies and enabling competencies that South African anaesthesiologists would be expected to possess on graduation that would contribute to their fitness for purpose. These competencies would provide a means with which to both define and measure fitness for purpose in the South African anaesthesiology context (Figure 2).

Results

Sixteen participants were identified, with all agreeing to participate in the study. The final panel consisted of eight public and eight private sector anaesthesiologists affiliated to academia, deemed to be considered local experts and representative of their geographical and training centre location. There was a 100% response rate for all three rounds and all questions were answered.

Round 1

Round one comprised two components: a) scoring of existing CanMEDS competencies and b) free text to allow for respondent suggestions. Ninety-seven questions were included with 89 representing the enabling competencies of the seven existing CanMEDS specialist roles that required scoring. Eight questions prompted respondents to consider whether any new roles or enabling competencies for existing roles were absent from the current CanMEDS framework (free text). At the end of round one, consensus was achieved for 77 of the 89 enabling competencies, all with scores of 3 or 4 (worthy of inclusion). Non-consensus competencies proceeded to round two (Table I).

Table I. Summary of CanMEDS enabling competency scoring for rounds one to three.

	Medical Expert	Communicator	Collaborator	Leader	Health Advocate	Scholar	Professional	Total
ROUND 1								
Enabling competencies	17	17	7	11	6	18	13	89
Consensus achieved	17	16	7	10	0	15	12	77
ROUND 2								
Enabling competencies (carried over from R1)	0	1	0	1	6	3	1	12
Consensus achieved	N/A	0	N/A	1	3	1	0	5
Enabling competencies Deleted after R2	0	1	0	0	3	2	1	7
ROUND 3								
Enabling competencies	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

R1 – round one; R2 – round two; N/A – not applicable

In the second (free text) component of round one, respondents considered what enabling competencies and /or roles were omitted from or insufficiently represented by the existing generic CanMEDS framework deemed necessary for South African anaesthesiology. Respondents provided 56 additional suggestions. These were categorised into related themes and cross-referenced with the CanMEDS 2015 framework⁸ to avoid duplication. Of these, eighteen either did not form part of the existing CanMEDS framework or were considered inappropriately represented in the framework for the local context (Table II). These were retained for consideration in round two (Table III).

Of the proposed 18 additions for inclusion into round two, 44% were incorporated into existing CanMEDS roles with the remaining 10 (56%) considered under two overarching **new** themes:

Humaneness, defined as tenderness, compassion, and sympathy for people, especially for those who suffer or are distressed, that causes the least harm to people and should underpin ALL the roles of a specialist; and

Context awareness, defined as the global ability of a specialist to be aware of and consider how various clinical and non-clinical contexts would require a modification in practice to ensure good outcomes. This would include both situational and context-specific adaptation that will permeate across ALL the roles of the specialist.

Table II. Summary of free text suggestions for additions to existing CanMEDS (rounds one to three)

	Medical Expert	Communicator	Collaborator	Leader	Health Advocate	Scholar	Professional	Humaneness	Context Awareness	Total
ROUND 1										
Suggestions	10	4	5	9	3	2	13	6	4	56
Cross referenced to CanMEDS	9	3	3	9	1	2	11	0	0	38
ROUND 2										
Enabling competencies scored (carried over from R1)	1	1	2	0	2	0	3*	6	4	19
Consensus achieved	1	1	2	0	1	0	2	6	4	17
ROUND 3										
Enabling competencies	0	0	0	0	1	0	1	0	0	2
Consensus achieved	N/A	N/A	N/A	N/A	1	N/A	1	N/A	N/A	2

R1 – round one; R2 – round two; R3 – round three; N/A – not applicable *One question carried over from R1 was considered as two separate questions in R2

Table III. Summary of categorised round one free text suggestions for consideration in round two

Suggestion not part of/insufficiently represented by CanMEDS	Theme allocated to suggestion
Ability to multi-task.	Medical Expert
The importance of a translator where there is a language barrier: effective communication to ensure patient understanding.	Communication
Ability to decide on the appropriate level of competence of the healthcare provider to whom patient care is handed over (e.g. awareness of level of competency required at handover).	Collaborator
Ability to respond to need for involvement outside perioperative domain e.g. mass casualties.	Collaborator
Ensure that all staff (including oneself) in the clinical environment are safe and not at risk with respect to physical or psychological injuries.	Health Advocate
In-depth knowledge of global health issues	Health Advocate
Advocacy on behalf of the profession to the public: public opinion of the profession.	Professional
Punctual and efficient practice.	Professional
Adaptability and creativity in various situations with respect to solving problems.	Context Awareness
Ability to assess capacity to consent in various contexts: context specific adaptation.	Context awareness
Remain humane despite inhumane demands.	Context awareness
Situational awareness: the ability to perceive, comprehend the meaning of, and to predict the impact of variables in the work environment.	Context awareness
Tolerance of diversity/differences and able to practise non-judgementally.	Humaneness
Ability to remain calm under pressure.	Humaneness
Possess an awareness of and respect for the impact and sensitivities of race, culture, ethnicity and gender differences on decision-making and patient management.	Humaneness
Honesty, integrity, altruism, humility.	Humaneness
Manage patients and their families/caregivers with a caring and empathetic nature.	Humaneness
Humanitarianism.	Humaneness

Round 2

Round two comprised two components. The first consisted of the 12 remaining questions carried over from round one that required rescoring to reach consensus. The second section comprised 20 questions in total; 19 formulated from the 18 free text suggestions and one assessed relative importance of suggestions from round one.

The twelve enabling competencies carried over from round one were rescored with seven not reaching consensus and thus excluded (Table IV). The remaining five items all scored 3 or 4 and were thus considered worthy of inclusion (Table I).

Table IV. CanMEDS enabling competency deletions after rounds one and two

Role	Enabling Competency Deleted
Communicator	Assist patients and their families to identify, access, and make use of information and communication technologies to support their care and manage their health.
Health Advocate	Work with patients to address determinants of health that affect them and their access to needed health services or resources.
Health Advocate	Work with patients and their families to increase opportunities to adopt healthy behaviours.
Health Advocate	Work with a community or population to identify the determinants of health that affect them.
Scholar	Contribute to the work of a research programme.
Scholar	Pose questions amenable to scholarly inquiry and select appropriate methods to address them.
Professional	Participate in peer assessment and standard-setting.

In the second component, nineteen enabling competencies were scored for the first time. Two did not reach consensus and were forwarded to round three (Table II). All consensus scores were either 3 or 4 and were included. The final question in this component interrogated the relative importance of CanMEDS roles. Consensus was not achieved requiring rescoring in round three.

Round 3

Round three addressed three outstanding questions from round two. At the outset, respondents were asked to re-score two enabling competencies to reach consensus (Table II), which was achieved. Thereafter, a final modified CanMEDS list for South African anaesthesiology was created (Appendix).

To investigate the relative importance of CanMEDS roles, the third question was expanded to include all existing CanMEDS roles as well as the two additions of Humaneness and Context Awareness. The expanded questions required a) *rating of importance* of the roles using a 9-point scale and the b) *weighting of all roles as a percentage of time spent for teaching, training and assessment* (Figures 3 and 4).

Discussion

This descriptive study examined the views of experts in South African anaesthesiology to ascertain whether the existing CanMEDS competency framework is appropriate for establishing fitness for purpose in local anaesthesiologists. The results indicate that all seven CanMEDS roles and the majority (82/89) of the CanMEDS enabling competencies are considered important

locally. This attests to the applicability of this framework, albeit generic in nature, to most aspects of local anaesthetic practice. However, seven CanMEDS enabling competencies were deemed unworthy and omitted (Table IV). Of those, the majority were associated with the role of Health Advocate. This reflects international sentiments^{9,17} of specialists including anaesthesiologists, consistently rating this the least important of all specialist roles. Our panel rated the importance of all nine meta-competencies highly, scoring all between seven and nine, with the lowest rated being Health Advocate^{9,17} (Figure 2).

Reasons for the low ratings of health advocacy despite inclusion into specialist training frameworks are varied. Some suggest trainees are not taught advocacy or may only advocate at an individual rather than at a societal level.^{9,17} Others report that specialists rate health advocacy lowest, unlike general practitioners, suggesting that advocacy needs within a hospital are deferred to those involved in primary health care.⁹ Verma, Flynn and Seguin report that Canadian faculties find it difficult to formally teach and assess advocacy, suggesting its learning via the hidden curriculum through experience rather than by formal teaching.¹⁷ Hence, if the healthcare system lacks good role modelling, this component of learning might be omitted, causing deficiencies. Important considerations of conflict may arise where specialists need to be managers in situations of resource constraints yet are expected to promote health advocacy for all.¹⁷ Health advocacy may be perceived as additional work by busy anaesthesiologists who are working in demanding situations with high clinical loads. Time constraints, poor remuneration and feelings of overwhelming demands may unfortunately render health advocacy a lower priority despite the acceptance of the social responsibility for advocacy to all.¹⁷ Despite deletions of some societal health advocacy-related enabling competencies, our panel suggested additions

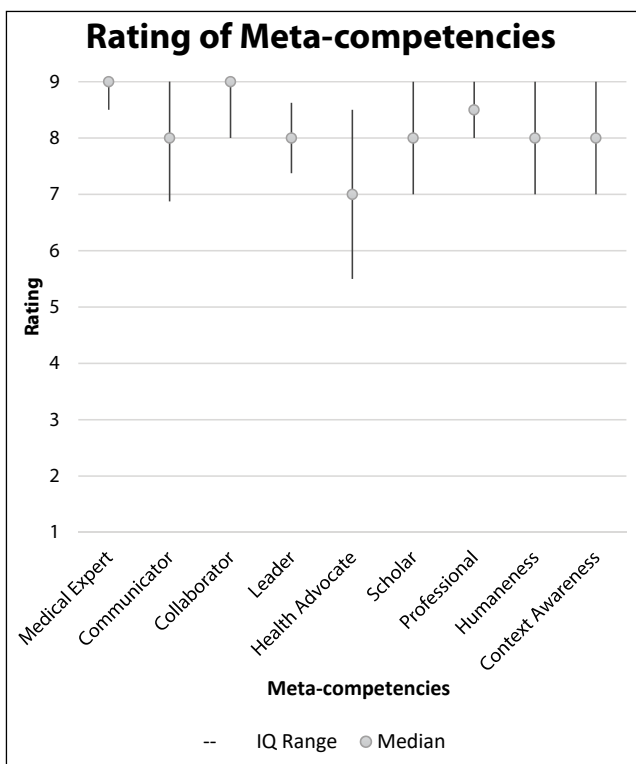


Figure 3. Round 3 median rating of importance of meta-competencies. Rankings done on 9-point scale with 1 = LEAST important and 9 = MOST important.

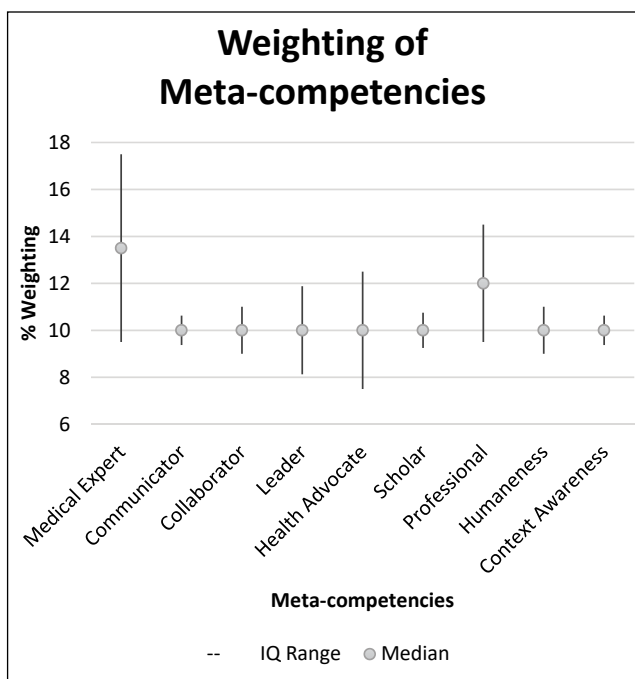


Figure 4. Round 3 median weighting of meta-competencies with respect to time to be spent on teaching, training and assessment. Median weighting reflected as a percentage (%).

more appropriate for the specialist anaesthesiologist, reflecting advocacy towards colleagues and self to ensure physician welfare (Table III).

Our panel rated the roles of Collaborator and Medical Expert highest. Results for Collaborator may suggest that anaesthesiologists appreciate that their expert perioperative management of patients cannot be performed in isolation and that collaboration with other disciplines is crucial to enhance patient outcomes. Collaboration is not only important for clinical care of patients but also with respect to training, teaching and research.

The high rating of Medical Expert reflects the perceived central role that this meta-competency plays in creating an expert. According to Dreyfus and Dreyfus, the trainee evolves from competent, to proficient and ultimately to an expert who has intuitive knowledge and can perform complex tasks.¹⁸ CanMEDS considers the Medical Expert as 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”.⁸ Although our panel echoes this sentiment it suggests that the core personal attributes considered important for practitioners to possess in order to be FFP are not entirely taken into account. Experts felt that the seven CanMEDS meta-competencies were not inclusive enough for the requirements of a local anaesthesiologist and suggested the addition of other features, categorised into roles of Humaneness and Context Awareness, to improve applicability in the local context.

Humaneness incorporates human attributes necessary to care for distressed or suffering individuals and describes the features of a good-natured individual of sound moral standards who responds appropriately to those in need. CanMEDS incorporates some aspects of Humaneness currently (altruism, humility, honesty, integrity)⁸ but these have been isolated to the role of professional. The panel considered these attributes not only important in one’s professional role but in every role of a specialist.

Due to the country’s economic instability and high levels of poverty, humanitarianism and empathy were considered important components of a South African anaesthesiologist. Likewise, the ability to remain calm in situations of severe shortages accompanied by an overwhelming epidemic of trauma, was considered necessary. The multi-racial and diverse nature of South Africa’s population also makes it essential that practitioners remain sensitive to patient differences and practise non-judgementally

in all their specialist roles. Humaneness is therefore considered a vital, core feature of a practitioner, and subsequently underpins all the roles of the anaesthesiologist.

Anaesthesiologists’ non-technical skills are necessary for the practice of safe anaesthesia with good patient outcomes.^{6,19} Several suggestions from the panel alluded to the ability of the anaesthesiologist to be able to perform numerous technical and non-technical skills concurrently. These include situational awareness, not only in the collaborator role as indicated by CanMEDS,⁸ but in all roles of the specialist. The panel suggested that anaesthesiologists should be able to think on their feet and be creative in situations where traditional means of problem solving may not work or may be inappropriate due to resource limitations. Thinking outside the box and having the ability to be adaptable in any given context was deemed important. Thus the anaesthesiologist, in their quest for good patient outcomes, must learn to modify their practice in any situation, allowing context awareness to permeate across all their specialist roles.

Based on suggestions from the panel that were categorised into the two new meta-competencies of Humaneness and Context Awareness, the authors deemed it necessary to amalgamate these with the existing CanMEDS framework for local applicability. Humaneness, considered a central, personal role, is situated centrally at the core of the CanMEDS framework whilst context awareness is an all-encompassing role that infiltrates all others, embracing both personal and professional components of the anaesthesiologist (Figure 5).

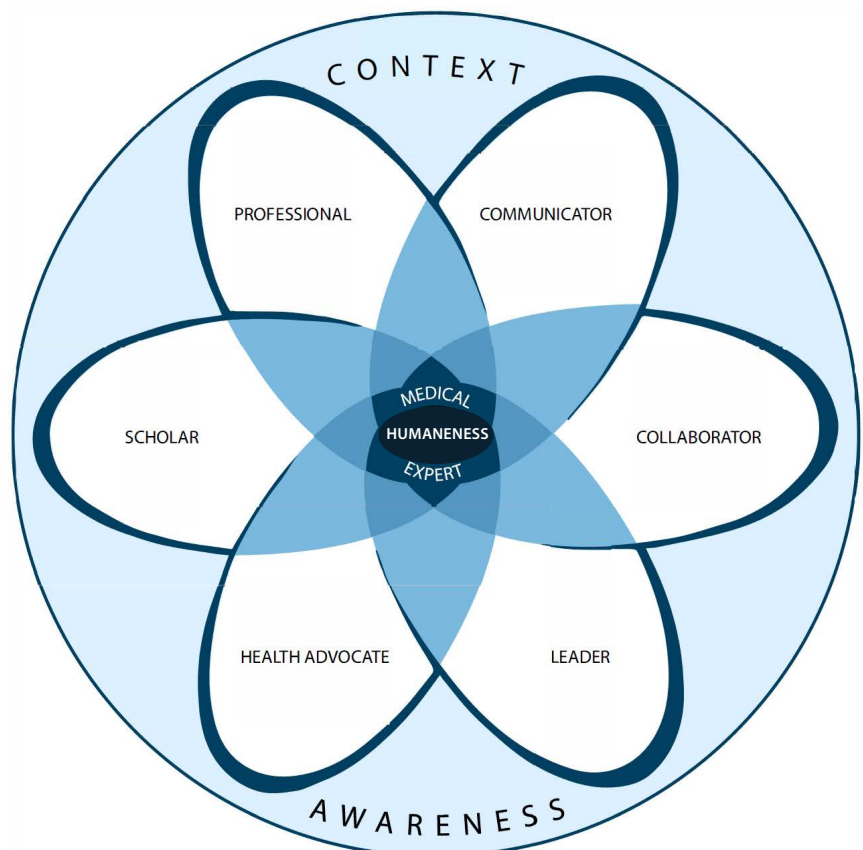


Figure 5. Modified CanMEDS for South African Anaesthesiology (Adapted from CanMEDS with permission)

This culminated in the creation of a comprehensive list of enabling competencies, specific to the South African anaesthesiology context, adapted from CanMEDS, which may be used for teaching and training and to assess FFP of local anaesthesiologists (Appendix).

Experts' weighting of the nine roles of the South African anaesthesiologist reflects that most roles should be evenly weighted with respect to time allocated for teaching, training and assessment. However, Medical Expert and Professional were weighted higher than the remaining seven meta-competencies. The large interquartile (IQ) ranges associated with Medical Expert and Professional indicate wider divergence of opinion despite the higher median scores. This alludes to the need for further research should these data be analysed for the purpose of curriculum development for South African anaesthesiology.

There were a number of limitations of this study, primarily related to the Delphi process.²⁰⁻²² Relevant to this study, there are variable opinions as to how to define and determine consensus, ranging from 51% to 90%.^{21,23} We determined that 80% would be appropriate for a high-stakes' study such as this. A larger sample size may be argued as a better representation of the South African anaesthesiology profession, however, limitations of panel size to ensure a successful Delphi process dictated the need for restrictive sampling. Our panel of 16, although slightly larger than the recommended number of 8–12 and logistically more difficult to manage, was however, representative of the entire country. Criticism exists regarding unequal distribution of expertise in panels,²¹ however this was not the case in our study. To follow up the potential lack of responses, investigators require respondent identities which may compromise the truthfulness of responses,²² however, in our study, participant responses were only known by a single investigator.

Our study had several strengths. The Delphi process was specifically chosen to generate consensus in a field where evidence is lacking. The sample is representative of all regions of South Africa and therefore attests to the generalised applicability nationally. Due to the absence of physical meetings, our expert panel was more geographically representative due to cost saving and less likely affected by peer pressure perceived from face-to-face encounters.²⁴ Excellent response rates were achieved by the electronic process. This ensured that all opinions and judgements of experts in all rounds were considered and contributed to the validity of the data.²³

Conclusion

This study provides some insight into the current perceptions of local anaesthesiology experts and has assisted in formulating a list of criteria against which South African anaesthesiology graduates can be measured to assess their fitness for purpose. Despite the current lack of local evidence in this regard, this study has succeeded in creating a modified CanMEDS framework that is applicable for use in all regions of South Africa. However, the question of whether South African anaesthesiology graduates *are* currently fit for purpose according to the modified framework, remains unanswered. Future research in this regard would require investigation of the various stakeholders'

opinions. Results of such further inquiry will inform teaching, training and assessment and assist in optimisation of the current anaesthesiology curriculum to address any deficiencies that might exist.

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Appendix

MEDICAL EXPERT

Key Competency:	Enabling Competencies:
1. Practise medicine within their defined scope of practice and expertise	1.1 Demonstrate a commitment to high-quality care of their patients 1.2 Integrate the CanMEDS Intrinsic Roles into their practice of medicine 1.3 Apply knowledge of the clinical and biomedical sciences relevant to their discipline 1.4 Perform appropriately timed clinical assessments with recommendations that are presented in an organized manner 1.5 Carry out professional duties in the face of multiple, competing demands 1.6 Recognize and respond to the complexity, uncertainty, and ambiguity inherent in medical practice
2. Perform a patient-centred clinical assessment and establish a management plan.	2.1 Prioritize issues to be addressed in a patient encounter 2.2 Elicit a history, perform a physical exam, select appropriate investigations, and interpret their results for the purpose of diagnosis and management, disease prevention, and health promotion 2.3 Establish goals of care in collaboration with patients and their families, which may include slowing disease progression, treating symptoms, achieving cure, improving function, and palliation 2.4 Establish a patient-centred management plan
3. Plan and perform procedures and therapies for the purpose of assessment and/or management.	3.1 Determine the most appropriate procedures or therapies 3.2 Obtain and document informed consent, explaining the risks and benefits of, and the rationale for, a proposed procedure or therapy 3.3 Prioritize a procedure or therapy, taking into account clinical urgency and available resources 3.4 Perform a procedure in a skillful and safe manner, adapting to unanticipated findings or changing clinical circumstances
4. Establish plans for ongoing care and, when appropriate, timely consultation.	4.1 Implement a patient-centred care plan that supports ongoing care, follow-up on investigations, response to treatment, and further consultation
5. Actively contribute, as an individual and as a member of a team providing care, to the continuous improvement of health care quality and patient safety.	5.1 Recognize and respond to harm from health care delivery, including patient safety incidents 5.2 Adopt strategies that promote patient safety and address human and system factors 5.3 Demonstrate the ability to multi-task

COMMUNICATOR

Key Competency:	Enabling Competencies:
1. Establish professional therapeutic relationships with patients and their families.	1.1 Communicate using a patient-centred approach that encourages patient trust and autonomy and is characterized by empathy, respect, and compassion 1.2 Optimize the physical environment for patient comfort, dignity, privacy, engagement, and safety 1.3 Recognize when the values, biases, or perspectives of patients, physicians, or other health care professionals may have an impact on the quality of care, and modify the approach to the patient accordingly 1.4 Respond to a patient's non-verbal behaviours to enhance communication 1.5 Manage disagreements and emotionally charged conversations 1.6 Adapt to the unique needs and preferences of each patient and to his or her clinical condition and circumstances
2. Elicit and synthesise accurate and relevant information, incorporating the perspectives of patients and their families.	2.1 Use patient-centred interviewing skills to effectively gather relevant biomedical and psychosocial information 2.2 Provide a clear structure for and manage the flow of an entire patient encounter 2.3 Seek and synthesize relevant information from other sources, including the patient's family, with the patient's consent
3. Share health care information and plans with patients and their families.	3.1 Share information and explanations that are clear, accurate, and timely, while checking for patient and family understanding 3.2 Disclose harmful patient safety incidents to patients and their families accurately and appropriately
4. Engage patients and their families in developing plans that reflect the patient's health care needs and goals.	4.1 Facilitate discussions with patients and their families in a way that is respectful, non-judgmental, and culturally safe 4.2 Use communication skills and strategies that help patients and their families make informed decisions regarding their health
5. Document and share written and electronic information about the medical encounter to optimize clinical decision-making, patient safety, confidentiality, and privacy.	5.1 Document clinical encounters in an accurate, complete, timely, and accessible manner, in compliance with regulatory and legal requirements 5.2 Communicate effectively using a written health record, electronic medical record, or other digital technology 5.3 Share information with patients and others in a manner that respects patient privacy and confidentiality and enhances understanding 5.4 Able to communicate effectively with patients, care-givers and families despite language differences

COLLABORATOR

Key Competency:	Enabling Competencies:
1. Work effectively with physicians and other colleagues in the health care professions.	1.1 Establish and maintain positive relationships with physicians and other colleagues in the health care professions to support relationship-centred collaborative care 1.2 Negotiate overlapping and shared responsibilities with physicians and other colleagues in the health care professions in episodic and ongoing care 1.3 Engage in respectful shared decision-making with physicians and other colleagues in the health care professions 1.4 Ability to respond to need for emergency involvement outside perioperative domain
2. Work with physicians and other colleagues in the health care professions to promote understanding, manage differences, and resolve conflicts.	2.1 Show respect toward collaborators 2.2 Implement strategies to promote understanding, manage differences, and resolve conflicts in a manner that supports a collaborative culture
3. Hand over the care of a patient to another health care professional to facilitate continuity of safe patient care.	3.1 Determine when care should be transferred to another physician or health care professional 3.2 Demonstrate safe handover of care, using both verbal and written communication, during a patient transition to a different health care professional, setting, or stage of care 3.3 Awareness of the competency required of the receiving practitioner at hand over of patients

LEADER

Key Competency:	Enabling Competencies:
1. Contribute to the improvement of health care delivery in teams, organisations, and systems	1.1 Apply the science of quality improvement to contribute to improving systems of patient care 1.2 Contribute to a culture that promotes patient safety 1.3 Analyze patient safety incidents to enhance systems of care 1.4 Use health informatics to improve the quality of patient care and optimize patient safety
2. Engage in the stewardship of health care resources.	2.1 Allocate health care resources for optimal patient care 2.2 Apply evidence and management processes to achieve cost-appropriate care
3. Demonstrate leadership in professional practice.	3.1 Demonstrate leadership skills to enhance health care 3.2 Facilitate change in health care to enhance services and outcomes
4. Manage career planning, finances, and health human resources in a practice.	4.1 Set priorities and manage time to integrate practice and personal life 4.2 Manage a career and a practice 4.3 Implement processes to ensure personal practice improvement

HEALTH ADVOCATE

Key Competency:	Enabling Competencies:
1. Respond to an individual patient's health needs by advocating with the patient within and beyond the clinical environment	1.1 Incorporate disease prevention, health promotion, and health surveillance into interactions with individual patients
2. Respond to the needs of the communities or populations they serve by advocating with them for system-level change in a socially accountable manner	2.1 Possess an In-depth knowledge of global health issues 2.2 Improve clinical practice by applying a process of continuous quality improvement to disease prevention, health promotion, and health surveillance activities 2.3 Contribute to a process to improve health in the community or population they serve 2.4 Ensure that all staff (including oneself) in the clinical environment are safe and not at risk with respect to physical or psychological injuries.

SCHOLAR

Key Competency:	Enabling Competencies:
1. Engage in the continuous enhancement of their professional activities through ongoing learning	1.1 Develop, implement, monitor, and revise a personal learning plan to enhance professional practice 1.2 Identify opportunities for learning and improvement by regularly reflecting on and assessing their performance using various internal and external data sources 1.3 Engage in collaborative learning to continuously improve personal practice and contribute to collective improvements in practice.
2. Teach students, residents (trainees), the public, and other health care professionals	2.1 Recognize the influence of role-modelling and the impact of the formal, informal, and hidden curriculum on learners 2.2 Promote a safe learning environment 2.3 Ensure patient safety is maintained when learners are involved 2.4 Plan and deliver a learning activity 2.5 Provide feedback to enhance learning and performance 2.6 Assess and evaluate learners, teachers, and programs in an educationally appropriate manner
3. Integrate best available evidence into practice.	3.1 Recognize practice uncertainty and knowledge gaps in clinical and other professional encounters and generate focused questions that address them 3.2 Identify, select, and navigate pre-appraised resources 3.3 Critically evaluate the integrity, reliability, and applicability of health-related research and literature 3.4 Integrate evidence into decision-making in their practice
4. Contribute to the creation and dissemination of knowledge and practices applicable to health.	4.1 Demonstrate an understanding of the scientific principles of research and scholarly inquiry and the role of research evidence in health care 4.2 Identify ethical principles for research and incorporate them into obtaining informed consent, considering potential harms and benefits, and considering vulnerable populations 4.3 Summarize and communicate to professional and lay audiences, including patients and their families, the findings of relevant research and scholarly inquiry

PROFESSIONAL

Key Competency:	Enabling Competencies:
1. Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards	1.1 Exhibit appropriate professional behaviours and relationships in all aspects of practice, demonstrating honesty, integrity, humility, commitment, compassion, respect, altruism, respect for diversity, and maintenance of confidentiality 1.2 Demonstrate a commitment to excellence in all aspects of practice 1.3 Recognize and respond to ethical issues encountered in practice 1.4 Recognize and manage conflicts of interest 1.5 Exhibit professional behaviours in the use of technology-enabled communication
2. Demonstrate a commitment to society by recognizing and responding to societal expectations in health care.	2.1 Demonstrate accountability to patients, society, and the profession by responding to societal expectations of physicians 2.2 Demonstrate a commitment to patient safety and quality improvement
3. Demonstrate a commitment to the profession by adhering to standards and participating in physician-led regulation.	3.1 Fulfill and adhere to the professional and ethical codes, standards of practice, and laws governing practice 3.2 Recognize and respond to unprofessional and unethical behaviours in physicians and other colleagues in the health care professions
4. Demonstrate a commitment to physician health and well-being to foster optimal patient care.	4.1 Exhibit self-awareness and manage influences on personal well-being and professional performance 4.2 Manage personal and professional demands for a sustainable practice throughout the physician life cycle 4.3 Promote a culture that recognizes, supports, and responds effectively to colleagues in need 4.4 Able to practice efficiently at all times 4.5 Ability to advocate on behalf of the profession to the public to assist in public awareness. 4.6 Able to function punctually at all times

CONTEXT AWARENESS

Key Competency:	Enabling Competencies:
1. Demonstrate the ability to adapt clinical and non-clinical practice to specific scenarios and environments to ensure good outcomes.	1.1 Ability to perceive, to comprehend the meaning of, and to predict the impact of variables in the work environment (situational awareness) 1.2 Capacity to be adaptable and creative in solving problems 1.3 Ability to assess capacity and obtain appropriate consent in any given circumstance 1.4 Ability to remain humane in difficult circumstances

HUMANENESS

Key Competency:	Enabling Competencies:
1. Demonstrate the ability to engage with and respond appropriately to patients, colleagues, societies and communities in need with qualities that personify good naturedness and with sound moral standards.	1.1 Awareness of and respect for the impact and sensitivities of race, culture and ethnicity on decision-making and patient management 1.2 Tolerance and the ability to respect diversities in patients, families and colleagues and function in a non-judgmental manner 1.3 Ability to practice with sound moral standards (Honesty, altruism, integrity, humility, commitment, kindness) 1.4 Ability to remain calm under pressure 1.5 Ability to manage patients and their families with a caring and empathetic nature. 1.6 Ability to promote human welfare and humanitarianism in society and at work

Part 3.2: Postscript to Paper 2

The abbreviation “FFP” in the Paper 2 publication alluded to both fitness for purpose and fit for purpose. To avoid confusion in subsequent papers, the following abbreviations have been used: fitness for purpose (FnFP); fit for purpose (FFP).

Paper 2, and its accompanying Appendix, make mention of “meta-competencies” rather than meta-competences and “enabling competencies” rather than enabling competences. These terminologies have been used interchangeably in the literature, but to avoid confusion, the author made the distinction between competences and competencies in part 2.3 (p25), which was written after publication of Paper 2. Subsequent publications (Papers 3 & 4), excluding their accompanying annexures which were created prior to the alignment of terminology in part 2.3 (p25), refer to meta-competences and enabling competences.

Corrigenda - Paper 2

On p61, right -hand column, paragraph 1, line 4: “where” should read “were”.

On p61, right-hand column, paragraph 1, line 10: “(Figure 2)” should read “(Figure 3)”

Part 3.3: Addendum to Paper 2

Results from Paper 2 reflect amendments made by experts to the existing CanMEDS meta- and enabling competences. The additional competences were considered to be more appropriate for use by anaesthesiologists in South Africa. CanMEDS classifies enabling competences as components of key competences which, in turn, constitute the meta-competences. Since the 19 additions were categorised according to meta-competences, not key competences, the author felt it necessary to contextualise the additions by attempting to categorise them according to existing meta- and key competences to align with CanMEDS (Table I, below). This was performed to facilitate the reader's being able to locate and categorise these additions, and to understand their roles in the locally amended list of CanMEDS criteria. New key competences were created for the new meta-competences Humaneness and Context Awareness.

Table I-Classification of 19 additional enabling competences from results of Paper 2

Meta-competence	Key competence	Enabling competence
Medical Expert	Actively contribute, as an individual and as a member of a team providing care, to the continuous improvement of health care quality and patient safety.	Demonstrate the ability to multi-task
Communicator	Document and share written and electronic information about the medical encounter to optimize clinical decision-making, patient safety, confidentiality, and privacy.	Able to communicate effectively with patients, care-givers and families despite language differences
Collaborator	Hand over the care of a patient to another health care professional to facilitate continuity of safe patient care.	Awareness of the competency required of the receiving practitioner at hand - over of patients
	Work effectively with physicians and other colleagues in the health care professions.	Ability to respond to need for emergency involvement outside perioperative domain

Meta-competence	Key competence	Enabling competence
Health Advocate	Respond to the needs of the communities or populations they serve by advocating with them for system-level change in a socially accountable manner	Possess an In-depth knowledge of global health issues.
		Ensure that all staff (including oneself) in the clinical environment are safe and not at risk with respect to physical or psychological injuries.
Professional	Demonstrate a commitment to physician health and well-being to foster optimal patient care	Able to practice efficiently at all times
		Ability to advocate on behalf of the profession to the public to assist in public awareness.
		Able to function punctually at all times
Context Awareness	Demonstrate the ability to adapt clinical and non-clinical practice to specific scenarios and environments to ensure good outcomes.	Demonstrate the ability to perceive, to comprehend the meaning of, and to predict the impact of variables in the work environment (situational awareness)
		Demonstrate the capacity to be adaptable and creative in solving problems
		Ability to assess capacity and obtain appropriate consent in any given circumstance
		Ability to remain humane in difficult circumstances
Humaneness	Demonstrate the ability to engage with patients, colleagues, societies and communities in need with qualities that personify with good naturedness and with sound moral standards.	Ability to promote human welfare and humanitarianism in society and at work
		Possess an awareness of and respect for the impact and sensitivities of race, culture and ethnicity on decision-making and patient management
		Display tolerance and the ability to respect diversities in patients, families and colleagues, and function in a non-judgmental manner
		Demonstrate the ability to remain calm under pressure
		Ability to manage patients and their families with a caring and empathetic nature.
		Demonstrate the ability to practice with sound moral standards (Honesty, altruism, integrity, humility, commitment, kindness)

The original CanMEDS flower diagram (Figure 1, p57) implies that all seven meta-competences are equally important, but this may not be universally true.¹⁻⁴ As alluded to previously, this is not a dilemma specific to SA. Many others, in considering CanMEDS for local use, have differentially weighted and ranked the importance of the CanMEDS meta-competences.¹⁻⁴ Even in Canada, where CanMEDS originated, clinicians do not consider all meta-competences equally important.⁵ Although some have sought to validate CanMEDS for their local use, and have investigated the importance of the meta-competences, there is no evidence that this information has been used to create a locally-contextual CanMEDS framework. Since CanMEDS is a generic specialist framework, not created specifically for anaesthesiology and not necessarily relevant in its entirety to all countries, it is important to consider that anaesthesiology in each country may have its own modified CanMEDS diagram. To obtain maximal benefit for trainees and faculties, a locally-applicable practical modification that takes into account national opinions of the importance and weightings of meta-competences should be sought and validated for local use. This would allow the CanMEDS competency framework to possibly become more useful and applicable to faculties and all graduate anaesthesiologists, irrespective of experience, in all countries.

Figures 3 & 4 (p61) indicate graphical representations of median values of local expert opinions with respect to rating of importance and proposed teaching time (weighting) of meta-competences. Experts considered all nine meta-competences as important but rated their importance differentially. Likewise, experts weighted the time to be spent on teaching and assessing the meta-competences differentially. This therefore suggests that the equal size of each “petal” in the original CanMEDS (Figure 1, p57) and modified CanMEDS (Figure 5, p62) diagrams may be misleading. However, the latter modified flower diagram provides the reader with a visual representation of the concept of FnFP of a South African anaesthesiologist. The FFP specialist is well-rounded and without deficiencies in any of the meta-competences comprising both technical and NTS.

Currently, the South African anaesthesiology curriculum⁶ consists of 13 domains (Table II, below) comprising content emanating from the seven original CanMEDS meta-competences. Each domain consists of several areas of clinical and non-clinical practice embodied in the seven CanMEDS specialist meta-competences. Domains 1-10 are clinical domains that incorporate both technical and NTS. However, domains 11-13 focus primarily on non-clinical areas of practice that emphasise NTS specifically. In order for the current curriculum to remain contemporary and consider the requirements of the local context, it will need to take into account the results of Paper 2. The author proposes that the two additional meta-competences, Humaneness and Context Awareness, be considered for inclusion into the domains of the current South African anaesthesiology curriculum. Similarly, curriculum designers/developers should consider structuring the curriculum and its domains to ensure that each domain is rooted in the nine meta-competences and their associated enabling competences.

Table II: FCA II curriculum according to the College of Anaesthetists, South Africa⁶

DOMAIN	DESCRIPTION
1	Fundamentals of Anaesthesia and Pain Management
2	Anaesthesia for Major and Trauma Surgery
3	Obstetric Anaesthesia and Analgesia
4	Anaesthesia for Cardiac, Thoracic and Vascular Surgery
5	Anaesthesia for Neurosurgery
6	Anaesthesia for ENT, Eye, Dental, Maxillofacial, and Head and Neck Surgery, including airway management
7	Paediatric Anaesthesia
8	Intensive Care Medicine
9	Pain Medicine
10	Anaesthesia in Remote Locations
11	Education, Self-directed learning and Research
12	Professionalism and Ethics in Practice
13	Quality, Safety, Management & Health economics

Weighting of the CanMEDS meta-competences in each domain has not been described by local curriculum developers or by CanMEDS. This omission may be problematic for teachers who are uncertain as to the emphasis that needs to be placed on the various domains and their component competences. South African exit examinations are blue-printed according to the curriculum to maintain transparency and fairness to candidates. However, assessors are unclear as to the degree of emphasis that should be placed on questions from each domain and from each meta-competence. Results from Paper 2 regarding meta-competence rating and weighting may assist assessors, examination convenors and the CMSA in this regard. Discussions about weighting propose that learners are more likely to learn content that is significantly weighted, suggesting that if items are to be emphasised, this should be reflected by their weighting.⁷

Although the modified CanMEDS flower diagram provides one with a visually appealing conceptual representation of a well-rounded, multifaceted and versatile FFP specialist, the practical application of the results from Paper 2 can be better depicted numerically. Of the many graphical ways of displaying information, the author proposes that a radar chart would provide a pragmatic means with which the multivariate data from Paper 2 could be more accurately displayed. While functioning as a visual aid and as a tool to animate the CanMEDS flower in regular daily training, this illustration would afford a greater insight with enhanced detail of the essential components, taking into account the differential importance of the specialist roles.

The proposed radar chart comprises nine axes, each depicting one of the meta-competences that local experts considered worthy of inclusion for FFP in SA anaesthesiology. The variable importance of the nine meta-competences are depicted by means of the corresponding lengths of the axes (Figure 1, below). Therefore a shorter axis would indicate a meta-competence of lesser importance than one with a longer axis (Figure 1).

Taking the concept of the radar chart further, the author postulates that secondarily, the radar chart could be useful as a self-reflective educational tool to inform the progress of trainees during their training time. Trainees could plot their individual progress dynamically, thereby affording them the opportunity to self-reflect and identify areas of deficiency necessitating emphasis. (Figure 1)

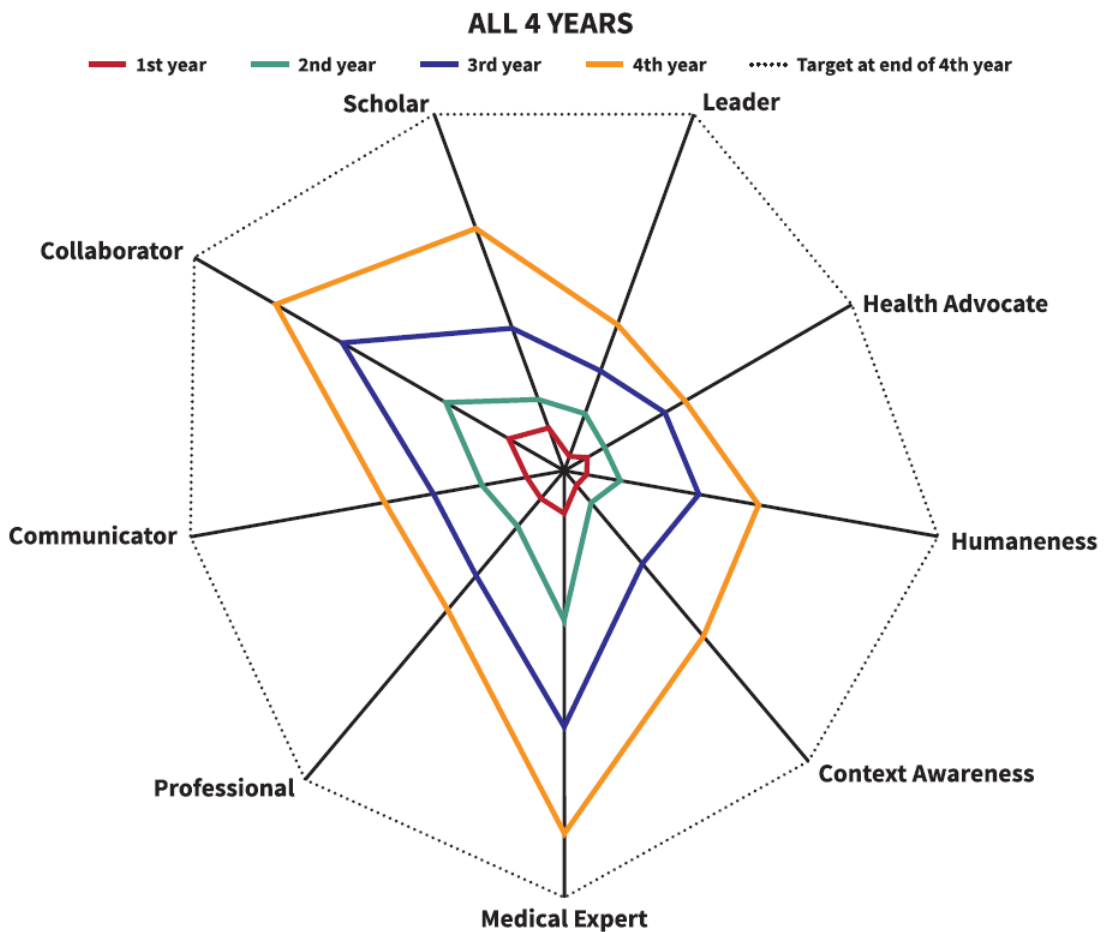


Figure 1. An example of a trainee radar chart indicating progress of training over four consecutive years

By using a radar chart as a guide to assist with attaining appropriate milestones for trainees at various intervals during their training, trainees can have a dynamic, graphical representation of their annual progress. They could update their chart each year as appropriate milestones are attained. The author recommends that the scales of each axis indicate the milestones or, preferably, EPAs attained by the trainee specific for each

meta-competence. Each training year could consist of a predetermined number of EPAs for each of the nine meta-competences, and the trainee’s annual progress could be easily depicted by the chart. Trainees can then reflect on their own progress plotted against expected annual targets for the nine meta-competences from which the curriculum is derived. Figures 2-5 indicate, as an example, potential progress of a trainee over four years of anaesthesiology training, and how their own attained targets compare to those expected at the end of each training year. By the end of the four-year training period, each trainee’s radar chart should consist of fully-attained meta-competences on appropriate scales (Figure 1). (It is quite acceptable that trainees’ charts may surpass that of the national benchmark, suggesting the attainment of excellence) (Part 2.3, p38). In this way, completion of the chart can be considered as a measure to assess eligibility to sit the final examination. It may be easier for faculties to graphically identify areas in which the trainee may still be deficient.

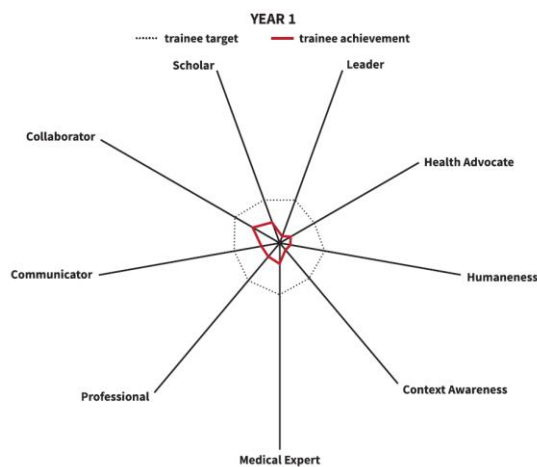


Figure 2. Example of trainee year 1

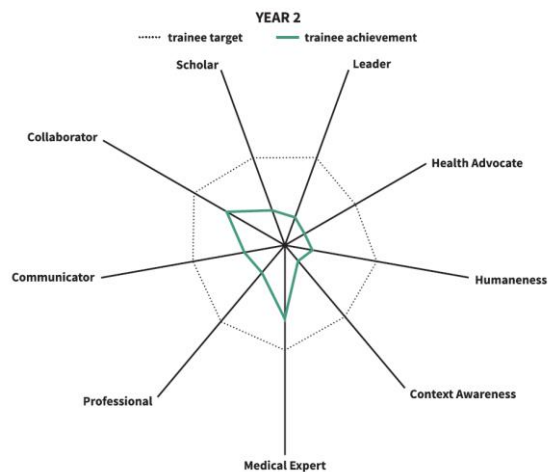


Figure 3. Example of trainee year 2

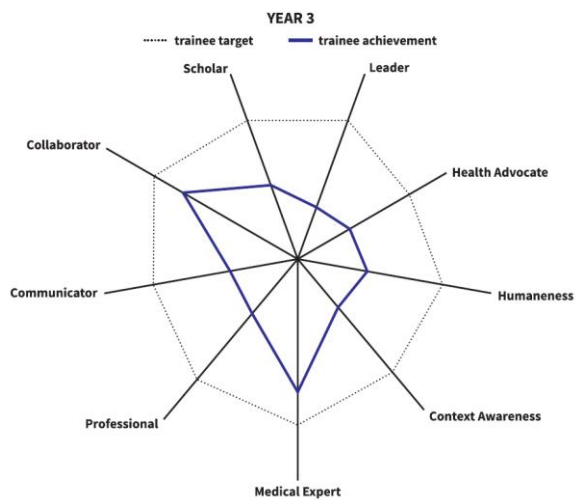


Figure 4. Example of trainee year 3

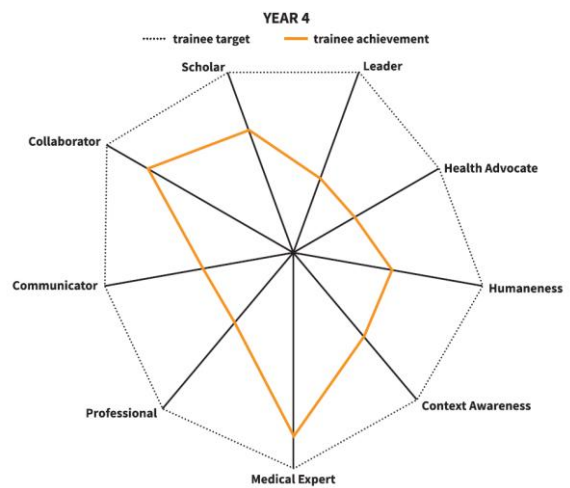


Figure 5. Example of trainee year 4

In conclusion, results of Paper 2 highlighting the opinions of experts indicates that the local curriculum and its accompanying domains requires amendment to include the additional meta-competences of Humaneness and Context Awareness, together with their associated enabling competences. The differential scoring of meta-competences unique to the SA context indicates that the proposed modified CanMEDS diagram of FnFP (Figure 5, p62) requires adjustment. Although conceptually appropriate, the illustration does not demonstrate differential scores of the approved nine meta-competences. However, a radar chart, conceptually similar to the modified CanMEDS diagram, may better display the opinions of experts and may secondarily assist trainees to track their progression through the process of specialisation.

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Chapter 4: Perceptions of local anaesthesiology graduate fitness for purpose according to seniors and graduates

Chapter 3 assisted by defining and illustrating FnFP in the local anaesthesiology context and proposed how the existing CanMEDS could be amended and made FFP as an instrument with which graduate FnFP could be gauged. This modified CanMEDS, deemed applicable for use in the South African anaesthesiology context, was proposed as a means for achieving graduate FnFP in the absence of other alternative structures.

Having defined FnFP locally, and establishing a means with which it can be gauged in graduates, it would be useful to establish whether local graduates are considered FFP according to the definition generated by local experts in Paper 2. The next publication, Paper 3, assesses stakeholder opinions of graduate FnFP by investigating perceptions of those who teach and assess anaesthesiology trainees, and compares them with those of trainees themselves. These important anaesthesiology opinions are compared and analysed to obtain insight into the perceived preparedness of local graduates.

Part 4.1: Paper 3 - Are South African anaesthesiologists fit for purpose? A comparison of opinions of graduates, teachers and examiners

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Are South African anaesthesiologists fit for purpose? A comparison of opinions of graduates, teachers and examiners

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Background: Anaesthesiologists must be assessed as and deemed fit for purpose (FFP) to function independently as specialists prior to their embarking on independent practice. Opinions of various stakeholders are useful in determining whether graduating specialists are prepared for practice, some of which include teachers, examiners and the graduates themselves.

Methods: This descriptive quantitative study comprised recent graduates and anaesthesiology teachers and examiners from all eight national university departments of anaesthesiology. Each participant scored the preparedness of graduates' competences deemed appropriate by national experts via an electronic survey. Nine specialist role meta-competences (medical expert, communicator, collaborator, leader, health advocate, scholar, professional, context awareness, humaneness) with their accompanying 101 component enabling competences were assessed. Participants used a 4-point Likert scale to score preparedness for each meta- and enabling competence (1 – completely unprepared; 2 – somewhat prepared; 3 – prepared; 4 – completely prepared). Scores of 1 and 2 were considered as unprepared and 3 and 4 as prepared. Scores of graduates, teachers and examiners were compared. After individual group comparisons, the scores of combined teachers and examiners (seniors) were compared with those of graduates.

Results: Response rates for graduates, teachers and examiners were 85%, 68% and 96% respectively. Graduates felt prepared for 7/9 roles (medical expert, collaborator, communicator, professional, scholar, context awareness and humaneness) and unprepared for the roles of health advocate and leader. Teachers' and examiners' scores were similar, perceiving graduates as prepared for 4/9 roles (medical expert, collaborator, context awareness and humaneness) and unprepared for the majority of their roles (communicator, scholar, professional, leader and health advocate). Leader and health advocate roles were unanimously perceived as unprepared by all three groups. Statistically significant disparate scores were evident between seniors and graduates for the roles of communicator, scholar and professional, with graduates assessing themselves as more prepared compared to the opinions of seniors.

Conclusion: According to South African national anaesthesiology teachers and examiners, local graduates may not be fit for purpose, despite the contrasting perceptions of graduates. Graduates' self-assessment may be less objective than that of experienced opinions, necessitating the need for longitudinal assessments to establish the impact of experience on subsequent graduate perceptions.

Keywords: fitness for purpose, anaesthesiology, medical education

Introduction

Medical graduates are subject to transitions during their careers. Whilst evolving from students to doctors, this transition may be fraught with perceptions of unpreparedness¹⁻⁷ manifesting as fear, anxiety, stress and burnout.⁸⁻¹⁰ Similarly, a stressful transition with feelings of unpreparedness plagues postgraduates from various disciplines expected to function independently as specialists upon graduation.¹¹⁻²⁰ Although burdens on trainees in high-income countries were exacerbated by the disadvantages of the European Working Time Directive,²¹ medical graduates of low-middle income countries have the added burden of vast supply-demand inequalities of human, financial and medical resources in healthcare environments far removed from global ideals. Such compounded burdens may accentuate perceptions of unpreparedness and aggravate anxiety, stress and job dissatisfaction.^{7,22,23}

South Africa is in need of specialists, particularly anaesthesiologists, with current estimates of 2.04 per 100 000 population²⁴ (personal communication: South African Society of Anaesthesiologists). Since higher-performing anaesthesiologists are associated with better patient outcomes,²⁵ it is incumbent on

the fraternity not only to produce specialists to reduce the deficit but also to ensure that specialists are fit for purpose (FFP) and able to meet the demands of society.²⁶

South African specialists who have completed their final exit examination and registration processes, must be equipped to function independently as FFP clinicians, irrespective of their placement within South Africa or abroad. They should be equipped with the knowledge, skills, behaviours and attitudes not only to transition from trainee to specialist smoothly, but to ensure minimal adverse effects to patients and themselves.

Finding a definition of fitness for purpose (FnFP) that is applicable to specialists worldwide may not be practical. FnFP implies that the graduate does what he/she was trained to do. However, FnFP in medicine and in anaesthesiology is complex and, until recently, has been poorly addressed in the literature.²⁷ Measuring whether a graduate does what he/she is supposed to in every situation for every patient under every circumstance is not as easy as testing a product in a factory. FnFP of anaesthesiologists is a concept that incorporates essential core elements to ensure an appropriately safe level of specialist practice. FFP anaesthesiologists have been defined as experts without deficiencies in technical and non-



Figure 1: Modified CanMEDS for South African anaesthesiology according to Kalafatis, Sommerville and Gopalan 2019²⁸

technical skills (NTS).²⁷ Each country or region must consider the minimum skills required for their anaesthesiologists to practice appropriately, taking into account the unique local demands of patients, colleagues, regulators, governments and society. To assess whether local anaesthesiology graduates are FFP, it is necessary to know which parameters to assess and how to assess them.

South African post-graduate specialist training, under the guidance of the Colleges of Medicine of South Africa (CMSA), is rooted in the Canadian Medical Education Directives for Specialists (CanMEDS). CanMEDS provides a generic framework for all specialist training irrespective of discipline. The authors previously attempted to define FnFP of South African anaesthesiologists by assessing this framework's applicability to South African anaesthesiology.²⁸ Using a Delphi method to determine what meta- and enabling competences were deemed appropriate by a representative panel of national public and private practice experts, the authors broadened the definition of FnFP in the South African anaesthesiology context with unique components that were deemed under-represented by CanMEDS. Amendments were made to the seven original specialist roles (medical expert, communicator, collaborator, scholar, leader, professional, health advocate) suggested by CanMEDS²⁹ by expanding them to nine with the addition of humaneness and context awareness (Figure 1). A comprehensive list of 101 enabling competences (Annexure) provided a means with which local anaesthesiology graduates' FnFP could be measured more objectively.²⁸

Aim of the study

The purpose of this study was to determine whether South African anaesthesiology graduates are perceived as FFP according to nationally-derived criteria. Stakeholders considered important in providing an opinion of FnFP of graduates were

national anaesthesiology teachers, examiners and the successful graduates of the national exit examination process.

Methods

Study details

The study comprises a single electronic survey (Survey Monkey®, SVMK, San Mateo, USA) undertaken by three groups. The first group consisted of anaesthesiology teachers at all eight national accredited university anaesthesiology departments. All anaesthesiologists involved in formal or informal teaching of trainees preparing for their exit examination were eligible for inclusion and invited to participate. Exclusion criteria were participation in the previous Delphi study²⁸ and those not involved in teaching. The second group comprised all official national Fellowship of the College of Anaesthetists of South Africa (FCA) examiners as appointed by the CMSA to perform examinations at exit level. Exclusion criteria were participation in the previous Delphi study²⁸ and non-examiners. Where dual teacher and examiner roles were noted, participants were counted as examiners. Candidates eligible to sit their final fellowship examinations in South Africa are able to do so in either semester one (May) or semester two (October) of each academic year. The third study group consisted of all graduates of the semester one (May 2019) FCA examination.

A 4-point Likert scale (1 – completely unprepared; 2 – somewhat prepared; 3 – prepared; 4 – completely prepared) was used for scoring graduate preparedness in the enabling competences. A priori, the authors determined that if > 50% of scores for each competence were 1 or 2, the item would be classified as unprepared. If > 50% of scores for the item were 3 or 4, the item would be considered as prepared.

The survey interrogated perceptions of preparedness for nine meta-competences with their associated 101 enabling competences derived from a previous study.²⁸ Each of the nine meta-competences had a variable number of enabling competences (Table I), with all 101 scored individually. The Cronbach's alpha reliability coefficient for the questionnaire was calculated.

The study population was described using mean and standard deviations for normally distributed data, and median and inter-quartile range for non-normally distributed data. The composite scores for the three groups were then compared using the Kruskal-Wallis test. Scores of examiners and teachers were compared using the chi-square (χ^2) test. Scores from the examiners and the teachers were then combined into a single composite score using a weighted average for each group, rounded to the nearest whole number, and compared against the graduate group using the χ^2 test.

Results

Figure 2 indicates the process of participant inclusion into the three study groups. Response rates for graduates, teachers and

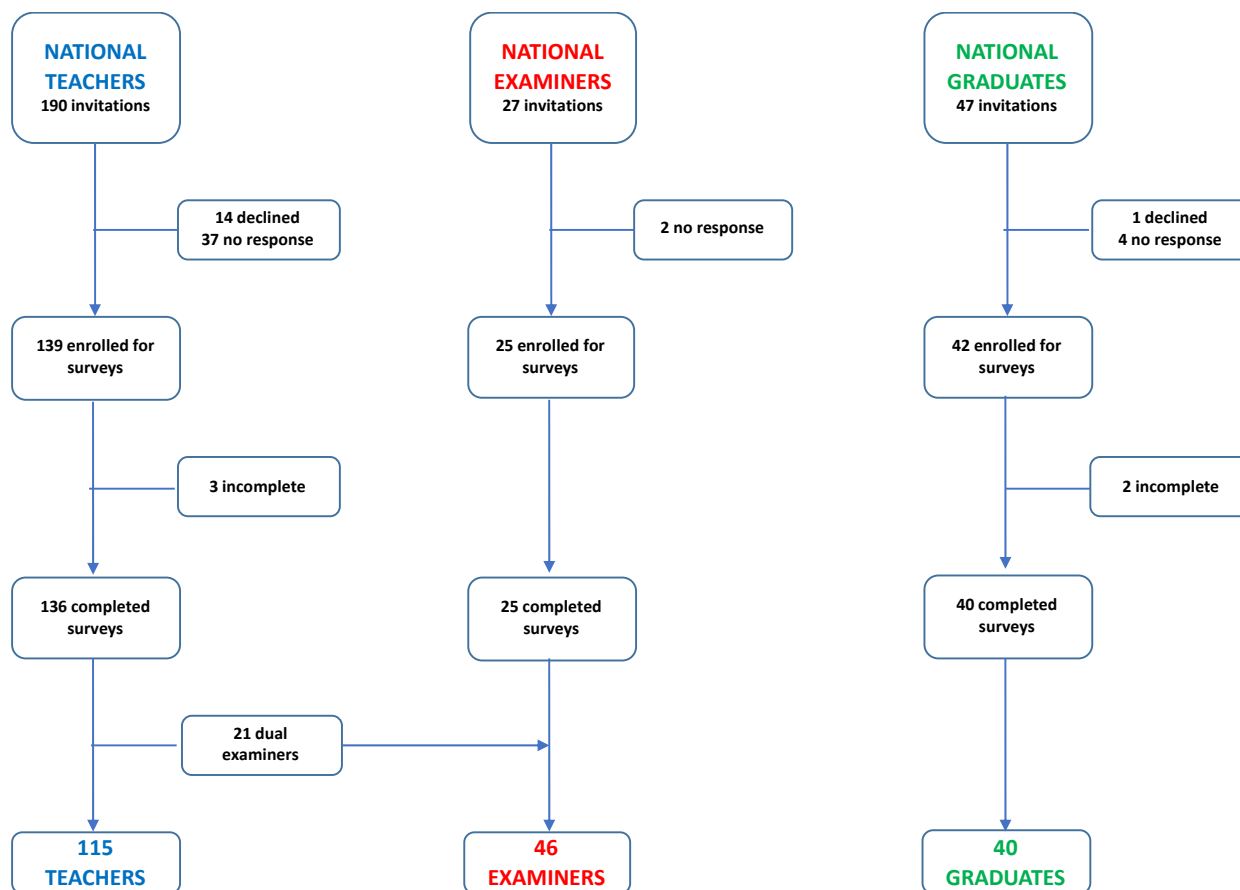


Figure 2: Process of participant inclusion into three groups

examiners were 85% (40/47), 71.5% (136/190) and 96% (25/27) respectively.

The Cronbach's alpha reliability coefficient for the questionnaire was calculated to be 0.76. Table I reflects a summary of the comparisons of responses of the three groups for the 101 enabling competences assigned to each of the nine modified CanMEDS meta-competences. Perceptions of preparedness by the three groups for the majority (5/9) of meta-competences were similar, and not statistically significant. These congruent perceptions were reflected as: Collaborator (prepared), context awareness (prepared), humaneness (prepared), leader (unprepared) and health advocate (unprepared). Significant differences between the groups were noted for the four remaining meta-competences, with opposing views displayed by seniors and graduates for communicator, scholar and professional and similar views for medical expert.

A χ^2 analysis of teacher and examiner scores revealed insignificant differences between the two groups for all roles except that of communicator. For this role, 64% of teachers and 94% of examiners scored graduates as unprepared.

Considering the similarities in responses between the teacher and examiner groups, the authors performed a secondary analysis combining these two groups into a seniors' group that was compared with the graduates. Results of these comparisons, reflected in Table II, were similar to those of the initial three-group comparison. Statistically significant disparate perceptions were

noted between seniors and graduates for communicator, scholar and professional roles, with graduates assessing themselves far more favourably than seniors. Despite both groups perceiving graduates as prepared for the role of medical expert, there was a statistical difference between them. This indicates that not all seniors were as certain of graduate preparedness compared with the graduates themselves. The majority in both groups considered graduates unprepared for the roles of leader and health advocate.

Discussion

The results of this study reveal that, according to experienced or inexperienced stakeholder views, new graduates are unprepared for five of nine specialist roles. These deficiencies are predominantly amongst the non-technical competences and may contribute to recent graduates feeling unprepared for their role as a specialist. This may predispose them to harmful adverse events and difficulties in practising as FFP practitioners.¹¹⁻²⁰

In keeping with our findings, previous studies across various medical specialities, including anaesthesiology, suggested that final year residents as well as new graduates feel unprepared for aspects of specialist practice,^{12,14,18,19,30-32} particularly leadership (management) and communication.^{12,13,15,33} A UK-based study assessing preparedness of new specialists across various specialities with under five years' experience revealed perceptions of unpreparedness in managerial skills that were not specific to particular disciplines and improved with experience.¹⁶

Table I: Summary of comparisons of responses from 115 teachers, 46 examiners and 40 graduates

Meta-competence	Enabling competences <i>n</i>	Unprepared <i>n</i> (%)	Prepared <i>n</i> (%)	<i>p</i> -value
Medical expert	18			0.042
Teachers		4 (22)	14 (78)	
Examiners	*	7 (39)	10 (56)	
Graduates		0	18 (100)	
Communicator	17			< 0.00001
Teachers		11 (64)	6 (35)	
Examiners	*	16 (94)	0	
Graduates		0	17 (100)	
Collaborator	9			0.526
Teachers		3 (33)	6 (67)	
Examiners		2 (22)	7 (78)	
Graduates		0	9 (100)	
Leader	11			0.55
Teachers		10 (91)	1 (9)	
Examiners		10 (91)	1 (9)	
Graduates		6 (56)	5 (44)	
Health advocate	5			0.711
Teachers		5 (100)	0	
Examiners		5 (100)	0	
Graduates		3 (60)	2 (40)	
Scholar	16			0.006
Teachers		9 (56)	7 (44)	
Examiners		8 (50)	8 (50)	
Graduates		1 (6)	15 (94)	
Professional	15			0.002
Teachers		8 (53)	7 (47)	
Examiners		10 (67)	5 (33)	
Graduates		0	15 (100)	
Context awareness	4			0.957
Teachers		0	4 (100)	
Examiners		1 (25)	3 (75)	
Graduates		0	4 (100)	
Humaneness	6			0.987
Teachers		1 (17)	5 (83)	
Examiners	*	1 (17)	4 (67)	
Graduates		0	6 (100)	
Total	101			

n – number, unprepared – completely unprepared or somewhat prepared, prepared – prepared or completely unprepared, * One enabling competence with equal number of prepared and unprepared scores hence the numbers in the columns do not add up to the total number of enabling competences

A cross-sectional cross-speciality study in the United Kingdom assessed perceptions of preparedness for the role of specialist. Final year residents scored their own preparedness for the role, and graduates and medical managers were asked to score preparedness of themselves and new specialists respectively. Results revealed, as in our study, disparate views between groups.¹⁷ All groups agreed that technical skills were performed well and that new specialists were well-prepared in this regard. However, residents felt unprepared for leadership roles that included time management, management of clinical services and business planning, management of human resources, particularly staff

complaints, and reported a lack of exposure to all specialist roles during training. Similarly, new graduates' perceptions reflected unpreparedness in leadership (responsibility, management of services) and management of practices and both financial and human resources. Poor collaboration with other departments and reduced understanding of the healthcare system together with difficulties in maintaining work-life balance were reported by graduates. Senior medical staff reflected that new graduates exhibited deficits in leadership and in understanding the role that specialists play in management and in leading a team.

Table II: Summary of response comparisons between 161 seniors (teachers + examiners) and 40 graduates

Meta-competence	Enabling competences n	Unprepared n (%)	Prepared n (%)	p-value
Medical expert	18			0.0455
Seniors		5 (28)	13 (72)	
Graduates		0	18 (100)	
Communicator	17			< 0.0001
Seniors	*	12 (71)	4 (24)	
Graduates		0	17 (100)	
Collaborator	9			0.2059
Seniors		3 (33)	6 (67)	
Graduates		0	9 (100)	
Leader	11			0.1486
Seniors		10 (91)	1 (9)	
Graduates		6 (56)	5 (44)	
Health advocate	5			0.4444
Seniors		5 (100)	0	
Graduates		3 (60)	2 (40)	
Scholar	16			0.0059
Seniors		9 (56)	7 (44)	
Graduates		1 (6)	15 (94)	
Professional	15			0.0007
Seniors		9 (60)	6 (40)	
Graduates		0	15 (100)	
Context awareness	4			1
Seniors		0	4 (100)	
Graduates		0	4 (100)	
Humaneness	6			1
Seniors		1 (17)	5 (83)	
Graduates		0	6 (100)	
Total	101			

n – number, unprepared – completely unprepared and/or somewhat prepared, prepared – prepared and/or completely unprepared, * One enabling competence with equal number of prepared and unprepared scores hence the numbers in the columns do not add up to the total number of enabling competences; examiner + teacher scores were combined into a single composite score using a weighted average for each group, rounded to the nearest whole number

Our study shows perceptions of unpreparedness of new specialists in roles predominantly non-technical in nature. There is, however, a paucity of literature assessing preparedness for specific CanMEDs or other roles in clinical practice. Our study reflected congruent perceptions of graduate preparedness for the specialist roles of medical expert, collaborator, context awareness and humaneness, and unpreparedness for health advocate and leader roles. The latter two, together with the disparate views for communicator, scholar and professional, reflect concerning opinions of graduate unpreparedness. After having successfully completed specialist training and fellowship examinations that grant licensure to practise, one would expect congruent results for all nine specialist roles. However, the results of our study depict a noteworthy disconnect between expected and actual perceptions, with 55.6% roles perceived as unprepared by at least one of the study groups. The implication of these results is that graduates may have deficiencies in some of their specialist roles and may not be FFP. These deficits are concerning since

they encompass core meta-competences that are designed to ensure safe and effective practice.

Health advocate was the lowest ranked of all the CanMEDS roles in Danish specialists³⁴ and South African anaesthesiologists.²⁸ Suggestions for its low rating are that less time is spent teaching this NTS and that it is poorly understood by both graduates and teachers, even in Canada^{34,35} where health advocate was incorporated into the original CanMEDS. Despite this low ranking, health advocate was considered worthy of inclusion in the skills set of South African anaesthesiologists.²⁸ Likewise, the roles of communicator, leader and professional represent NTS which traditionally form part of the hidden curriculum that is learned through rolemodelling and mentorship rather than through formal teaching,³⁵ rendering them difficult to assess formally.

Concerns related to learning from the hidden curriculum and the reliance on mentorship and rolemodelling for NTS transfer are relevant, since not all mentors may be appropriate rolemodels.

Learners may be viewing, processing, integrating and replicating attitudes and behaviours that are not necessarily ideal. There has been a paucity of objective measures of NTS against which trainees can be taught and assessed,³⁶ potentially contributing to the unpreparedness revealed by seniors in our study. With this in mind, the CMSA has recognised these limitations and incorporated NTS into the current anaesthesiology curriculum.³⁷

This study reveals significantly different perceptions for scholar between seniors and graduates. This discrepancy is cause for concern since scholarship incorporates a lifelong commitment to teaching and learning.^{28,29} The differing perceptions illustrate concerns about self-reflection by graduates who often overestimate their capabilities. Self-reflection is often poorly performed,³⁸ which may account for the unpreparedness of graduates according to more experienced staff. It is imperative to interrogate the poor rating of graduate scholarship by seniors and question whether poor scholars are a reflection of poor teaching, a poor programme or both. Teachers should engage with and motivate scholars in order to stimulate self-reflection that adjusts their practice. This engagement, however, requires formal and structured training that is often overlooked or under-emphasised in busy clinical departments.

Despite the stricter scoring by examiners compared to teachers, reflective perhaps of examiners' formal training in assessment, this study reveals the discrepancy between seniors' and newly qualified specialists' perceptions. Graduates' perceptions may be coloured by their recent success, providing a perception, clouded by emotion, of competence in most components of specialist practice resulting in the training of specialists who may not be FFP. These results also allude to potential flaws in the teaching and assessment processes. Assessments should be robust enough to exclude candidates who are not FFP from successful graduation. In the absence of this, one needs to interrogate whether the final FCA examinations are an appropriate indication not only of competence but more importantly, of fitness for purpose.

There were several strengths in this study. The high response rates of eligible practitioners in all groups contributed to the quality of results. Each study group was well represented nationally with involvement from each academic institution currently involved in anaesthesiology training. The Cronbach's alpha value of 0.76 indicated good internal consistency with respect to the questionnaire.³⁹ This is also the first study of this nature reflecting national perceptions of stakeholders, and will be able to assist policy makers, curriculum designers and regulators in future.

The key limitation of this study relates to under-representation of other stakeholders. In order to ascertain a 360-degree view of FnFP of anaesthesiologists, the views of the end users (surgeons and patients) would be of benefit and should be sought. However, the resultant magnitude of such a national assessment limited the stakeholder involvement to national anaesthesiology teachers, examiners and graduates only. Graduate sample sizes may be sub-optimal to inform change in practice; larger grad-

uate cohorts could provide more valuable data. However, this sample reflects approximately 50% of the annual graduate cohort and was deemed an appropriate sample of graduate opinions.

Existing studies of stakeholder views of specialists' preparedness have been predominantly cross-sectional and reflected participants' varying levels of experience. Future research should include longitudinal assessments of opinions to assess whether perceptions change with time and experience. Future research should also evaluate training and assessment processes to ascertain their appropriateness for determining FnFP of specialists.

Conclusion

The role of the anaesthesiologist has evolved over recent decades, currently reflected as that of a perioperative physician with ever-expanding roles outside the operating theatre. Trainees require considered, standardised and contextually appropriate teaching and assessment to fulfil their intended roles without any deficiencies. This study reveals deficiencies in over half of the expected roles of specialist graduates. These graduates' self-assessment may become more realistic with time and experience in independent practice. It would thus be important to assess them longitudinally to determine whether their opinions are aligned with that of their seniors. It is inevitable that teaching and assessment methods need to be interrogated and optimised to include processes that better link competency frameworks with the practice of FFP specialists.

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Conflict of interest

The authors report no conflicts of interest.

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Ethical approval

This study received ethical approval from the Biomedical Research Ethics Committee (BREC) at the University of KwaZulu-Natal (BE199/17).

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Annexure

In South Africa, the CMSA has adopted the CanMEDS physician competency framework for the training of specialists. The CanMEDS system defines the multiple roles of a specialist and consists of 7 main roles (medical expert, scholar, communicator, collaborator, leader, health advocate and professional) with multiple components that formulate the competencies of each major role. However, South African anaesthesiology experts are of the opinion that these 7 main roles do not adequately encompass all the roles of local anaesthesiologists and have modified them for local applicability. During this survey, you will be supplied with the modified list of main roles and competencies underpinning the functions of a specialist.

(Teachers/Examiners)

Since you are a national FCA II teacher/examiner, **you are asked to please consider how prepared you think graduates are in being able to perform each of the listed meta-competencies (main roles) and core competencies as a specialist at the time of their graduation. Despite the fact that some candidates will be better or worse than others, please consider an overall opinion of the group of candidates that usually presents for their final examination.**

(Graduates)

Since you have recently qualified as a specialist, **you are asked to please consider how prepared you are/confident you are in being able to perform each of the listed meta-competencies (main roles) and core competencies.**

Please answer using a 4-point Likert scale as follows:

- 1 – completely unprepared in being able to perform this competency
- 2 – somewhat prepared in being able to perform this competency
- 3 – prepared in being able to perform this competency
- 4 – completely prepared in being able to perform this competency

Medical expert

Key competency

1. Practice medicine within their defined scope of practice and expertise.

Enabling competencies

- 1.1 Demonstrate a commitment to high-quality care of their patients
- 1.2 Integrate the CanMEDS Intrinsic Roles into their practice of medicine
- 1.3 Apply knowledge of the clinical and biomedical sciences relevant to their discipline
- 1.4 Perform appropriately timed clinical assessments with recommendations that are presented in an organised manner
- 1.5 Carry out professional duties in the face of multiple, competing demands

- 1.6 Recognise and respond to the complexity, uncertainty, and ambiguity inherent in medical practice

Key competency

2. Perform a patient-centred clinical assessment and establish a management plan.

Enabling competencies

- 2.1 Prioritise issues to be addressed in a patient encounter
- 2.2 Elicit a history, perform a physical exam, select appropriate investigations, and interpret their results for the purpose of diagnosis and management, disease prevention, and health promotion
- 2.3 Establish goals of care in collaboration with patients and their families, which may include slowing disease progression, treating symptoms, achieving cure, improving function, and palliation
- 2.4 Establish a patient-centred management plan

Key competency

3. Plan and perform procedures and therapies for the purpose of assessment and/or management.

Enabling competencies

- 3.1 Determine the most appropriate procedures or therapies
- 3.2 Obtain and document informed consent, explaining the risks and benefits of, and the rationale for, a proposed procedure or therapy
- 3.3 Prioritise a procedure or therapy, taking into account clinical urgency and available resources
- 3.4 Perform a procedure in a skilful and safe manner, adapting to unanticipated findings or changing clinical circumstances

Key competency

4. Establish plans for ongoing care and, when appropriate, timely consultation.

Enabling competencies

- 4.1 Implement a patient-centred care plan that supports ongoing care, follow-up on investigations, response to treatment, and further consultation

Key competency

5. Actively contribute, as an individual and as a member of a team providing care, to the continuous improvement of health care quality and patient safety.

Enabling competencies

- 5.1 Recognise and respond to harm from health care delivery, including patient safety incidents
- 5.2 Adopt strategies that promote patient safety and address human and system factors
- 5.3 Demonstrate the ability to multi-task

Communicator

Key competency

1. Establish professional therapeutic relationships with patients and their families.

Enabling competencies

- 1.1 Communicate using a patient-centred approach that encourages patient trust and autonomy and is characterised by empathy, respect, and compassion.
- 1.2 Optimise the physical environment for patient comfort, dignity, privacy, engagement, and safety
- 1.3 Recognise when the values, biases, or perspectives of patients, physicians, or other health care professionals may have an impact on the quality of care, and modify the approach to the patient accordingly
- 1.4 Respond to a patient's non-verbal behaviours to enhance communication
- 1.5 Manage disagreements and emotionally charged conversations
- 1.6 Adapt to the unique needs and preferences of each patient and to his or her clinical condition and circumstances

Key competency

2. Elicit and synthesise accurate and relevant information, incorporating the perspectives of patients and their families.

Enabling competencies

- 2.1 Use patient-centred interviewing skills to effectively gather relevant biomedical and psychosocial information
- 2.2 Provide a clear structure for and manage the flow of an entire patient encounter
- 2.3 Seek and synthesise relevant information from other sources, including the patient's family, with the patient's consent

Key competency

3. Share health care information and plans with patients and their families.

Enabling competencies

- 3.1 Share information and explanations that are clear, accurate, and timely, while checking for patient and family understanding
- 3.2 Disclose harmful patient safety incidents to patients and their families accurately and appropriately

Key competency

4. Engage patients and their families in developing plans that reflect the patient's health care needs and goals.

Enabling competencies

- 4.1 Facilitate discussions with patients and their families in a way that is respectful, non-judgmental, and culturally safe
- 4.2 Use communication skills and strategies that help patients and their families make informed decisions regarding their health

Key competency

5. Document and share written and electronic information about the medical encounter to optimise clinical decision-making, patient safety, confidentiality, and privacy.

Enabling competencies

- 5.1 Document clinical encounters in an accurate, complete, timely, and accessible manner, in compliance with regulatory and legal requirements
- 5.2 Communicate effectively using a written health record, electronic medical record, or other digital technology
- 5.3 Share information with patients and others in a manner that respects patient privacy and confidentiality and enhances

understanding

- 5.4 Able to communicate effectively with patients, caregivers and families despite language differences

Collaborator

Key competency

1. Work effectively with physicians and other colleagues in the health care professions.

Enabling competencies

- 1.1 Establish and maintain positive relationships with physicians and other colleagues in the health care professions to support relationship-centred collaborative care
- 1.2 Negotiate overlapping and shared responsibilities with physicians and other colleagues in the health care professions in episodic and ongoing care
- 1.3 Engage in respectful shared decision-making with physicians and other colleagues in the health care professions
- 1.4 Ability to respond to need for emergency involvement outside perioperative domain

Key competency

2. Work with physicians and other colleagues in the health care professions to promote understanding, manage differences, and resolve conflicts.

Enabling competencies

- 2.1 Show respect toward collaborators
- 2.2 Implement strategies to promote understanding, manage differences, and resolve conflicts in a manner that supports a collaborative culture

Key competency

3. Hand over the care of a patient to another health care professional to facilitate continuity of safe patient care.

Enabling competencies

- 3.1 Determine when care should be transferred to another physician or health care professional
- 3.2 Demonstrate safe handover of care, using both verbal and written communication, during a patient transition to a different health care professional, setting, or stage of care
- 3.3 Awareness of the competency required of the receiving practitioner at hand over of patients

Leader

Key competency

1. Contribute to the improvement of health care delivery in teams, organisations, and systems.

Enabling competencies

- 1.1 Apply the science of quality improvement to contribute to improving systems of patient care
- 1.2 Contribute to a culture that promotes patient safety
- 1.3 Analyse patient safety incidents to enhance systems of care
- 1.4 Use health informatics to improve the quality of patient care and optimise patient safety

Key competency

2. Engage in the stewardship of health care resources.

Enabling competencies

- 2.1 Allocate health care resources for optimal patient care
- 2.2 Apply evidence and management processes to achieve cost-appropriate care

Key competency

3. Demonstrate leadership in professional practice.

Enabling competencies

- 3.1 Demonstrate leadership skills to enhance health care
- 3.2 Facilitate change in health care to enhance services and outcomes

Key Competency

4. Manage career

Enabling competencies

- 4.1 Set priorities and manage time to integrate practice and personal life
- 4.2 Manage a career and a practice
- 4.3 Implement processes to ensure personal practice improvement

Health advocate**Key competency**

1. Respond to an individual patient's health needs by advocating with the patient within and beyond the clinical environment.

Enabling competencies

- 1.1 Incorporate disease prevention, health promotion, and health surveillance into interactions with individual patients

Key competency

2. Respond to the needs of the communities or populations they serve by advocating with them for system-level change in a socially accountable manner.

Enabling competencies

- 2.1 Possess an in-depth knowledge of global health issues
- 2.2 Improve clinical practice by applying a process of continuous quality improvement to disease prevention, health promotion, and health surveillance activities
- 2.3 Contribute to a process to improve health in the community or population they serve
- 2.4 Ensure that all staff (including oneself) in the clinical environment are safe and not at risk with respect to physical or psychological injuries

Scholar**Key competency**

1. Engage in the continuous enhancement of their professional activities through ongoing learning.

Enabling competencies

- 1.1 Develop, implement, monitor, and revise a personal learning plan to enhance professional practice
- 1.2 Identify opportunities for learning and improvement by regularly reflecting on and assessing their performance using various internal and external data sources
- 1.3 Engage in collaborative learning to continuously improve personal practice and contribute to collective improvements in practice.

Key competency

2. Teach students, residents (trainees), the public, and other health care professionals.

Enabling competencies

- 2.1 Recognise the influence of role-modelling and the impact of the formal, informal, and hidden curriculum on learners

- 2.2 Promote a safe learning environment
- 2.3 Ensure patient safety is maintained when learners are involved
- 2.4 Plan and deliver a learning activity
- 2.5 Provide feedback to enhance learning and performance
- 2.6 Assess and evaluate learners, teachers, and programs in an educationally appropriate manner

Key competency

3. Integrate best available evidence into practice.

Enabling competencies

- 3.1 Recognise practice uncertainty and knowledge gaps in clinical and other professional encounters and generate focused questions that address them
- 3.2 Identify, select, and navigate pre-appraised resources
- 3.3 Critically evaluate the integrity, reliability, and applicability of health-related research and literature
- 3.4 Integrate evidence into decision-making in their practice

Key competency

4. Contribute to the creation and dissemination of knowledge and practices applicable to health.

Enabling competencies

- 4.1 Demonstrate an understanding of the scientific principles of research and scholarly inquiry and the role of research evidence in health care
- 4.2 Identify ethical principles for research and incorporate them into obtaining informed consent, considering potential harms and benefits, and considering vulnerable populations
- 4.3 Summarise and communicate to professional and lay audiences, including patients and their families, the findings of relevant research and scholarly inquiry

Professional**Key competency**

1. Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards.

Enabling competencies

- 1.1 Exhibit appropriate professional behaviours and relationships in all aspects of practice, demonstrating honesty, integrity, humility, commitment, compassion, respect, altruism, respect for diversity, and maintenance of confidentiality
- 1.2 Demonstrate a commitment to excellence in all aspects of practice
- 1.3 Recognise and respond to ethical issues encountered in practice
- 1.4 Recognise and manage conflicts of interest
- 1.5 Exhibit professional behaviours in the use of technology-enabled communication

Key competency

2. Demonstrate a commitment to society by recognising and responding to societal expectations in health care.

Enabling competencies

- 2.1 Demonstrate accountability to patients, society, and the profession by responding to societal expectations of physicians
- 2.2 Demonstrate a commitment to patient safety and quality improvement

Key competency

3. Demonstrate a commitment to the profession by adhering to standards and participating in physician-led regulation.

Enabling competencies

- 3.1 Fulfil and adhere to the professional and ethical codes, standards of practice, and laws governing practice

-
- 3.2 Recognise and respond to unprofessional and unethical behaviours in physicians and other colleagues in the health care professions

Key competency

4. Demonstrate a commitment to physician health and well-being to foster optimal patient care.

Enabling competencies

- 4.1 Exhibit self-awareness and manage influences on personal well-being and professional performance
- 4.2 Manage personal and professional demands for a sustainable practice throughout the physician life cycle
- 4.3 Promote a culture that recognises, supports, and responds effectively to colleagues in need
- 4.4 Able to practice efficiently at all times
- 4.5 Ability to advocate on behalf of the profession to the public to assist in public awareness
- 4.6 Able to function punctually at all times

Context awareness

Key competency

1. Ability to adapt clinical and non-clinical practice to specific scenarios and environments to ensure good outcomes.

Enabling competencies

- 1.1 Ability to perceive, to comprehend the meaning of, and to predict the impact of variables in the work environment (situational awareness)
- 1.2 Capacity to be adaptable and creative in solving problems
- 1.3 Ability to assess capacity and obtain appropriate consent in any given circumstance
- 1.4 Ability to remain humane in difficult circumstances

Humaneness

Key competency

1. Ability to engage in good nature with patients, colleagues, societies and communities.

Enabling competencies

- 1.1 Awareness of and respect for the impact and sensitivities of race, culture and ethnicity on decision-making and patient management
- 1.2 Tolerance and the ability to respect diversities in patients, families and colleagues and function in a non-judgmental manner
- 1.3 Ability to practice with sound moral standards (honesty, altruism, integrity, humility, commitment, kindness)
- 1.4 Ability to remain calm under pressure
- 1.5 Ability to manage patients and their families with a caring and empathetic nature
- 1.6 Ability to promote human welfare and humanitarianism in society and at work

Part 4.2: Corrigenda – Paper 3

Three errors were noted in the Annexure to Paper 3.

p88, left column, line 8 should read:

4. Manage career planning, finances, and health human resources in a practice”.

p89, left column, lines 20-21 should read:

1. Demonstrate the ability to adapt clinical and non-clinical practice to specific scenarios and environments to ensure good outcomes”.

p89, left column, lines 32-33 should read:

1. Demonstrate the ability to engage with and respond appropriately to patients, colleagues, societies and communities in need with qualities that personify good naturedness and with sound moral standards”.

Part 4.3: Addendum to Paper 3

Results reflected in Paper 3 warrant further exploration to obtain a greater understanding of the perceptual differences between graduates and seniors. This may also assist in understanding why local graduates may not be considered FFP by their seniors. Overall, graduates were assessed as being prepared by either themselves, their seniors or both, in four of the nine meta-competences (Medical Expert, Collaborator, Context Awareness and Humaneness). Graduates were considered unprepared by either themselves or their seniors for Communicator, Professional and Scholar, and by both groups for Leader and Health Advocate. Determining where the disparities lie may provide the reader with further insights into graduate preparedness. Similarly, an analysis of the results obtained for Medical Expert, although reflecting preparedness by both study groups but with statistically significant differences, may provide a better understanding as to why seniors' opinions vary from those of graduates.

When reflecting on the differences in scoring of the specialist meta-competences, it is important to understand how the meta-competences have been constituted. The seven original CanMEDS roles each consist of key- and enabling competences.¹ The key competences describe broad abilities that are thematically grouped and associated with a specific role. Each key competence is further divided into sub-abilities or enabling competences that describe the knowledge, attitudes and skills required to attain the broader key competences. With the addition of Humaneness and Context Awareness by South African experts, the author noted that these are primarily attributes rather than specialist roles, *per se*. It was subsequently decided that the constructs that were modified or developed locally would rather be referred to as meta-competences. This term incorporates both the roles and attributes required to function appropriately as a specialist.

It is important to bear in mind that the two groups of respondents were not assessing exactly the same thing. Examiners and teachers were asked to assess a hypothetical group of recent graduates, since they were not necessarily familiar with individual

graduates at that time. The graduates, in contrast, were each assessing themselves. The researchers did not ask the graduates to consider the possible preparedness of their peers as a group – although their responses may well have been the same, on the assumption that their peers would be very similar to themselves. Had they asked graduates to assess a hypothetical group of their peers, graduates' aggregated opinions would have been more directly comparable to those of their seniors. The assessments by the two groups were done simultaneously, so seniors may in fact have been referring to individuals in the current group when making their judgements, thereby potentially introducing recency bias, favouring reference to the most recent graduates rather than to graduates in general.

With respect to the meta-competence Communicator, Table II in Paper 3 (p83) indicates that 71% of seniors consider graduates unprepared compared with 0% of graduates. The scores indicated by Table I (below) expand on these differences of opinions by examining the scores for the discrepant enabling competences. Of the 17 enabling competences for Communicator, 16 displayed discrepant scores between graduates and seniors. The range of discrepancies emphasises broad areas of graduate deficiencies according to seniors. Table I (below) lists these discrepant enabling competences, and makes reference to the following key competence(s) with which each is associated. (Table 1, column 2, below)

1. Establish professional therapeutic relationships with patients and their families;
2. Elicit and synthesise accurate and relevant information, incorporating the perspectives of patients and their families;
3. Share health care information and plans with patients and their families;
4. Engage patients and their families in developing plans that reflect the patient's health care needs and goals;
5. Document and share written and electronic information about the medical encounter to optimise clinical decision-making, patient safety, confidentiality, and privacy.¹

Table I. Discrepant enabling competence scores for Communicator

Enabling competence	Associated key competence no.	Unprepared %	Prepared %
Communicate using a patient-centred approach that encourages patient trust and autonomy and is characterized by empathy, respect, and compassion	1		
SENIORS		50.3	49.7
GRADUATES		10	90
Optimise the physical environment for patient comfort, dignity, privacy, engagement, and safety	1		
SENIORS		55.3	44.7
GRADUATES		17.5	82.5
Recognise when the values, biases, or perspectives of patients, physicians, or other health care professionals may have an impact on the quality of care, and modify the approach to the patient accordingly	1		
SENIORS		66.5	33.5
GRADUATES		35	65
Respond to a patient's non-verbal behaviours to enhance communication	1		
SENIORS		72	28
GRADUATES		35	65
Manage disagreements and emotionally charged conversations	1		
SENIORS		72	27
GRADUATES		47.5	52.5
Adapt to the unique needs and preferences of each patient and to his or her clinical condition and circumstances	1		
SENIORS		52.2	47.8
GRADUATES		20	80
Use patient-centred interviewing skills to effectively gather relevant biomedical and psychosocial information	2		
SENIORS		52.2	47.8
GRADUATES		17.5	82.5
Provide a clear structure for and manage the flow of an entire patient encounter	2		
SENIORS		50.9	49.1
GRADUATES		32.5	67.5

Enabling competence	Associated key competence no.	Unprepared %	Prepared %
Seek and synthesise relevant information from other sources, including the patient's family, with the patient's consent	2		
SENIORS		54.7	45.3
GRADUATES		32.5	67.5
Share information and explanations that are clear, accurate, and timely, while checking for patient and family understanding	3		
SENIORS		59	40.4
GRADUATES		25	75
Disclose harmful patient safety incidents to patients and their families accurately and appropriately	3		
SENIORS		75.8	24.2
GRADUATES		40	60
Facilitate discussions with patients and their families in a way that is respectful, non-judgmental, and culturally safe	4		
SENIORS		64.6	35.4
GRADUATES		37.5	62.5
Use communication skills and strategies that help patients and their families make informed decisions regarding their health	4		
SENIORS		62.1	37.9
GRADUATES		20	80
Able to communicate effectively with patients, care-givers and families despite language differences *	5		
SENIORS		68.9	30.4
GRADUATES		40	60
Document clinical encounters in an accurate, complete, timely, and accessible manner, in compliance with regulatory and legal requirements	5		
SENIORS		55.3	44.7
GRADUATES		30	70
Share information with patients and others in a manner that respects patient privacy and confidentiality and enhances understanding	5		
SENIORS		51.6	48.4
GRADUATES		7.5	92.5

*Blue text: enabling competences that are considered predominantly non-technical in nature by the author; *Enabling competence added by South African experts (Part 3.3, Table I, p68-69)*

Whilst exploring the disparate opinions further, the author probed the nature of the discrepant enabling and associated key competences. Communicator's key competences comprise a number of enabling competences that are predominantly non-technical in nature. Chapter 2 has discussed in detail the limitations in teaching and/or assessing NTS, which may account for the deficits that seniors note. These key and enabling competences highlight the need for graduates to be able to communicate and to plan patient care effectively. It is concerning that deficits are perceived in a meta-competence such as Communicator that is essential to effective specialist practice.

It is interesting to note that graduates consider themselves unprepared for the meta-competences of Leader and Health Advocate. With respect to Leader, unpreparedness for the eleven enabling competences varied from 56% to 91% for graduates and seniors respectively. Likewise, unpreparedness for the five enabling competences of Health Advocate varied from 60% to 100% respectively. The majority of enabling competences for both Leader and Health Advocate include components of specialist practice that incorporate NTS. Since NTS are less formally taught to trainees, this may account for the concordant opinions of unpreparedness. However, this does not explain the affirmative graduate scores for Communicator. If NTS are not being formally taught or assessed, why is it that graduates perceive their Communicator abilities to be without deficit, and yet feel deficient in the NTS required for Leader and Health Advocate? It is the author's opinion that graduates may perceive communication skills as something that perhaps all of them have and have had for many years with other more generalised and less specific enabling competences. Leader and Health Advocate, on the other hand, may require abilities and skill sets that require specific training. It may be that graduates are assuming, incorrectly, that they can all communicate effectively and that this meta-competence does not require specific training.

Results from Paper 3, Table II (p83) reflect that 56% of seniors consider graduates unprepared for the role of Scholar compared with 6% of graduates. These discrepancies are expanded in Table II (below). Of the 16 enabling competences for Scholar, eight displayed discrepant scores. Further examination of the key competences comprising the discrepant enabling competences indicate that, according to seniors, trainees are experiencing difficulties with the following key competences:

6. Engage in the continuous enhancement of their professional activities through ongoing learning;
7. Teach students, residents, the public, and other health care professionals;
8. Integrate best available evidence into practice;
9. Contribute to the creation and dissemination of knowledge and practices applicable to health.¹

Table II. Discrepant enabling competence scores for Scholar

Enabling competence	Associated key competence no.	Unprepared %	Prepared %
Develop, implement, monitor, and revise a personal learning plan to enhance professional practice	6		
SENIORS		51.6	47.8
GRADUATES		27.5	72.5
Identify opportunities for learning and improvement by regularly reflecting on and assessing their performance using various internal and external data sources	6		
SENIORS		57.8	41.6
GRADUATES		30	70
Engage in collaborative learning to continuously improve personal practice and contribute to collective improvements in practice.	6		
SENIORS		51.6	47.8
GRADUATES		25	75
Recognise the influence of role-modelling and the impact of the formal, informal, and hidden curriculum on learners	7		
SENIORS		55.9	43.5
GRADUATES		20	77.5

Enabling competence	Associated key competence no.	Unprepared %	Prepared %
Assess and evaluate learners, teachers, and programs in an educationally appropriate manner	7		
SENIORS		59.6	39.8
GRADUATES		37.5	62.5
Recognise practice uncertainty and knowledge gaps in clinical and other professional encounters and generate focused questions that address them	8		
SENIORS		59	39.1
GRADUATES		30	70
Identify, select, and navigate pre-appraised resources	8		
SENIORS		50.9	48.4
GRADUATES		40	60
Summarise and communicate to professional and lay audiences, including patients and their families, the findings of relevant research and scholarly inquiry	9		
SENIORS		58.4	41
GRADUATES		47.5	52.5

Blue text: enabling competences that are considered predominantly non-technical in nature by the author

According to the author, seven of the discrepant enabling competences require that the graduate master some NTS to perform the task at hand. It is clear that Scholar, like many other meta-competences, cannot be performed optimally in isolation. The Scholar needs to collaborate, communicate and self-regulate (professionalism) and thus needs to ensure that he/she is able to perform the necessary NTS.

Seniors seem to be of the opinion that graduates have difficulties with the synthesis of new information and their ability to teach others. This may be due to difficulties in graduate self-awareness and understanding one's limitations and gaps in knowledge. It may also reflect deficits in formal teaching. It is possible that graduates recall the way they were taught, and instruct others based on perceptions obtained from those teaching interactions. This highlights the relevance of the "hidden curriculum" referred to in Chapter 2, and the need for formalisation of non-technical meta-, key- and enabling competences in the curriculum.

With respect to Professional, results from Paper 3, Table II (p83) reflect that 60% of seniors consider graduates unprepared compared with 0% of graduates. Table III (below) expands on these discrepant perceptions. Of the 15 enabling competences for Professional, eight displayed discrepant scores. Results from Table III (below) indicate that according to seniors, trainees experience difficulty with the key competences below:

10. Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards;
11. Demonstrate a commitment to the profession by adhering to standards and participating in physician-led regulation;
12. Demonstrate a commitment to physician health and well-being to foster optimal patient care.¹

Table III. Discrepant enabling competence scores for Professional

Enabling competence	Associated key competence no.	Unprepared %	Prepared %
Recognise and manage conflicts of interest	10		
SENIORS		64	34.8
GRADUATES		42.5	57.5
Exhibit professional behaviours in the use of technology-enabled communication	10		
SENIORS		50.9	48.4
GRADUATES		20	80
Recognise and respond to unprofessional and unethical behaviours in physicians and other colleagues in the health care professions	11		
SENIORS		59.6	39.8
GRADUATES		27.5	72.5
Able to practise efficiently at all times *	12		
SENIORS		58.4	41
GRADUATES		27.5	72.5
Ability to advocate on behalf of the profession to the public to assist in public awareness. *	12		
SENIORS		65.2	34.2
GRADUATES		42.5	57.5

Enabling competence	Associated key competence no.	Unprepared %	Prepared %
Exhibit self-awareness and manage influences on personal well-being and professional performance	12		
SENIORS		64.6	34.8
GRADUATES		15	85
Manage personal and professional demands for a sustainable practice throughout the physician life cycle	12		
SENIORS		73.3	26.1
GRADUATES		40	60
Promote a culture that recognises, supports, and responds effectively to colleagues in need	12		
SENIORS		64.6	33.5
GRADUATES		37.5	62.5

*Blue text: enabling competences that are considered predominantly non-technical in nature by the author; *Enabling competence added by South African experts (Part 3.3, Table I, p68-69)*

The key competences with which graduates have difficulty indicate potential problems in being able to detect, synthesise, understand and respond appropriately to the various influences on the clinician. This, in turn, influences how the clinician responds to those around him/her: patient, families, society and the profession. It highlights the need for Humaneness, Context Awareness and Communicator in being able to function and respond appropriately within the profession. Deficits in the role of Professional allude to the predominant deficit in NTS that are of importance to this meta-competence. Graduates need to be able to function with a degree of emotional intelligence in order to respond appropriately to those around him/her, and to be able to balance the multitude of demands that their position places on their personal lives. If achieved, the author suggests that this may result in relational intelligence² which could enhance graduate interactions with all stakeholders. If graduates are unprepared for the role of Professional, the negative effects may be far-reaching.

Although both study groups perceived graduates as prepared for the role of Medical Expert, results from Paper 3, Table II (p83) reflect differing opinions of graduate unpreparedness (28% of seniors versus 0% of graduates). Of the 18 enabling competences that exist for Medical Expert, 33.3% displayed discrepant scores which are

explored further in Table IV (below). These discrepancies reveal that trainees are experiencing difficulty with aspects of the following key competences:

13. Practise medicine within their defined scope of practice and expertise;
14. Perform a patient-centred clinical assessment and establish a management plan;
15. Establish plans for ongoing care and, when appropriate, timely consultation;
16. Actively contribute, as a member of a team providing care, to the continuous improvement of health care quality and patient safety.¹

Table IV. Discrepant enabling competence scores for Medical Expert

Enabling competence	Associated key competence no.	Unprepared %	Prepared %
Integrate the CanMEDS intrinsic roles into their practice of medicine	13		
SENIORS		58.4	41
GRADUATES		25	75
Recognise and respond to the complexity, uncertainty, and ambiguity inherent in medical practice	13		
SENIORS		57.1	42.9
GRADUATES		37.5	62.5
Establish goals of care in collaboration with patients and their families, which may include slowing disease progression, treating symptoms, achieving cure, improving function, and palliation	14		
SENIORS		70.2	29.2
GRADUATES		47.5	52.5
Implement a patient-centred care plan that supports ongoing care, follow-up on investigations, response to treatment, and further consultation	15		
SENIORS		50.3	49.7
GRADUATES		32.5	67.5
Recognise and respond to harm from health care delivery, including patient safety incidents	16		
SENIORS		52.8	47.2
GRADUATES		20	80
Adopt strategies that promote patient safety and address human and system factors	16		
SENIORS		60.2	39.8
GRADUATES		35	65

Blue text: enabling competences that are considered predominantly non-technical in nature by the author

The key and enabling competences of Medical Expert consist of technical and non-technical skills. Results from Table IV indicate that, according to the author, all discrepant enabling competences for Medical Expert incorporate NTS. Concerns related to NTS acquisition and learning from the hidden curriculum may account for the discordant scores. Graduates may be over-estimating their non-technical prowess at the time of graduation, with the assumption that certification implies FnFP contributing to discordant perceptions of graduates and seniors.

In addition, a possible reason for discrepant scores noted not only for Medical Expert but for Communicator, Scholar and Professional is that of interdependence of meta-competences. This may be underestimated during training, impacting negatively on trainees and their abilities. As suggested in Chapter 2, the reductionist nature of competency frameworks like CanMEDS de-emphasises the interdependence, and context, of competences, which may also account for deficits in NTS acquisition. Meta-competences do not exist in isolation, and each cannot exist without expertise in other roles, and if taught in isolation, can account for deficits.

Table V. Summary of 38 enabling competences for Communicator, Scholar, Professional and Medical Expert with discrepancies between seniors and graduates.

Meta-competence	Total no. of enabling competences	No. (%) discrepant enabling competences	No. (%) of discrepant enabling competences with predominantly NTS
Communicator	17	16 (94.0)	15 (93.8)
Scholar	16	8 (50.0)	7 (87.5)
Professional	15	8 (53.3)	7 (87.5)
Medical Expert	18	6 (33.3)	6 (100)
TOTAL	66	38(57)	35 (92)

The summarised results of Tables I-IV reflected in Table V (above) indicate varying degrees of discrepant opinions between seniors and graduates. Most discrepancies were noted for Communicator. These may be indicative of the difficulties that seniors perceive graduates may be having with NTS. The last column of table V indicates the number of discrepant enabling competences that are, according to the author,

predominantly related to NTS. CanMEDS does not distinguish between technical or NTS. However, in order to make some sense of the impact of NTS, a suitable understanding of NTS and how they differ from technical skills is required.

Technical skills can be defined as abilities or knowledge used to perform a practical task, perceived as psychomotor actions that improve with practice.³⁻⁵ There is no accepted universal definition for NTS, but many agree that NTS describe the social (communication, teamwork), cognitive (decision-making, situational awareness) and personal resource skills (coping mechanisms to reduce stress/fatigue) required to support and complement one's technical abilities, contributing to decreasing error and preventing adverse events.⁶⁻⁸ With this description in mind, the author explored the discrepant enabling competences further in an attempt to establish which would be considered non-technical and to assess their impact in the noted deficiencies. One may, taking into account nuances, argue which competences are predominantly technical versus non-technical. Since this classification had not previously been undertaken, the author attempted to do so for those discrepant enabling competences, noting that 92% of them are predominantly non-technical in nature.

Most enabling competences for Communicator rely on NTS in order to perform this role satisfactorily. The significant difference in perceptions of preparedness suggest that communication skills are poorly taught, assessed or lacking in the current curriculum, and necessitate further exploration and attention. Of concern is the significant over-estimation by graduates of their communication skills and abilities that may be a consequence of the difficulty that graduates have in self-assessment, especially at the time of graduation.⁹

Similarly, results for Professional reveal that more than half of the enabling competences have discrepant scores. Of those, >80% incorporate NTS. The impact of NTS seems to be slightly less with Scholar, which incorporates more technical skills; however, >80% of the discrepant competences are considered non-technical by the author.

When one takes into account the congruent opinions of seniors and graduates for the poorly-prepared meta-competences of Leader and Health Advocate, the impact of NTS becomes clearer. Of concern is that these results indicate that meta-competences incorporating NTS are not only perceived to be performed poorly by graduates but in some such as Communicator, graduate perceptions may not be reflective of realistic specialist practice.

Being able to self-assess requires maturity and the ability to objectively reflect on one's own practice to institute change.⁹ Forming part of the Professional role, this self-regulatory practice is, in the author's opinion, not emphasised enough in local training and may account for discrepancies in perceptions.

In conclusion, results from Paper 3 reveal that local graduates fare similarly to those elsewhere. South African graduates feel unprepared for several aspects of specialist practice. These may be technical but are more often related to NTS, reflective in deficits that cause difficulties with Leader/management aspects of practice as well as those of Health Advocate and Professional.¹⁰⁻¹⁵ The influence of NTS, the associated interdependence and contextual nature of competences, and the lack of graduate insight at the time of certification are postulated as reasons for the discrepant opinions of graduate preparedness. Addressing these further may assist in training anaesthesiologists who are truly FFP in SA.

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Chapter 5: The effect of time and/or experience on graduate self-assessment of fitness for purpose

After noting disparities in perceptions of graduate FnFP between graduates and senior anaesthesiologists in Chapter 4, it would be interesting to determine how these opinions compare with time or experience after graduation. New specialists are expected, at the time of graduation, to be at the peak of their training but with little experience. The author thought it useful to consider the impact that specialist experience might have on perceptions of FnFP. When evaluating preparedness for practice, most evidence is cross-sectional in nature, either at graduation or at varying levels of experience after graduation. While this provides some valuable information, it does not evaluate how an individual's preparedness may change with time. Since some deficiencies become evident only after the graduate is thrust into the role of the specialist, perceptions of preparedness at the time of graduation may fail to recognise these deficiencies. If perceptions of preparedness are indicative of deficiencies at graduation, faculties should interrogate the reasons that deficiencies exist, and whether the added experience has contributed to preparedness. These can then be addressed during training to avoid deficiencies in future graduates.

Valuable information could be gained through longitudinal assessments of graduates. However, there is a paucity of evidence evaluating the temporal nature of preparedness. The next publication, Paper 4 (manuscript), aims to obtain such information from local anaesthesiology graduates in an attempt to determine the temporal nature of graduate self-assessment of FnFP.

Part 5.1: Paper 4 (manuscript) - Do South African anaesthesiology graduates consider themselves fit for purpose? A longitudinal study

This manuscript has been submitted for publication to the Southern African Journal of Anaesthesia and Analgesia, and has been accepted for publication.

Nicola Kalafatis, Thomas Sommerville and Pragasan Dean Gopalan. Do South African anaesthesiology graduates consider themselves fit for purpose? A longitudinal study

ABSTRACT

Background

Before embarking on a career as an independent specialist anaesthesiologist, graduates must be assessed as fit for purpose. Graduate self-assessment at qualification and at a later period may be useful in assessing their fitness for purpose and its change over time.

Methods

This quantitative, descriptive study enrolled recent national anaesthesiology graduates. Each participant scored, at two separate time intervals, their preparedness for competences deemed appropriate by national experts via an electronic survey. Nine meta-competences (Medical Expert, Communicator, Collaborator, Leader, Health Advocate, Scholar, Professional, Context Awareness, and Humaneness) and their 101 component enabling competences were included. Participants scored preparedness for each competence using a 4-point Likert scale (1-completely unprepared; 2-somewhat prepared; 3-prepared; 4-completely prepared). Scores of 1 and 2 were considered as unprepared and scores of 3 and 4 as prepared. Scores at the time of graduation were compared with those after 12 months' experience.

Results

The overall response rate was 79%. At graduation, graduates felt prepared for 7 of the 9 meta-competences (Medical Expert, Collaborator, Communicator, Professional, Scholar, Context Awareness and Humaneness) and unprepared for Health Advocate and Leader. After 12 months, graduates felt prepared for all 9 meta-competences but perceptions of preparedness for 14% (14 of 101) of the enabling competences had declined.

Conclusion

At graduation, South African anaesthesiology graduates consider themselves unprepared for the meta-competences of Leader and Health Advocate, both comprising predominantly NTS. Their perceptions at graduation suggest that they are not fully prepared and may therefore not be fit for purpose as specialists. Graduates' self-assessment longitudinally reflects that their perceptions of fitness for purpose change after a period of time and specialist experience.

Keywords:

Fitness for purpose; anaesthesiology; medical education

Introduction

The ultimate achievement of being awarded the Fellowship of the College of Anaesthetists (FCA) by the Colleges of Medicine of South Africa (CMSA) is something to which South African trainees aspire, their graduation representing a culmination of many years of hard work, commitment, dedication and sacrifice. However, graduation also marks an important transition from trainee to independent anaesthesiologist. This transition usually brings with it excitement and enthusiasm, but for some graduates it symbolises a time of uncertainty, self-doubt and anxiety.

Studies show that transitional periods for medical practitioners may be fraught with anxiety, stress, job dissatisfaction and burnout due to perceptions of unpreparedness for the new role.¹⁻³ This plagues junior doctors transitioning to first-time clinician,⁴⁻¹⁰ and postgraduates evolving into specialists.¹¹⁻²⁰ Graduates feel more prepared for clinical than non-clinical skills, with deficits in leadership/managerial skills as well as in communication and professionalism.^{12,13,15,21-23} Improving graduate preparedness may limit the difficulties of the transitional period.

In South Africa, postgraduate specialist training is rooted in the Canadian Medical Education Directives for Specialists (CanMEDS). CanMEDS utilises a generic framework for all specialist training and proposes that once trained, a graduate should be able to perform all their core specialist roles. These comprise the central complex role of Medical Expert with its six accompanying intrinsic roles (Communicator, Collaborator, Scholar, Leader, Professional, Health Advocate).²⁴ However, despite competency-based training, several studies have shown graduates to be considered unprepared for specialist practice by themselves^{11,25,26} and/or their seniors/managers,^{17,23} and may therefore not be fit for purpose (FFP). The authors attempted to define fitness for purpose (FnFP) in South African anaesthesiology in terms of the currently-used CanMEDS competency framework, assessing its local applicability and considering possible unique contextual components.²⁷ By using an iterative Delphi method, amendments were made to the seven original CanMEDS roles, with the addition of Humaneness and Context Awareness (Figure 1). A comprehensive list of nine meta-

competences, useful to assess FnFP, was generated together with their component 101 enabling competences (Annexure). This provided an objective means with which local anaesthesiology graduates' FnFP could be assessed.

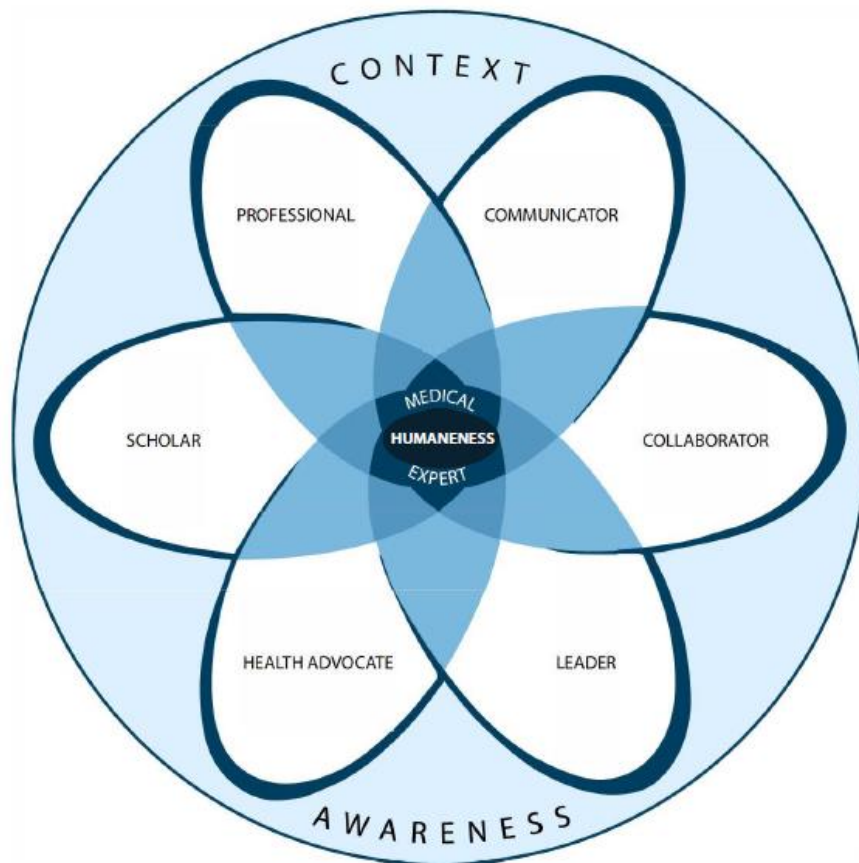


Figure 1. Modified CanMEDS for South African anaesthesiology according to Kalafatis, Sommerville and Gopalan²⁷

Specialist roles in anaesthesiology combine technical with non-technical skills (NTS) in various combinations to compose specialist meta-competences. Fitness for purpose in anaesthesiology has been defined as expertise (established capability developed with training and experience over time, allowing the development of tacit knowledge) without any deficits in technical or NTS.²⁸ Opinions of graduates themselves may be useful in addressing whether they feel prepared and appropriately trained for their specialist roles. Related studies have been predominantly cross-sectional, representing varying levels of participant experience 0-5 years post-graduation.^{15-19,29,30} Most

graduates feel more comfortable with their technical skills; however, some deficits exist predominantly in NTS,^{13,18,26} resulting in the need for supplemental courses.^{26,31} Other graduate self-reflective research indicates deficits in both clinical and NTS (managerial).^{12,13,15-17,32} Roberts, Starr and de Witt performed a longitudinal study of 24 new graduates in paediatric primary care, assessing whether preparedness changed with time and/or experience.³³ The initial study of 32 aspects of clinical practice revealed deficits in clinical and non-clinical areas. The study group was followed up five years later with re-assessment of the same practice areas, revealing a 50% reduction in deficits, indicating the influence on preparedness of experience and/or time. However, deficits remained in two clinical and one non-clinical area despite certification and specialist experience.³³ Longitudinal studies have not been replicated in anaesthesiology and would be of value to assess graduate FnFP and possible changes with time.

Aim of the study

The purpose of this study was to determine whether South African anaesthesiology graduates consider themselves FFP as specialists at graduation and if their perceptions had changed a year later.

Methods

Ethics

This study received ethical approval from the Biomedical Research Ethics Committee (BREC) at the University of KwaZulu-Natal (BE199/17). All respondents provided informed consent.

Study details

The quantitative study comprised an electronic survey (Survey Monkey®, SVMK, San Mateo, USA) undertaken on two separate occasions by the same study group. The participants consisted of all national anaesthesiology graduates of the first semester 2019 FCA CMSA summative examination.

The first survey was undertaken at the time of graduation in May 2019 (T₁) with a follow-up survey after 12 months' experience in May 2020 (T₂). The survey interrogated self-perceptions of preparedness for nine meta-competences with their associated 101 enabling competences. These had been deemed applicable for assessment of FnFP for South African anaesthesiology from a previous study.²⁷ Each of the nine meta-competences had a variable number of enabling competences (Table I), and each competence was scored individually.

A 4-point Likert scale was used for scoring graduate preparedness in the enabling competences (1-completely unprepared; 2-somewhat prepared; 3-prepared; 4-completely prepared). *A priori*, the authors determined that if >50% of scores for each competence were 1 or 2, the item would be classified as unprepared. If >50% of scores for the item were 3 or 4, the item would be considered as prepared. These composite scores were combined to create scores for each meta-competence. Changes in these meta-competence scores a year later were then analysed using McNemar's test for paired proportions with a Yates continuity correction of 0.5. An alpha of 5% was used to define statistical significance, and two-sided tests were performed in all analyses. STATA 14 (StataCorp.2015. Stata Statistical, release 14, College Station, TX: StataCorp LP) was used for statistical comparisons. Respondents' perceptions are described using mean and standard deviations for normally distributed data, and median and inter-quartile range for non-normally distributed data.

Results

Figure 2 summarises inclusion processes for the study at T₁ and at T₂, achieving response rates of 85% and 93% respectively. The overall response rate was 79%, with 37 participants from a total of 47 graduates.

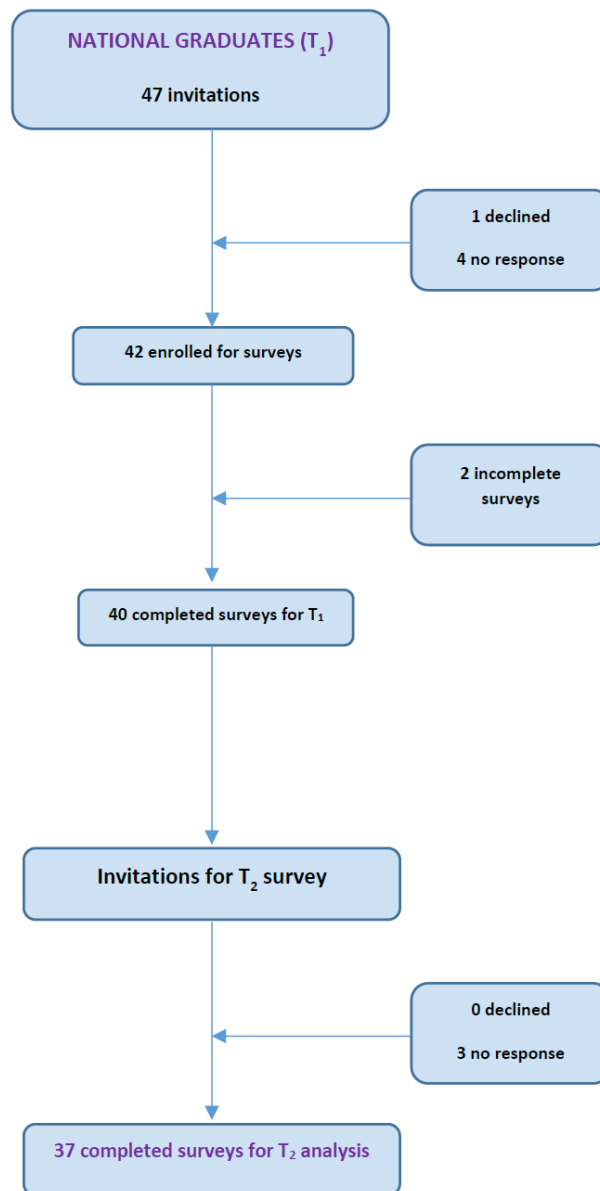


Figure 2. Participant inclusion

The responses of the study group and comparisons between the two time intervals are reflected in Table I. At T₁, graduates felt prepared for seven of nine (78%) meta-competences and unprepared for two: Leader and Health Advocate. The 10 component enabling competences from three meta-competences for which graduates did not feel prepared at T₁ are listed in Table II. At T₂, graduates felt prepared for all of the nine meta-competences. Statistically significant differences between the groups' responses over the two time periods were noted for two meta-competences, Leader and Health Advocate, with both considered prepared at T₂.

Table I. Summary of comparisons of 37 graduate responses at T₁ and T₂

Meta-competence	Enabling competences n	Unprepared n (%)	Prepared n (%)	p- value (T ₁ cf T ₂)
Medical Expert	18			
T ₁		0	18 (100)	1
T ₂		0	18 (100)	
Communicator	17			
T ₁		0	17 (100)	1
T ₂		0	17 (100)	
Collaborator	9			
T ₁		0	9 (100)	1
T ₂		0	9 (100)	
Leader	11			
T ₁		6 (55)	5 (45)	0.041
T ₂		0	11 (100)	
Health Advocate	5			
T ₁		3 (60)	2 (40)	0.041
T ₂		0	5 (100)	
Scholar	16			
T ₁		1 (6)	15 (94)	1
T ₂		0	16 (100)	
Professional	15			
T ₁		0	15 (100)	1
T ₂		0	15 (100)	
Context Awareness	4			
T ₁		0	4 (100)	1
T ₂		0	4 (100)	
Humaneness	6			
T ₁		0	6 (100)	1
T ₂		0	6 (100)	
Total	101			

Table II. Competences for which graduates felt unprepared (completely unprepared or somewhat prepared) at graduation

Meta-competence	Enabling competences
Leader	Apply the science of quality improvement to contribute to improving systems of patient care
	Use health informatics to improve the quality of patient care and optimise patient safety
	Facilitate change in health care to enhance services and outcomes
	Set priorities and manage time to integrate practice and personal life
	Manage a career and a practice
	Implement processes to ensure personal practice improvement
Health Advocate	Possess an in-depth knowledge of global health issues
	Improve clinical practice by applying a process of continuous quality improvement to disease prevention, health promotion, and health surveillance activities
	Contribute to a process to improve health in the community or population that they serve
Scholar	Critically evaluate the integrity, reliability, and applicability of health-related research and literature

Changes in preparedness scores over time were assessed for all 101 enabling competences that compose the nine meta-competences. To explore graduate unpreparedness further the total number of enabling competences that had any number of scores for “completely unprepared (Likert 1) and “somewhat prepared” (Likert 2) at T₁ were identified (Table III, column 3). Those enabling competences were then followed up at T₂ for comparison. At T₂, enabling competences with any Likert 1 or Likert 2 scores were again identified and the number of these scores was tallied. The total number of Likert 1 or 2 scores for each enabling competence was compared at both time intervals to ascertain if the number had increased, decreased or remained unchanged with time. Enabling competences that had a greater number of Likert 1 or 2 scores at T₂ than T₁ (Table III, column 5) have been expanded in Table IV to indicate the changes.

Table III. Changes in graduate scores of Likert 1 or 2 for 101 enabling competences from T₁ to T₂

Meta-competence	Total no of enabling competences	No. of enabling competences with any Likert score of 1 or 2 at T ₁	No. of enabling competences with decreased no. of Likert 1 or 2 scores at T ₂ (%)	No. of enabling competences with increased no. of Likert 1 or 2 scores at T ₂ (%)	No. of enabling competences with unchanged no. of Likert 1 or 2 scores at T ₂ (%)
Medical Expert	18	18	15 (83)	0	3 (17)
Communicator	17	17	14 (82)	3 (18)	0
Collaborator	9	8	6 (67)	2 (22)	1 (11)
Leader	11	11	11 (100)	0	0
Health Advocate	5	5	5 (100)	0	0
Scholar	16	16	10 (63)	4 (25)	2 (12)
Professional	15	15	10 (67)	2 (13)	3 (20)
Context Awareness	4	4	1 (25)	1 (25)	2 (50)
Humaneness	6	6	4(67)	2(33)	0
TOTAL	101	100	76 (75)	14 (14)	11 (11)

Table IV. Enabling competences with increased number of Likert 1 or 2 scores at T₂

Meta-competence	Enabling competence	Total no. of Likert 1 or 2 scores	
		T ₁	T ₂
Communicator	Communicate effectively using a written health record, electronic medical record, or other digital technology	7	8
	Share information with patients and others in a manner that respects patient privacy and confidentiality and enhances understanding	3	5
	Able to communicate effectively with patients, care-givers and families despite language differences	13	17
Collaborator	Ability to respond to need for emergency involvement outside perioperative domain	2	5
	Show respect toward collaborators	0	1
Scholar	Promote a safe learning environment	4	6
	Ensure patient safety is maintained when learners are involved	1	3
	Assess and evaluate learners, teachers, and programs in an educationally appropriate manner	13	14
	Integrate evidence into decision-making in their practice	3	4
Professional	Demonstrate a commitment to patient safety and quality improvement	1	2
	Manage personal and professional demands for a sustainable practice throughout the physician life cycle	14	16
Context Awareness	Capacity to be adaptable and creative in solving problems	5	7
Humaneness	Ability to practise with sound moral standards (Honesty, altruism, integrity, humility, commitment, kindness)	2	3
	Ability to remain calm under pressure	4	5

Discussion

This study reveals that new specialists felt unprepared for the Leader and Health Advocate meta-competences at graduation. With respect to Leader, this is in keeping with other studies reflecting difficulties experienced by new graduates in many specialties with managerial tasks and leadership.^{12,13,15-17,32} A UK-based study suggests that graduates feel particularly unprepared for leadership roles such as clinical service management, time management, business planning, and management of human and financial resources.¹⁷ In the same study, unpreparedness was noted in graduates' abilities to take responsibility for management of services, in practice management

including staff complaints and in work-life balance. Although not explored in our study, others postulate that poor exposure to managerial and leadership-related tasks during training, poor collaboration with others and a limited understanding of the complexities of the healthcare system may account for graduate unpreparedness,¹⁷ all of which may be relevant in our study population.

Our study also indicates that graduates felt poorly prepared at graduation for the meta-competence of Health Advocate. This may be explained by the difficulties that faculties have in teaching and assessing this meta-competence. Studies indicate that the importance of Health Advocate is rated low by teachers and faculties despite patients' perspectives to the contrary.³⁴⁻³⁶ This is mirrored in the South African context²⁷ and may account for the unpreparedness of our graduates. A possible explanation for this unpreparedness is that less time is spent on teaching this NTS to trainees because it is poorly understood by trainers themselves, even in Canada where it has been incorporated into CanMEDS.^{34,35}

Studies assessing preparedness of anaesthesiology graduates are scarce. Research of a variety of final year trainees³² and new specialist graduates,^{16,17} including anaesthesiologists, reveal predominant deficiencies in NTS. Simon, Trawicki and Galgon focused specifically on preparedness in anaesthesiology by performing a national survey of final year trainees in the USA.²² Results indicate that the majority of trainees felt comfortable with most of the technical procedures required of a specialist. Deficits in technical skills, noted in 30-40% of trainees, were considered easily remediable by means of simulation or extra courses. However, approximately 50-70% of respondents were not comfortable with NTS (managerial).²² These anaesthesiology-specific results, together with those of our study, suggest that graduates feel deficient in NTS, which may have an impact on their ability to perform as a specialist. For meta-competences comprising NTS, such as Leader and Health Advocate, trainees often assimilate the necessary NTS from the "hidden curriculum".³⁷⁻⁴¹ Learning in this manner incorporates sub-conscious and informal role-modelling and mentorship.⁴²

Since some of the role models may not have received formal training, trainees may unknowingly be learning practices and attitudes that may not be of an appropriate standard.⁴³ This lack of formalised training may account for deficits.

Our study, similarly to others,^{16,33} reveals that graduate preparedness improves with time. After 12 months' experience post-fellowship, graduates indicate no significant deficits in any of their specialist meta-competences. Most graduates felt more prepared for most of the enabling competences of their specialist roles. This concurs with similar findings suggesting that graduate preparedness improves temporally.³³ Due to the paucity of evidence from longitudinal research, it is not clear exactly how much time is required post-graduation for specialists to feel comfortable in performing all their specialist roles.

In our study, 14 of the 101 enabling competences had more Likert 1 and 2 scores after a year's specialist experience (Table IV). These 14 enabling competences could be grouped into: broader responsibilities of a specialist, balancing work and personal lives, and working calmly with humaneness despite external pressure. The increase in these scores suggest that graduates may not have been aware of their deficiencies at the time of graduation and discovered their shortcomings after a period of time. The two enabling competences with the greatest increase in these scores were: ability to communicate effectively with patients, families and care-givers, and the ability to respond to emergencies outside of the perioperative domain. These highlight the need for focused attention on effective communication with patients in a manner that is clear and understandable to all, and the need for collaboration with colleagues outside of operating theatres.

The findings from this study affirm those of others that graduates may become aware of their own shortcomings only when faced with situations in the role of a specialist, and make these observations retrospectively with the passage of time and some insight and maturity.³³

Graduate self-assessment may be less useful as an indicator of preparedness than as part of evaluation of the quality of graduate training and educational experiences.²² It forms an important component of a 360 degree review of FnFP of anaesthesiology graduates and may provide valuable insights into training programmes.

At graduation, new specialists may assume that they have no deficits in technical or NTS as they have been certified for specialist practice. This, together with heightened emotion and relief after years of hard work, may give a false sense of subjective FnFP.^{17,33,44} Local anaesthesiology graduates overestimated their preparedness at graduation compared to opinions of their teachers and examiners²³ with seniors' opinions of graduate preparedness differing significantly from those of graduates in >50% of the meta-competences assessed. However, graduates may also under-estimate their abilities and self-scrutinise excessively.²² Both under-and overestimation may result from the Dunning-Kruger effect;⁴⁵ incompetent individuals may be unable to recognise their own shortcomings.⁴⁵⁻⁴⁷ The ability to self-assess and self-regulate is an important part of professional practice,⁴⁸ ensuring practitioner accountability to the profession, the public and themselves,²⁴ and allowing professional progression.⁴⁹ However, not all graduates possess these abilities⁵⁰ at the time of graduation, with deficits only evident with the passage of time, specialist experience³³ or learner maturity.

One of the strengths of this study is the quality of the results as reflected by the high proportion of eligible graduates participating in the study as well as a high response rate at T₂. This is the first national, longitudinal study reflecting the temporal nature of anaesthesiology graduates' opinions, and will be able to assist trainers and curriculum designers in future, focusing in particular on Leader and Health Advocate.

Limitations of this study exist. Firstly, one has to consider whether the opinions of a single graduating group are indicative of general national perceptions. Future research could evaluate perceptions of multiple groups of graduates over several years to assess more generalised perceptions. Secondly, the size of this respondent cohort may limit the value of the results, the national anaesthesiology training programme being

relatively small. Thirdly, the re-assessment period of 12 months may not be appropriate to assess whether experience has affected perceptions of preparedness. Although the second assessment revealed no deficits in meta-competences, longitudinal studies should ideally track respondents over an extended period of time to address the temporal nature of preparedness. However, the ideal time interval(s) to assess changes in preparedness is unknown. Fourthly, the Likert scale used to assess preparedness may be too insensitive to detect minor changes that were experienced by graduates but it is unlikely that these were meaningful. Finally, this study did not explore the reasons for perceptions of unpreparedness.

Conclusion

South African anaesthesiology graduates consider themselves unprepared for the meta-competences of Leader and Health Advocate at graduation. Both meta-competences comprise predominantly NTS that are not formally taught and assessed, which may account for the deficiencies. Graduates' self-assessment one year later revealed no deficiencies in any of the nine specialist meta-competences and suggest that fitness for purpose and preparedness, although not present at graduation, may change after a period of time and experience as a specialist.

Acknowledgement

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Annexure

In South Africa, the CMSA has adopted the CanMEDS physician competency framework for the training of specialists. The CanMEDS system defines the multiple roles of a specialist and consists of 7 main roles (Medical expert, scholar, communicator, collaborator, leader, health advocate and professional) with multiple components that formulate the competencies of each major role. However, South African anaesthesiology experts are of the opinion that these 7 main roles do not adequately encompass all the roles of local anaesthesiologists and have modified them for local applicability. During this survey, you will be supplied with the modified list of main roles and competencies underpinning the functions of a specialist.

Since you have recently qualified as a specialist, **you are asked to please consider how prepared you are/confident you are in being able to perform each of the listed meta-competencies (main roles) and core competencies.**

Please answer using a 4-point Likert scale as follows:

1-completely unprepared in being able to perform this competency

2-somewhat prepared in being able to perform this competency

3-prepared in being able to perform this competency

4-completely prepared in being able to perform this competency

MEDICAL EXPERT

Key Competency:

1. Practise medicine within their defined scope of practice and expertise

Enabling Competencies:

- 1.1 Demonstrate a commitment to high-quality care of your patients
- 1.2 Integrate the CanMEDS intrinsic roles (communicator, collaborator, professional, scholar, health advocate and leader) into your practice of medicine
- 1.3 Apply knowledge of the clinical and biomedical sciences relevant to your discipline
- 1.4 Perform appropriately timed clinical assessments with recommendations that are presented in an organized manner
- 1.5 Carry out professional duties in the face of multiple, competing demands
- 1.6 Recognise and respond to the complexity, uncertainty, and ambiguity inherent in medical practice

Key Competency:

2. Perform a patient-centred clinical assessment and establish a management plan.

Enabling Competencies:

- 2.1 Prioritise issues to be addressed in a patient encounter
- 2.2 Elicit a history, perform a physical exam, select appropriate investigations, and interpret results for the purpose of diagnosis and management, disease prevention, and health promotion
- 2.3 Establish goals of care in collaboration with patients and their families, which may include slowing disease progression, treating symptoms, achieving cure, improving function, and palliation
- 2.4 Establish a patient-centred management plan

Key Competency:

3. Plan and perform procedures and therapies for the purpose of assessment and/or management.

Enabling Competencies:

3.1 Determine the most appropriate procedures or therapies

3.2 Obtain and document informed consent, explaining the risks and benefits of, and the rationale for, a proposed procedure or therapy

3.3 Prioritise a procedure or therapy, taking into account clinical urgency and available resources

3.4 Perform a procedure in a skillful and safe manner, adapting to unanticipated findings or changing clinical circumstances

Key Competency:

4. Establish plans for ongoing care and, when appropriate, timely consultation.

Enabling Competencies:

4.1 Implement a patient-centred care plan that supports ongoing care, follow-up on investigations, response to treatment, and further consultation

Key Competency:

5. Actively contribute, as an individual and as a member of a team providing care, to the continuous improvement of health care quality and patient safety.

Enabling Competencies:

5.1 Recognise and respond to harm from health care delivery, including patient safety incidents

5.2 Adopt strategies that promote patient safety and address human and system factors

5.3 Demonstrate the ability to multi-task

COMMUNICATOR

Key Competency:

1. Establish professional therapeutic relationships with patients and their families.

Enabling Competencies:

1.1 Communicate using a patient-centred approach that encourages patient trust and autonomy and is characterized by empathy, respect, and compassion

1.2 Optimise the physical environment for patient comfort, dignity, privacy, engagement, and safety

1.3 Recognise when the values, biases, or perspectives of patients, physicians, or other health care professionals may have an impact on the quality of care, and modify the approach to the patient accordingly

1.4 Respond to a patient's non-verbal behaviours to enhance communication

1.5 Manage disagreements and emotionally charged conversations

1.6 Adapt to the unique needs and preferences of each patient and to his or her clinical condition and circumstances

Key Competency:

2. Elicit and synthesise accurate and relevant information, incorporating the perspectives of patients and their families.

Enabling Competencies:

2.1 Use patient-centred interviewing skills to effectively gather relevant biomedical and psychosocial information

2.2 Provide a clear structure for and manage the flow of an entire patient encounter

2.3 Seek and synthesise relevant information from other sources, including the patient's family, with the patient's consent

Key Competency:

3. Share health care information and plans with patients and their families.

Enabling Competencies:

3.1 Share information and explanations that are clear, accurate, and timely, while checking for patient and family understanding

3.2 Disclose harmful patient safety incidents to patients and their families accurately and appropriately

Key Competency:

4. Engage patients and their families in developing plans that reflect the patient's health care needs and goals.

Enabling Competencies:

4.1 Facilitate discussions with patients and their families in a way that is respectful, non-judgmental, and culturally safe

4.2 Use communication skills and strategies that help patients and their families make informed decisions regarding their health

Key Competency:

5. Document and share written and electronic information about the medical encounter to optimise clinical decision-making, patient safety, confidentiality, and privacy.

Enabling Competencies:

5.1 Document clinical encounters in an accurate, complete, timely, and accessible manner, in compliance with regulatory and legal requirements

5.2 Communicate effectively using a written health record, electronic medical record, or other digital technology

5.3 Share information with patients and others in a manner that respects patient privacy and confidentiality and enhances understanding

5.4 Able to communicate effectively with patients, care-givers and families despite language differences

COLLABORATOR

Key Competency:

1. Work effectively with physicians and other colleagues in the health care professions.

Enabling Competencies:

1.1 Establish and maintain positive relationships with physicians and other colleagues in the health care professions to support relationship-centred collaborative care

1.2 Negotiate overlapping and shared responsibilities with physicians and other colleagues in the health care professions in episodic and ongoing care

1.3 Engage in respectful shared decision-making with physicians and other colleagues in the health care professions

1.4 Ability to respond to need for emergency involvement outside perioperative domain

Key Competency:

2. Work with physicians and other colleagues in the health care professions to promote understanding, manage differences, and resolve conflicts.

Enabling Competencies:

2.1 Show respect toward collaborators

2.2 Implement strategies to promote understanding, manage differences, and resolve conflicts in a manner that supports a collaborative culture

Key Competency:

3. Hand over the care of a patient to another health care professional to facilitate continuity of safe patient care.

Enabling Competencies:

3.1 Determine when care should be transferred to another physician or health care professional

3.2 Demonstrate safe handover of care, using both verbal and written communication, during a patient transition to a different health care professional, setting, or stage of care

3.3 Awareness of the competency required of the receiving practitioner at hand over of patients

LEADER

Key Competency:

1. Contribute to the improvement of health care delivery in teams, organisations, and systems

Enabling Competencies:

1.1 Apply the science of quality improvement to contribute to improving systems of patient care

1.2 Contribute to a culture that promotes patient safety

1.3 Analyse patient safety incidents to enhance systems of care

1.4 Use health informatics to improve the quality of patient care and optimise patient safety

Key Competency:

2. Engage in the stewardship of health care resources.

Enabling Competencies:

2.1 Allocate health care resources for optimal patient care

2.2 Apply evidence and management processes to achieve cost-appropriate care

Key Competency:

3. Demonstrate leadership in professional practice.

Enabling Competencies:

3.1 Demonstrate leadership skills to enhance health care

3.2 Facilitate change in health care to enhance services and outcomes

Key Competency:

4. Manage career planning, finances, and health human resources in a practice.

Enabling Competencies:

4.1 Set priorities and manage time to integrate practice and personal life

4.2 Manage a career and a practice

4.3 Implement processes to ensure personal practice improvement

HEALTH ADVOCATE

Key Competency:

1. Respond to an individual patient's health needs by advocating with the patient within and beyond the clinical environment

Enabling Competencies:

1.1 Incorporate disease prevention, health promotion, and health surveillance into interactions with individual patients

Key Competency:

2. Respond to the needs of the communities or populations they serve by advocating with them for system-level change in a socially accountable manner

Enabling Competencies:

2.1 Possess an In-depth knowledge of global health issues

2.2 Improve clinical practice by applying a process of continuous quality improvement to disease prevention, health promotion, and health surveillance activities

2.3 Contribute to a process to improve health in the community or population they serve

2.4 Ensure that all staff (including oneself) in the clinical environment are safe and not at risk with respect to physical or psychological injuries.

SCHOLAR

Key Competency:

1. Engage in the continuous enhancement of their professional activities through ongoing learning

Enabling Competencies:

1.1 Develop, implement, monitor, and revise a personal learning plan to enhance professional practice

1.2 Identify opportunities for learning and improvement by regularly reflecting on and assessing their performance using various internal and external data sources

1.3 Engage in collaborative learning to continuously improve personal practice and contribute to collective improvements in practice.

Key Competency:

2. Teach students, residents (trainees), the public, and other health care professionals

Enabling Competencies:

2.1 Recognise the influence of role-modelling and the impact of the formal, informal, and hidden curriculum on learners

2.2 Promote a safe learning environment

2.3 Ensure patient safety is maintained when learners are involved

2.4 Plan and deliver a learning activity

2.5 Provide feedback to enhance learning and performance

2.6 Assess and evaluate learners, teachers, and programs in an educationally appropriate manner

Key Competency:

3. Integrate best available evidence into practice.

Enabling Competencies:

- 3.1 Recognise practice uncertainty and knowledge gaps in clinical and other professional encounters and generate focused questions that address them
- 3.2 Identify, select, and navigate pre-appraised resources
- 3.3 Critically evaluate the integrity, reliability, and applicability of health-related research and literature
- 3.4 Integrate evidence into decision-making in their practice

Key Competency:

- 4. Contribute to the creation and dissemination of knowledge and practices applicable to health.

Enabling Competencies:

- 4.1 Demonstrate an understanding of the scientific principles of research and scholarly inquiry and the role of research evidence in health care
- 4.2 Identify ethical principles for research and incorporate them into obtaining informed consent, considering potential harms and benefits, and considering vulnerable populations
- 4.3** Summarise and communicate to professional and lay audiences, including patients and their families, the findings of relevant research and scholarly inquiry

PROFESSIONAL

Key Competency:

1. Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards

Enabling Competencies:

1.1 Exhibit appropriate professional behaviours and relationships in all aspects of practice, demonstrating honesty, integrity, humility, commitment, compassion, respect, altruism, respect for diversity, and maintenance of confidentiality

1.2 Demonstrate a commitment to excellence in all aspects of practice

1.3 Recognise and respond to ethical issues encountered in practice

1.4 Recognise and manage conflicts of interest

1.5 Exhibit professional behaviours in the use of technology-enabled communication

Key Competency:

2. Demonstrate a commitment to society by recognising and responding to societal expectations in health care.

Enabling Competencies:

2.1 Demonstrate accountability to patients, society, and the profession by responding to societal expectations of physicians

2.2 Demonstrate a commitment to patient safety and quality improvement

Key Competency:

3. Demonstrate a commitment to the profession by adhering to standards and participating in physician-led regulation.

Enabling Competencies:

- 3.1 Fulfill and adhere to the professional and ethical codes, standards of practice, and laws governing practice
- 3.2** Recognise and respond to unprofessional and unethical behaviours in physicians and other colleagues in the health care professions

Key Competency:

- 4. Demonstrate a commitment to physician health and well-being to foster optimal patient care.

Enabling Competencies:

- 4.1 Exhibit self-awareness and manage influences on personal well-being and professional performance
- 4.2 Manage personal and professional demands for a sustainable practice throughout the physician life cycle
- 4.3 Promote a culture that recognises, supports, and responds effectively to colleagues in need
- 4.4 Able to practise efficiently at all times
- 4.5 Ability to advocate on behalf of the profession to the public to assist in public awareness.
- 4.6 Able to function punctually at all times

CONTEXT AWARENESS

Key competency:

1. Demonstrate the ability to adapt clinical and non-clinical practice to specific scenarios and environments to ensure good outcomes.

Enabling Competencies:

1.1 Ability to perceive, to comprehend the meaning of, and to predict the impact of variables in the work environment (situational awareness)

1.2 Capacity to be adaptable and creative in solving problems

1.3 Ability to assess capacity and obtain appropriate consent in any given circumstance

1.4 Ability to remain humane in difficult circumstances

HUMANENESS

Key competency:

1. Demonstrate the ability to engage with and respond appropriately to patients, colleagues, societies and communities in need with qualities that personify good naturedness, and with sound moral standards.

Enabling Competencies:

1.1 Awareness of and respect for the impact and sensitivities of race, culture and ethnicity on decision-making and patient management

1.2 Tolerance and the ability to respect diversities in patients, families and colleagues and function in a non-judgmental manner

1.3 Ability to practise with sound moral standards (Honesty, altruism, integrity, humility, commitment, kindness)

1.4 Ability to remain calm under pressure

1.5 Ability to manage patients and their families with a caring and empathetic nature.

1.6 Ability to promote human welfare and humanitarianism in society and at work

Part 5.2: Postscript to Paper 4

Several suggestions were made by the examiners of this PhD after the Paper 4 manuscript had been accepted for publication. The author felt that these suggestions enhanced the quality of the research and deemed them worthy of inclusion. Postscript changes to the manuscript are as follows:

p110, paragraph 2, line 5 amended to "...with reported deficits in leadership/managerial skills..."

p110, paragraph 3, line 1 amended to "...postgraduate specialist training is framed by the Canadian..."

p110, paragraph 3, line 5 amended to "...Medical Expert with its six intersecting intrinsic roles..."

p110, paragraph 3, lines 6-7 amended to "Despite competency-based training, several studies have shown graduates..."

p110, paragraph 3, lines 9-10 amended to "The researchers attempted to define fitness for purpose (FnFP)..."

p112, paragraph 1, lines 7-9 amended to "The study group was followed up five years later with re-assessment of the same practice areas, revealing a 50% reduction in previously reported deficits, indicating the influence of experience and/or time on preparedness".

p113, paragraph 2, line 3 amended to "*A priori*, the researchers determined that if..."

p119, paragraph 3, line 1 amended to "There are few studies assessing preparedness of anaesthesiology graduates."

p121, paragraph 4, lines 1-4 amended to “The following limitations of this study were noted. Firstly, the sample was limited to the opinions of a single graduating group which may not be generalisable to national perceptions. Future research should evaluate perceptions of multiple groups of graduates over several years to assess more generalised perceptions.”

p122, paragraph 1, lines 1-2 amended to “Thirdly, the re-assessment period of 12 months may limit the ability to interpret the effect of experience on perceptions of preparedness.”

Chapter 6: Integrating discussion with conclusion

Rationale and aim of study

Historically, South African anaesthesiology trainees have been certified and licensed for practice after completion of four years of training that follow the prescripts of a national curriculum nominally based on CanMEDS. Despite certification, not all graduates are able to perform all their specialist duties, a concern not unique to SA, suggesting that they, like others,¹⁻¹⁰ may not be prepared for practice. This may result in adverse effects towards patients and the graduates themselves. By arguing that FnFP of graduates should be pursued, this research set out to investigate four major sub-topics in order to understand the concept and explore local opinions of FnFP in the South African anaesthesiology context.

The first step reviewed the concept of FnFP, and its applicability to medicine and anaesthesiology, in the context of the general understanding of 'competence' in postgraduate medical education. Step two investigated whether the existing CanMEDS framework is a means with which to define FnFP in the South African anaesthesiology context. At the end of this step, experts had provided a list of skills and attributes by which local FnFP in anaesthesiology could be gauged. Step three determined whether various stakeholders considered local graduates FFP according to the locally-approved criteria. The final step explored temporal changes in graduate self-assessment of FnFP using the same criteria.

The aim of this research was to explore FnFP in South African anaesthesiology by means of the sequential exploration of these four major areas. This was performed through conceptualisation, assessment of its relevance and local applicability, how it may be gauged and finally, its perceived existence in South African anaesthesiology graduates.

Synthesis of findings

The purpose of postgraduate medical education should be to educate learners to be able to do what is required of a specialist. This research considered how this purpose could be fulfilled via a competence-based framework and what needs to be done to achieve fulfillment. It commenced with a review of the literature which interrogated previously-held ideals and concepts related to postgraduate medical education; concepts which may be influenced by stakeholder motives. It may be assumed that graduates can function as specialists because they have been certified. However, it is argued that one should reverse this syllogism; trainees should be certified only if they can function as a specialist. Focus therefore needs to be shifted away from attaining certification to rather ensuring that the standard against which trainees are taught and assessed assures their abilities to function as specialists. The current certification process in SA bases itself on the fulfillment of pre-determined requirements.¹¹ Local training, as in most countries, follows the prescripts of a competency framework¹¹ and, having completed the necessary requirements, the graduate is deemed 'competent'. However, since some 'competent' graduates still have deficits, the author argues that the problem lies with misunderstandings related to the concept of competence.

Currently, no universal definition of competence exists, contributing to confusion, despite several having been proposed.¹²⁻¹⁵ Attempts to improve definitions to more accurately incorporate the contextuality¹⁶ and "all-encompassing"¹⁷ nature of competence have not been successful in eliminating graduate deficits. As a reminder, terminologies related to competence may be causing confusion. The author argues that *competence* as a descriptor of an individual's ability to perform all their specialist meta-competences is inappropriate and would be better described by *fitness for purpose*.

Expertise without any deficiencies in technical or non-technical skills, as suggested by the author in Chapter 2, is conceptualised as FnFP.

Fitness for purpose expands the current understanding of competence and expertise to enhance the journey to becoming a specialist. It proposes that medical education forms part of a continuum, constantly evolving to finely tune what has come before in order to improve what comes next. It has a wider theoretical application in various industries outside of anaesthesiology and medicine. It proposes major strides in medical education by pushing the bar higher, to make specialists better not only as doctors but as people interacting with others on a daily basis. It expands the notion of 'competent' doctors being trained to merely perform certain tasks as technicians, and allows for the manifestation of a well-rounded professional who is ready and able to perform all tasks expected of him/her in any situation. It affords the specialist a practical wisdom of being able to know when and how to apply their knowledge and skills in a wider context that incorporates humanism, considered important by patients.¹⁸ It also engenders professional behavior that allows the physician to use his/her personal experience and intuition from tacit knowledge as well as his/her abilities to perceive, interpret, synthesise and self-reflect to enhance patient care. Fitness for purpose suggests that there is more to medical education than just passing assessments: it incorporates how, what, when and why practitioners do the things they do. The author suggests that by conceptualising and understanding FnFP and appreciating its rightful position on the continuum of postgraduate medical education, this may inform how learners are taught, assessed, certified and practise as well-rounded specialists.

Deliberations on what has been achieved by refining terminologies relating to competence and FnFP highlight the need for precision. Terminological precision is relevant not just to the way that one talks or writes about these concepts, but more importantly, to the way one thinks about them and ultimately, translates them into the way trainees are educated.

Taking the concept of FnFP forward into the South African anaesthesiology context, Chapter 3 explored how it can be defined locally. In addition to the proposed definition in Chapter 2 of expertise without deficits in technical or NTS, the author suggests that contextualisation of FnFP is important and should be considered by faculties. Each

country and each discipline may have their unique requirements for specialists that may influence what technical and non-technical skills the local expert should have, affecting how local FnFP will be defined. Chapter 3 explored this in the South African context by investigating whether the CanMEDS competences and their attendant components were perceived as an appropriate means with which to gauge local FnFP. CanMEDS has widespread use to train practitioners to perform all the recommended roles of a specialist. The framework sets out to train a 'competent' practitioner that can, by virtue of its seven component roles, function as a specialist on graduation. The author questioned whether the anaesthesiologist in SA, trained according to CanMEDS, may be considered FFP, and whether CanMEDS is an appropriate tool to achieve this purpose. CanMEDS has been validated for general use and in anaesthesiology in other countries;^{19,20} however, it has not been validated to determine FnFP. Paper 2 attempted to ascertain whether CanMEDS could represent an appropriate representation for FnFP, since it is the chosen teaching framework currently in use in SA.

Reflecting on Paper 2 and the use of enabling competences to gauge graduates' abilities to perform meta-competences, the author acknowledges that the reductionist approach employed by competency frameworks to the training of meta-competences may be problematic. Taking into account that SA has chosen CanMEDS as the competency framework, and that research needed to commence at grassroots level, the author considered how the current CanMEDS framework and its enabling competences could be modified to gauge graduate FnFP. By doing this, the author attempted to make recommendations on CanMEDS taking its limitations into account.

Chapter 3 directly enquired as to the relevance and worthiness of CanMEDS to address FnFP for anaesthesiology in SA. National experts excluded some CanMEDS enabling competences perceived as less relevant to South African anaesthesiology, and made amendments to improve local applicability. This was performed by the addition of 19 new enabling competences and two new meta-competences, Humaneness and Context Awareness.

Humaneness was thought to be lacking from the existing CanMEDS competences and was believed to incorporate personal humanistic attributes necessary to care for those in distress or in need, good naturedness, sound moral standards, empathy and non-judgmentalism. It was considered a central component of the South African anaesthesiologist, expressing itself as a human trait important to the care provided by anaesthesiologists. Despite some components of Humaneness evident in the CanMEDS Professional role, local experts agreed that the South African anaesthesiologist requires Humaneness to be a core component that infiltrates every aspect of the specialist care that they provide. Experts felt that Humaneness is particularly important for local specialists: SA has a very diverse and under-resourced population necessitating empathy, respect, tolerance and non-judgmentalism by anaesthesiologists who must respond with humanitarianism and altruism. It was therefore proposed as a stand-alone meta-competence worthy of specific attention during training rather than its current minor role as a subsidiary to other meta-competences.

Context Awareness was also considered to be lacking in the CanMEDS competences for an anaesthesiologist in SA, and was included to ensure that specialists can think on their feet, creatively when required, and be adaptable to modify their practice(s) to suit any scenario. The author suggests that SA, being the diverse country that it is, with an equally diverse population, renders an awareness of one's context and adapting one's behaviour accordingly all the more relevant to specialists in SA. SA may be described as many countries rolled into one. The population is not homogenous and that, together with financial constraints, dictates that anaesthesiologists in SA have to readily adapt their practice to suit the demands placed on them by various cultural, ethnic, religious and financial determinants. 'Context awareness' would also afford the anaesthesiologist the ability to remain humane despite often inhumane demands that may be placed on them working in remote or poorly-resourced areas.

The 'context aware', FFP anaesthesiologist would, in the author's opinion, form an integral part of a 'collectively competent' healthcare team. 'Collective competence' conceptualises how individual competence translates into something greater than self,

and can more readily meet the needs of demanding healthcare systems.²¹ Several authors suggest that although necessary, individual 'competence' alone does not suffice since 'competent' individuals do not always come together to form 'competent' teams.^{21,22} Several of the CanMEDS roles (Medical expert, Collaborator, Communicator and Leader) incorporate the teamwork required for collective practice into their enabling competences.²³ 'Collective competence' is achieved by working interdependently and by using collective knowledge to afford clinicians a greater understanding of the workplace context, its systems and its expectations.^{22,24} Collaborative expertise develops as a result of collective and complex interactions between clinicians, patients, families and settings²² contributing to improved patient care and fewer adverse events and errors.²¹ The author proposes that the adaptable and 'context aware' anaesthesiologist may assist in the development of 'collectively competent' or FFP teams.

Having obtained the opinions of local experts and taking into account the insufficiencies, it was evident that the existing CanMEDS framework might not be able to train local anaesthesiologists to be FFP according to local expectations. CanMEDS required modification by the addition of the two meta-competences to enhance its own FnFP to do what it has been asked to do: train FFP South African anaesthesiologists. This thus posed an interesting idea: one cannot achieve FnFP in the output (graduate) if the means to that end (CanMEDS instrument) is not in itself FFP. The research then takes on an interesting angle by revealing a mandatory dualism at the core of FnFP. Fitness for purpose often refers to the output, whether it is a product, a contract or some type of offering from a service provider. However, thought should be given to how this FnFP is being measured and whether the tool itself is FFP to perform the expected task. The author suggests that not only should FnFP of local professionals be defined but that one does the same with the measuring tool. The author has argued that local definitions of professional FnFP are relevant and mandatory; however, similar consideration should be given to the measuring tool.

During the Delphi process of Paper 2, experts were also asked to rate the importance of the modified meta-competences, and weight them for proposed time to be spent on their instruction. In keeping with others,²⁵ local experts did not perceive all meta-competences as equally important, despite this impression by CanMEDS. Similarly, experts suggested differential weighting of each meta-competence, with implications for time to be allocated for teaching and assessment. CanMEDS has not explored the relative rating/weighting of their seven specialist roles, implying intentionally or unintentionally that all are considered equal. This, however, seems to be contrary to what experts elsewhere perceive as realistic practice for a specialist.^{19,20,26,27} South African anaesthesiology expert ratings of importance fared similarly to those in Denmark and Germany^{19,20} with highest scores for Medical Expert, Collaborator and Communicator, and lowest scores, including suggestions from Canada itself, for Health Advocate.^{19,20,26,27} Although all meta-competences were considered important and worthy of inclusion in the South African context, differences in importance/weighting have practical implications for curriculum developers, assessors, examination convenors, and trainees. South African experts attempted to provide clarity in this regard to enhance the utility of the results from Paper 2 and to improve the training of FFP specialists.

With the addition of two new meta-competences, Humaneness and Context Awareness, the existing CanMEDS graphic was amended. Humaneness was considered a central and personal meta-competence, situated at the very core of the CanMEDS flower graphic as an integral part of the medical expert. The all-encompassing meta-competence of Context Awareness, embracing the professional and personal components of all the specialist meta-competences, was given an over-arching position on the flower. This graphic assists in visualising the concept of the FFP South African anaesthesiologist and demonstrates how it has been locally defined and tailored to suit the specific needs of the discipline and locale of its specialists. The specific positions of the meta-competences of Humaneness and Context Awareness, unique to the South African anaesthesiologist, reiterate their importance and worthiness for inclusion. The author has argued why these are important in the local context; why do they not feature in the

original CanMEDS? Perhaps, with time, they may be deemed relevant to other countries too. The graphic serves as a reminder that in SA, the FFP anaesthesiologist would be a well-rounded clinician who has managed to achieve the correct balance of technical and NTS that afford him/her the ability to serve the population well.

Paper 2 culminated in the creation of an extensive list of 101 enabling competences and nine meta-competences. This modification of the original CanMEDS was considered an important outcome from this research as it provided a FFP means with which graduate FnFP could possibly be gauged prospectively.

An addendum to Paper 2 further explored the results of this paper and the utility of the modified CanMEDS graphic. A radar chart was proposed as an alternative graphic for use with detail and insights from expert opinion regarding relativity of meta-competence scoring, and was proposed for use for training purposes. This graphic proffers utility as a suggested educational tool to track the progress, for the entirety of training, of a learner by means of dynamic and individualised self-assessment. This chart proposes benefit to anaesthesiologists as it offers a more quantitative means of gauging a trainee's progress, providing a degree of 'measurability' to the process by the inclusion of numerical scales.

Having established what FnFP is (Chapter 2) and how it can be locally defined for South African anaesthesiology (Chapter 3), the next logical step was to probe this further, in the last two chapters, by asking what the modified CanMEDS tool reveals when applied to local anaesthesiologists, and whether it can determine if local graduates are perceived as FFP.

The perceptions by seniors of national anaesthesiology trainees' FnFP compared with individual opinions of trainees themselves constituted Chapter 4 of this research. Research has indicated that seniors do not always concur with the readiness for practice perceived by graduates.⁷ In general, new graduates and final year trainees feel unprepared for their roles as specialists, with particular deficits noted in the meta-competences of Leader and Communicator.^{2,3,5,28} Results from Paper 3 reveal that local graduates fare similarly, experiencing unpreparedness for the meta-competences of

Leader and Health Advocate on self-assessment. Seniors, however, rated graduates in SA as unprepared for the majority of their specialist meta-competences (Leader, Health Advocate, Scholar, Communicator and Professional). This assessment of graduates suggests that despite having completed mandatory training and examinations, they may not be FFP.

In attempting to investigate these results further, a detailed assessment of the enabling competences with discrepant opinions between the two groups was undertaken in Chapter 4, part 4.3, revealing that 92% of them were non-technical in nature. The unpreparedness for Leader and Health Advocate, both comprising predominantly NTS, together with results from the discrepant enabling competences, reveals that graduates seem to be unprepared predominantly for NTS. Local graduates are supposedly trained, according to the CanMEDS competency framework, to be 'competent', yet are graduating with multiple deficits. How is this possible? The author proposes several postulates that may account for these deficits.

Firstly, competency frameworks themselves, such as CanMEDS, may be problematic. Their reductionist approach to teaching meta-competences by means of milestones, removing them from their context and excluding the possible impact of competence inter-dependence, may particularly affect the NTS. Assessing competence of deconstructed milestones rather than of entrustable professional activities (EPAs), which are more akin to the complex tasks of a specialist, can result in deficiencies in important NTS.

The dearth of explicit NTS teaching, and reliance on the hidden curriculum rather than explicit incorporation into training frameworks, may also be contributory. Faculties themselves need to be familiar and at ease with NTS, and how to incorporate them in formalised assessments. This would necessitate examiner training to enhance familiarity with the assessment of such skills. Since criteria for entrance to training programmes are ill-designed to select the best candidates for the role of a potential specialist anaesthesiologist, it may be possible that not all trainees are equally receptive to NTS tutelage. Matveevski, Moore and Samuels propose that since the quality of

anaesthesiologists is affected by personal and behavioural attributes, applicants should be screened to assess their technical and non-technical abilities,¹⁶ a suggestion worthy of consideration to address the skills deficits in graduates. Training programmes do not take variations in trainees into account. Training modalities are generalisable in their approach and teach practitioners what to do; they cannot alter personality types or moral codes of conduct. Emotional intelligence (EI) has been shown to correlate well with several NTS such as communication, decision making, leadership and teamwork;²⁹ however, EI currently does not constitute a selection criterion for choosing applicants for specialist training.

In addition to the possible contributions that competency-based frameworks may be making to graduate deficits, the author proposes that inadequate operationalisation of such frameworks may also be contributory. National anaesthesiology training in SA, as mentioned in Chapter 3 (p71), follows a curriculum of 13 domains supposedly rooted in the CanMEDS framework. The question is therefore begged that if the curriculum is rooted in CanMEDS with its extensive roles and enabling competences, where are the deficits emanating from? Theoretically, CanMEDS has been incorporated into the South African anaesthesiology curriculum but operationally, this may not have been achieved. It would entail each domain incorporating the CanMEDS roles with their numerous enabling competences. This has not been undertaken in SA and suggests that perhaps, despite having adopted CanMEDS, the South African anaesthesiology faculty may not be using it correctly. Despite the sampled graduates having passed their fellowship examinations and been certified by examiners as specialists, a sample of the examiners' colleagues believed that recent graduates are not FFP. This provides an example of the disconnect between licensure to practice and FFP that motivated the author to perform this research. This disconnect may, *inter alia*, be as a result of insufficient operationalisation of CanMEDS. If one claims to be using CanMEDS, or any tool, for teaching, then one has to ensure that the tool is being implemented appropriately. If not, deficits are inevitable and the outputs of the programme, the graduates, may be of variable quality.

Having followed the international trend away from apprenticeship or time-based training, the South African anaesthesiology faculty has perhaps not transitioned completely to competency-based training. The faculty may still, unintentionally, be straddling both frameworks by not aligning their theoretical with their operational acceptance of CanMEDS, thereby occupying a 'no-man's land' reflected in graduate deficits. Difficulty, for various reasons, has been noted with operationalising training frameworks,^{27,28,30-32} and lack of faculty buy-in was described in Chapter 2 (p33-35) as a limitation that posed a difficulty to their incorporation. Lack of faculty buy-in may be contributing to insufficient operationalisation of CanMEDS, with resultant reduction in observable benefits.

Having adopted CanMEDS as the competency framework of choice in SA, concerns regarding graduate deficits urge one to consider whether the framework itself, with its disadvantages, is causing the deficits in graduates or if it is failing to prevent them. The author has argued previously that the generic use of competency frameworks is not without its disadvantages, which must be taken into account when evaluating the quality of graduates.

Taking the issue of implementation further, one has to question how teaching is being done, and if it is following the prescripts of CanMEDS. Not all teachers are aware of the CanMEDS competences. The author proposes that this may account for the more lenient assessment of graduates by teachers compared with examiners, as noted in Paper 3; teachers in SA may be less familiar than examiners with the expected CanMEDS competences of a graduate. Failure to correctly implement CanMEDS into the curriculum or to focus sufficiently on its attendant meta-competences may result in a subsequent failure to assess the prescribed competences.

In training FFP specialists, teachers and examiners should be FFP as well, not only as practitioners but in their supervisory and assessment roles respectively, being expert at what they are doing without deficit. This then expands on the previous suggestion of the multiplicity of FFP. Not only are graduates and the tool with which their FFP is being measured expected to be FFP, but *all* role-players in the training of specialists should be

FFP: the training programme itself, the teachers, the examiners, the examination process, and the measuring tool of graduate FnFP. Fitness for purpose of graduates cannot be expected if South African anaesthesiology and all its relevant components are not FFP.

An interesting concept to ponder, emanating from the results of Paper 3, is that of the value of assessments. Brooks suggests that assessments of (potential) experts should be made by experts themselves;³³ a similar opinion shared by others in the discernment of excellence.³⁴ This highlights the value of the 'expert opinion' in assessment, rather than that of an outcomes-based checklist type of assessment which, according to Brooks, is promulgated by competency frameworks. Brooks suggests superiority of the exclusive use of expert opinion over checklists during assessments. The author agrees to the extent that relying on experts to assess trainees allows the assessor to detect nuances and important aspects of practice.³⁵ However, relying exclusively on undirected expert opinion to provide a global rating of a trainee is fraught with controversy because it may be highly subjective and subject to rater bias.³⁵

On the other hand, there is no value if assessors merely tick boxes on a checklist; this process can be performed by any individual trained to look for the pre-determined responses, and negates the effectiveness of the test and the value of the expertise of the assessor. Trainees may score the required points on a checklist, yet display dangerous or concerning aspects of practice that are detectable by the expert but missed by the checklist. Checklists, such as the modified CanMEDS list emanating from Paper 2 may assist in directing the assessor to a particular point of interest that warrants interrogation.

Somewhere in the dichotomy of these two extremes – represented by the apprentice who, after time and experience, becomes an expert versus the specialist who is deemed 'competent' after completion of competency-based training – lies the value of the expert in the assessment process. There are advantages and disadvantages on both sides; however, the author is of the opinion that the truth lies somewhere in the middle, and should not be portrayed as one of two absolutes that lie at the extremes of opinion.

The expert is essential in the assessment process with the checklist providing a scaffold on which to build his/her opinion.³⁵ The expert's learned eye interrogates the items of the checklists, which in turn directs his/her gaze in the assessment of FnFP.

Paper 3 requested participants to make a value judgement by taking the middle-ground approach suggested above, of using expert opinion with a checklist. Using the modified CanMEDS tool was considered by the author of more value in gauging graduate FnFP than by posing just a single binary question about graduate FnFP: yes or no.

Although this research did not set out to investigate assessments, Paper 3 shows discrepancies in opinions between seniors and graduates, suggesting that the relevance of assessor opinions may require exploration before drawing any conclusions of graduate FnFP. Remembering that seniors were assessing FCA graduates in general versus the personal assessments made by graduates, one can still gain some insight from the discrepancies in their respective scoring. In situations where graduate and senior opinions are significantly discordant, one assumes that those of seniors are fairer, more objective or more accurate than those of graduates. This may primarily be due to the experience of seniors compared to graduates who may be less experienced at formulating an expert opinion of themselves. It may also be due to suggestions that experts in the field, with an understanding of the contextuality of the work environment,^{16,36,37} are the best equipped socially, practically and cognitively to apply context-specific judgements,³⁸ making them, rather than non-experts, best positioned to judge trainees' abilities.^{33,39}

The value of graduate self-assessment is however, more controversial. Some have cited usefulness in informing performance of tasks,⁴⁰ validity in non-examination settings,⁴¹ correlation with trained observers,⁴² and as a means for self-reflection and self-monitoring.^{43,44} However, several have reported self-assessment as being inaccurate⁴⁵ or invalid,^{41,46} with responses that are affected by many variables.⁴⁷ Eva and Regehr doubt the capacity of an individual to self-assess and self-regulate but acknowledge the conundrum that develops in that it is required to improve one's practice⁴⁸ throughout one's professional's career.⁴⁹ In attempting to make sense of this dilemma, Eva and

Regehr argue that the reason that self-assessment has failed to gain significant support in medical studies is because of poor conceptualisation and operationalisation,⁴⁴ with potential value being demonstrated if these are appropriately addressed. This can be achieved by acknowledging that self-assessment is affected by context, content and perspective, and is considered to be useful when paired with feedback and guidance from trained observers.^{43,44,50}

Acknowledging the aforementioned potential advantages and disadvantages of self-assessment, the validity of graduate opinions was explored by Paper 3 which revealed that graduates considered themselves prepared for all specialist meta-competences (except Leader and Health Advocate), contrary to their seniors' opinions, highlighting the impact of experience on expert opinion. Graduates and seniors were both asked to make a judgement call on graduate FnFP. Although the seniors were not assessing these individual graduates, the discrepancies support the author's opinion that both guiding criteria and the learned eye of an expert are required to provide a valid opinion. Perhaps recent graduates have not yet fully attained the learned eye, and experience as an expert may be required to establish the validity of their opinions.

In Chapter 5, the temporal nature of anaesthesiologists' perceptions of their preparedness for practice was assessed. Most similar studies are cross-sectional in nature and assess graduates at single time intervals post-graduation.^{3,8,51} Results of this longitudinal study over a year constituting Paper 4 revealed that after 12 months graduates felt prepared for all nine meta-competences. This chapter, together with components of chapter 4, explore graduate self-efficacy as a means of assessing preparedness for practice. Papers 3 and 4 sought the opinions of graduates' own preparedness by means of a questionnaire with a 4-point Likert scale. The questionnaire, with content derived from a national Delphi process,⁵² had good internal consistency with a Cronbach alpha of 0.76, and allowed free text so that other opinions not included by the questionnaire could be obtained.^{53,54} Various self-efficacy scales are available to rank responses.³ A Likert scale was chosen as it allows for degrees of opinions rather than binary responses, and allows quantitative data to be obtained and analysed.⁵⁵

Chapter 5 revealed that despite the improvement in preparedness for all nine meta-competences, closer investigation of the results of Paper 4 indicate that perceptions of preparedness for 14% of the 101 enabling competences had *declined* with time. Graduates, after some experience, may have developed greater insight into their own deficiencies, having overestimated their preparedness initially. With time, there may be a degree of fall-off of skills that were required to pass an exit examination but may not be used in daily practice. The appropriate time interval post-graduation to assess for changes in opinions is not known. One may argue that 12 months is too short, or too long, to detect any significant change, and that perhaps different time intervals may reveal larger differences in opinions. Despite the short time interval reflected by Paper 4, these results indicated changes in graduate preparedness. It is noteworthy that the second assessment of graduates occurred during the Coronavirus 2019 (Covid-19) global pandemic. The impact of Covid-19 on the graduates was not investigated; however, the possibility exists that expected post-graduate learning may not have occurred due to Covid-19, resulting in a decline rather than an incline in some enabling competences.

While graduates appear to be more prepared after 12 months, this must be interpreted within the methodology of Paper 4. It was decided, *a priori* by the researchers, that if >50% of scores for a particular meta-competence were a Likert 1 or 2, the meta-competence would be classified as unprepared. Similarly, if >50% of scores were rated a 3 or 4, that meta-competence would be classified as prepared. The researchers did not investigate the degree of scoring within each meta-competence. If a particular meta-competence had, for example, 25 enabling competences, a score of 13 or more in either direction would classify it as prepared or unprepared. These classifications thus do not imply that 100% of the enabling competences were scored as prepared or unprepared, rather reflective of a majority score. There are several enabling competences over and above the 14% recorded, for which some graduates still felt unprepared. Again, this highlights the possibility that perhaps the anaesthesiology faculty in SA is not paying enough attention to the minutiae of competency-based training. The Canadians have, after successful incorporation of CanMEDS and its milestones into curricula, noted the shortcomings of the framework and instituted change by means of the Competence by

Design conceptual framework for residency training that includes EPAs.⁵⁶ SA is trailing significantly behind in this regard and in order for anaesthesiology training to progress and evolve into a more FFP process in SA, meticulous implementation followed by re-evaluation of CanMEDS needs to be undertaken.

Contribution to knowledge

This study has made the following original contributions to the literature and the advancement of knowledge:

- Fitness for purpose has, until now, been a term used predominantly in non-medical realms with reference mainly to products, programmes and processes. This study has proposed its use for practitioners, conceptualised it, defined it, assessed its relevance in SA anaesthesiology, and proposed a tool with which it may be gauged in local graduates.
- Concerns related to the misunderstandings associated with the commonly-used term *competence* and its confusing use at micro and macro levels in postgraduate medical education prompted an extensive critique of contemporary terminologies. This culminated in the proposed adoption of the holistic term *fitness for purpose*, in reference to an expert who can perform as a specialist without any deficiencies in technical or non-technical micro-competences.
- FnFP was further defined in the context of South African anaesthesiology through compilation of a list of expert-approved criteria that were used to gauge FnFP of local graduates. The existing CanMEDS framework was modified for local use by the addition of two meta-competences, Humaneness and Context Awareness, with 19 enabling competences, and by the exclusion of seven enabling competences.
- As a surrogate measure for FnFP, the modified version of CanMEDS became potentially more FFP as a tool with which to gauge graduate FnFP.

- FnFP takes on multiple facets in postgraduate medical education: it may simultaneously reflect the attributes of the graduate, those of the instrument with which the graduate is measured, the teachers, assessors, assessment processes and tools.
- The original CanMEDS flower diagram was modified to conceptually depict local anaesthesiology FnFP. The new illustration may aid faculties and anaesthesiologists to visualise and understand the concept of the well-rounded, FFP specialist who incorporates all nine meta-competences for South African anaesthesiology. This graphic, with the deliberate placement of Humaneness and Context Awareness in specific positions, alludes to the nature of these meta-competences in the FFP anaesthesiologist.
- An educational tool was conceptualised and proposed for use to monitor the progress of a trainee in a dynamic and individualised fashion. This radar chart, depicting the nine SA-specific meta-competences of varying importance, was proposed as a means to aid in trainee self-reflection to highlight strengths and weaknesses for praise or remedial practice. This chart could, with temporal-specific targets for training, be used to measure individual progress annually and at the end of training. It could also compare these with national targets to visually assess which trainees are ready to sit their final examinations and which still have deficits that require attention.
- Making use of the modified CanMEDS tool to gauge graduate FnFP revealed that graduates were not considered FFP by their seniors or themselves at the time of graduation. Most of the areas of deficiency incorporate NTS which require attention and a renewed emphasis in the curriculum.
- Graduate self-assessment of FnFP improved after one year and revealed no deficits in the nine meta-competences overall. However, graduates felt less prepared for 14% of the enabling competences, warranting closer inspection as to why this may be so, despite gaining specialist experience.

- The overall contributions of this study are that FnFP is contextual and requires a local definition for domestic relevance. It has a multifaceted nature, relating to all role-players in the entire training process. *Fitness for purpose*, rather than *'competence'*, should be considered as the target for licensure to practise for anaesthesiology in SA in an attempt to educate specialists who can function without deficit.

Study limitations

One of the aims of this research was to gauge the FnFP of South African anaesthesiology graduates. In order to make this pronouncement, a global assessment, in the form of a 360 degree review, would be beneficial. This would include incorporation of an appropriate sample of patients and surgeons, as end-users, in both the private and public sectors to be both demographically and geographically representative of South Africa. Similarly, opinions of hospital managers, employers and nursing staff may also have been beneficial.

Paper 2 made use of a Delphi process to collate opinions of South African anaesthesiology experts in areas in which evidence is lacking. This process is associated with several limitations as mentioned previously, such as determination of consensus,^{57,58} number of participants⁵⁹ and number of iterations required. Participants of the Delphi process of Paper 2 were excluded from participation in Paper 3 and their opinions may have provided valuable insights into the perceived FnFP of graduates.

Opinions of seniors were not directly aligned with those of graduates in Paper 3. Seniors assessed FnFP of a hypothetical group of FCA graduates. Graduates, on the other hand, made individual assessments of their own perceived FnFP. Although providing valuable preliminary information in this field, these opinions were not aligned, and conclusions should bear this in mind.

The sample size of the cohort of graduates included in Papers 3 and 4 of the research may be considered small. This research may have benefited from a larger cohort by inclusion of graduates from more than one graduation over a number of years.

The time interval used in Paper 4 was selected as one year. This may have been too short to optimally detect any meaningful changes in graduate perceptions. Equally, it may have been too long, with changes in graduate perceptions having occurred well within that period. There may also be relevance in following graduates up over a shorter time frame to ascertain when their perceptions begin to change.

This was an exploratory study, largely focused on the meaning and implications of FnFP as a concept. It did not attempt to replicate the FCA fellowship assessment by assessing graduates' actual abilities at graduation or at follow-up.

Study implications

By conceptualising and defining FnFP locally, it is hoped that it may inform teaching and learning, assessment, certification and practice of anaesthesiologists in SA. This may provide a benchmark against which all graduates could be measured and may provide very useful information for curriculum developers, who could align the curriculum with the opinions of national experts. Having defined FnFP, this may also afford trainees the ability to self-assess during training to gauge their own FnFP before entering independent practice and discovering deficiencies there. The advantages of FnFP as a concept are achieved when it is contextualised before applying it to individuals.

For South African anaesthesiology, the definition of FnFP was enhanced by the addition of two new meta-competences, Humaneness and Context Awareness. These new meta-competences need to be taught to and understood by trainees, and are proposed for inclusion in training programmes and assessment processes. The modified CanMEDS illustration may provide a useful means of explaining the concept of FnFP in SA to those unfamiliar with it, faculty and trainees alike, not only providing a reminder of the well-rounded FFP graduate, but also that not all specialist meta-competences are technical; some draw on core human traits and require practitioners to spend time on self-reflection and introspection to evolve into better specialists.

The radar chart could become a tool incorporated into a trainee's portfolio at commencement of training and reviewed by trainees, trainers and supervisors. The growth of the trainee's outline on the chart could stimulate useful and constructive feedback for trainees who may excel in particular areas or have difficulties with certain competences. Trainees may not be aware of their strengths and deficits, especially early in the training process, and this tool may assist in bringing these to consciousness during rather than at the end of training. This would allow time for guidance in particular directions. At the end of the training programme, heads of department would be able to peruse trainee portfolios and make informed decisions, for example, as to their readiness to sit the final summative examination.

Having revealed that local graduates may be considered not FFP and that deficits are predominantly non-technical in nature, an emphasis on such skills may be necessary. With the insight that the whole is not necessarily equal to the sum of its parts, the use of the current CanMEDS competency framework with its focus on the instruction and achievement of milestones should be reconsidered. Since EPAs incorporate more complex tasks and responsibilities, simulating those required of a specialist, the local curriculum could be re-designed to incorporate EPAs with appropriate allocations for each year of training indicated on radar charts. EPAs, as mentioned previously, imply supervisor trust in a trainee to perform specific tasks. They take theoretical competences from a competency framework and turn them into clinically-relevant tasks and responsibilities⁶⁰ with decreasing supervision as the trainee progresses in experience and ability. The author believes that EPAs, comprising several enabling competences, are more able to incorporate the interdependence and contextuality of enabling competences. They may therefore better reflect the ability to perform a meta-competence compared with enabling competence milestones. For this reason, the author believes that EPAs may better link training with FFP, and proposes that future operationalisation of CanMEDS in SA could incorporate EPAs rather than enabling competences. Local assessors will require formalised training of how to assess EPAs, in particular those including NTS, so that these skills are not omitted in assessment processes, whether formative or summative. Similarly, teachers should be trained in

how to teach EPAs according to the current framework. Trainees need to understand the importance of NTS in their everyday practice as anaesthesiologists. Since assessment drives learning,^{61,62} the inclusion of NTS into assessments would assist in emphasising their importance to trainees.

Having decided to proceed with postgraduate training according to CanMEDS, the South African anaesthesiology faculty has to ensure that theoretical and operational implementation of the framework are aligned. This research implies that this may not be the case, and that failure to successfully operationalise CanMEDS may be contributing to graduate deficits.

A significant implication from this research is the importance of and the need for self-reflection in all anaesthesiologists, irrespective of experience. Seniors, new graduates and trainees all benefit from self-assessment in order to improve their practice, providing that it is associated with a degree of self-reflection. For learning to be meaningful, effective reflection is important.⁶¹ Results from Papers 3 and 4 suggest that trainees need to constantly examine themselves in an attempt to improve their abilities. The proposed radar chart may assist trainees to reflect on their own practice and develop a habit of effective self-reflection that can be carried throughout their careers.

Conclusions

On the basis that not all anaesthesiologists are thought to function optimally in all their specialist meta-competences, this research attempted to explore the idea of FnFP of practitioners. In so doing, it conceptualised and defined FnFP in the South African anaesthesiology context in terms of the CanMEDS framework, providing a means with which it can be gauged. At the same time, it attempted to gauge whether local anaesthesiology graduates are considered FFP. This research also assisted in the creation of a visual aid for FnFP, and in the provision of a proposed educational tool to assist with graduate self-assessment.

This research was able to establish that, when assessed against a modified CanMEDS framework, local graduates are not considered FFP by either their seniors or themselves at the time of graduation, exhibiting deficits primarily in NTS. Postulates for these deficits were explored, relating to disadvantages of competency-based training and ineffective operationalisation of the chosen framework. The disadvantages associated with the application, design and utility of competency frameworks may render them less effective than hoped, and need to be addressed if graduate FnFP is to be targeted.

The positive changes in graduate self-assessment of their perceived FnFP over time was established. However, the impact on enabling competences was not universally positive, with deficits in preparedness revealing themselves only after time and experience as a specialist.

As a result of this research, one is able to better understand that, although still valid for specific assessments, micro-competence should not be the goal that specialist graduates strive for or that regulators and assessors should be targeting. Competence is proposed as the primary goal *en route* to expertise, with the journey of training culminating in attaining FnFP: expertise without deficits. This continuum of training will assist in the quest for zero defect so that graduates can become the well-rounded, fit-for-purpose anaesthesiologists that they are expected to be. However, it must be remembered that FnFP is multifaceted and does not only apply to professionals. It is a standard that should be applied to the entire discipline of South African *anaesthesiology* with all its attendant educational processes including its teachers, examiners, assessments and teaching and assessment tools, rather than only to its *anaesthesiologists*.

Recommendations

The following recommendations are proposed as a consequence of this study:

- A clear distinction has been made between the terms *competence* and *fitness for purpose*. The author recommends that these distinctions should be borne in mind going forward.
- Non-technical skills require greater emphasis in the preparation of specialists.
- The use of self-reflective tools should be considered during training.
- The multifaceted nature of FnFP should be acknowledged. FnFP of all components of South African anaesthesiology should be established.
- Improvement of operationalisation of CanMEDS by local faculty with appropriate amendments that align CanMEDS competences with curriculum design and trainee assessment. This may require incorporation of EPAs into the learning framework.

Future research

This study highlights the need for future research in the following areas:

- Validation of the conceptualisation of FnFP for South African anaesthesiologists. This could be obtained by garnering opinions from others not included in this research.
- Validation of the modified CanMEDS list of criteria, defining FnFP in South African anaesthesiologists, designed by and for use by experts, as a means with which to gauge local graduate FnFP.
- If the modified CanMEDS is validated as a FFP instrument with which to gauge graduate FnFP, investigation should assess if it helps to train FFP graduates.
- Assess how Humaneness and Context Awareness, together with their enabling competences should be taught and assessed, and their impact on FnFP.

- Investigate the impact of incorporation of EPAs, rather than milestones, into the FCA curriculum. EPAs could be investigated as to their approximation in reflecting the complex tasks within meta-competences of a specialist in keeping with the updated CanMEDS Competence by Design conceptual framework.
- Investigate the utility of the proposed radar chart with appropriate scales as an educational tool to monitor trainees' progress.
- Investigate FnFP of a specific cohort of graduates by means of self-assessment and senior assessment, and evaluate nuances in results rather than binary nature of results.
- Investigate reasons for graduate deficits and ways in which deficits may be minimised, for example, extension of training time, addition of extra modules to cover aspects of practice omitted by the existing curriculum.
- Investigate FnFP of teachers, examiners, assessment processes and tools in the current anaesthesiology community in SA.
- Longitudinal studies of FnFP spanning longer time intervals. Suggestions would be assessment of graduates at time of graduation, at five years and ten years post-graduation, to assess the impact of time and experience on FnFP and to elicit which competences anaesthesiologists attain only after graduation or which deficits are noted whilst practising in the role of specialist.
- Interrogate the impact of screening of anaesthesiology training programme applicants for emotional intelligence with respect to NTS prowess and FnFP.

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Appendices

Appendix 1: The Study Protocol

FITNESS FOR PURPOSE OF SOUTH AFRICAN ANAESTHESIOLOGISTS

PhD(Anaesthetics)

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EXECUTIVE SUMMARY

The purpose of this descriptive qualitative study is to develop and define the concept of fitness for purpose in specialist anaesthesiologists and then ascertain whether South African graduate anaesthesiologists are indeed fit for purpose. This will be determined using criteria deemed applicable for South African anaesthesiology. The research will progress from providing a background to the concept of fitness for purpose to the development of a definition and a comprehensive list of component competencies as deemed applicable to the South Africa anaesthesiology context by local experts. Thereafter the research will interrogate local graduate self-assessment and opinions of national teachers and assessors with respect to perceptions of graduate fitness for purpose.

Anaesthesiologists are expected to function independently in their roles as specialists after they have completed their prescribed training period and have succeeded in the respective examination processes. However, several have experienced difficulties with the transition from trainee to consultant and this may have adverse effects on the individual, the patient, colleagues, other trainees or the workplace. Affected graduates are at risk for developing job dissatisfaction, job stress with eventual burnout or substance abuse. To avoid adverse effects associated with the transitioning period between trainee and consultant, it is necessary to ensure that graduating trainees are well prepared to embrace the clinical and non-clinical aspects of their roles as specialists. It is therefore imperative that graduating specialists are fit for purpose, and do not lack the knowledge, skill, attitudes and behaviours to embrace all the expectations that they face post-graduation.

Medical specialists, in general, are expected to be competent in various medical / clinical roles as well as in various non-technical / non-medical roles. Some suggested competencies include medical expertise, scholarship, communication, collaboration, management, professionalism, leadership and health advocacy. Attempts have been made to address the required multifaceted role of the graduating specialist and there

has been an increasing focus to train specialists who are competent in the various roles of a consultant. Several studies evaluating the appropriate training and skills acquisition for trainees in various disciplines have shown that some graduates feel better prepared for some of their roles (medical) and less prepared for other roles (non-medical). In the discipline of anaesthesiology, there is a paucity of evidence in the literature with respect to fitness for purpose. A few aspects of the roles of the specialist have been addressed but there has been no assessment of whether anaesthesiologists are fit for purpose internationally or in the South African context.

Component studies

Study 1: Fitness for purpose in anaesthesiology - a review.

This study will offer an objective review of the concept of fitness for purpose. This concept will be introduced in various other vocations to assess what fitness for purpose means and how it may be defined. Thereafter, fitness for purpose in medicine and in particular, anaesthesiology, will be reviewed in an attempt to define and describe it in the context of anaesthesiology. The purpose of this review will be to list and categorise what, according to existing literature, are the currently accepted clinical and non-clinical competencies that a specialist anaesthesiologist is expected to possess, having completed their time as a trainee, to ensure a smooth transition to the role as a specialist.

Study 2: Defining fitness for purpose in South African anaesthesiologists using a Delphi technique to assess the CanMEDS framework.

This study will evaluate whether anaesthesiologists' currently accepted competencies as determined by the result of the review (study 1) can be improved or modified to better define fitness for purpose in the context of South African anaesthesiologists who may require competencies that are unique to practice within the local context, both in

the public and private sectors. A panel of local experts will determine, by means of a 3-stage Delphi technique, what core competencies would be required as a minimum to ensure that all graduating anaesthesiologists in South Africa are fit for purpose. This list of core competencies will be used to assess fitness for purpose of local graduates in the subsequent two studies.

Study 3: Are South African anaesthesiologists fit for purpose? A comparison of opinions of graduates, teachers and examiners.

In ascertaining whether anaesthesiology graduates are fit for purpose, it is essential to assess the opinions of senior colleagues intimately involved in the teaching and assessment of trainees. This study will explore the perceptions of those involved in teaching and training of senior trainees of all national anaesthesiology departments according to criteria deemed applicable by the Delphi process. The study will also interrogate the opinions of assessors from the anaesthesiology examining body (College of Anaesthetists of South Africa).

Study 4: Do South African anaesthesiology graduates consider themselves fit for purpose? A longitudinal study.

After studies 1 and 2, there will be a clearer understanding of what fitness for purpose is and how it is defined in the South African anaesthesiology context. Study 4 will investigate whether time and experience affects anaesthesiologists' opinions of fitness for purpose by exploring opinions of graduates at two separate intervals. The first period of self-reflection and self-assessment will occur immediately post-graduation, assuming graduates have no experience as a qualified consultant. Graduates' self-assessments will be based on criteria obtained from the Delphi process of study 2. The second assessment will take place on the same graduates 12 months later after a period of specialist experience. The biphasic perceptions of the graduates will be compared to establish whether perceptions of fitness for purpose differ at different intervals times and are

related to training or to training and post-licensure experience. This will provide valuable insights into the current training programmes and whether they are producing specialists who are fit for purpose.

The overall research will contribute to our understanding of the concept of fitness for purpose and will assist curriculum developers, teachers/trainers and assessors in ensuring that their graduates complete their training with the appropriate skills to fulfil all the roles required of them as a specialist. It will also benefit trainees by clarifying what is expected of them and will assist in their preparation and confidence in their abilities to perform as specialists. This will be advantageous to clinician and patient well-being.

THE PROTOCOL

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1. DEFINING THE RESEARCH PROBLEM

Currently, teaching has shifted from a time-based, apprenticeship-type model to a competency-based model. Despite the latter model being advantageous in several areas of training, there are disadvantages with competency frameworks. They assume that meta-competences or specialist roles can and will be performed successfully by the trainee if trainees are successful in achieving the components of a meta-competence. This however, is not always the case since complex meta-competences cannot universally be reduced to concise sub-competencies that can be attained and assessed easily. It is therefore problematic to assume that a trainee who achieves the component competency milestones will achieve the meta-competence of a particular specialist role. Studies on preparedness for practice have revealed that there is a perception by graduates (and their colleagues) of their perceived lack of preparedness for practice despite being deemed competent by their licensing authorities. This discrepancy in perceptions may be associated with a multitude of adverse effects and can contribute to reduced clinician well-being and poor patient outcomes. Fitness for purpose however assumes that trainees will have been trained beyond the scope of competence into experts without any deficiencies and aims to provide the benchmark against which all graduates should be measured.

Fitness for purpose has not been evaluated in the anaesthesiology context despite evidence confirming ongoing deficiencies in graduates. It is thus essential to investigate the concept of fitness for purpose and to define and explore it in the South African anaesthesiology context. The research aims to determine whether South African anaesthesiologists are fit for purpose as specialists in their field.

2. LITERATURE OVERVIEW AND MOTIVATION

Training in anaesthesia is a dynamic process. If anaesthesiologists are expected to fulfil the requirements placed on them by their patients, their colleagues and their employers in an ever-changing world, then their training and their practice has to evolve concurrently with the demands for contemporary excellence in their field. It is clear that current anaesthesiologists work in an environment under different pressures and constraints compared to their colleagues from the previous century. The out-dated teaching method of an “apprenticeship” for trainees is no longer acceptable as a means of training fully competent specialists.¹ In order for anaesthesiologists of the 21st century to remain contemporary in their roles as specialists, they need to strive for excellence.² Studies have shown that better anaesthetists have better patient outcomes.³ For the field of anaesthesiology to evolve into a practice of holistic and excellent perioperative care, all anaesthesiologists need to be competent in the medical and non-medical roles expected of them whilst concurrently balancing these expectations on their professional lives with those in their personal lives. Any imbalance may result in adverse effects on the individual, the patients or in the workplace. It is difficult to manage specialists’ personal stressors in the workplace; however, every effort should be made to ensure that specialist anaesthetists are competent in all their professional roles to minimise or to avoid adverse events.

Opinions vary in determining what constitutes a good doctor. Patients desire their doctors to be adept at both technical and non-technical skills and regard the latter skills highly.⁴⁻⁷ Likewise learners consider humanism in medicine of paramount importance and echo the sentiments of patients in their desires for doctors to be both technically and non-technically astute.⁸⁻¹⁰

Attempts have been made to address the various roles of a specialist to ensure that medical education enhances patient care and outcomes. These roles have been detailed by the Royal College of Physicians and Surgeons of Canada,¹¹ and by the Accreditation Council for Graduate Medical Education (ACGME) in the United States.^{12,13} The former

created the recently–revised Canadian Medical Education Directives for Specialists (CanMEDS) comprising 7 roles deemed necessary for all specialists (Medical Expert, Scholar, Professional, Collaborator, Communicator, Health Advocate and Leader).¹⁴ Likewise, the ACGME proposes 6 core competencies necessary for medical specialists (Medical Knowledge, Patient Care, Practice-based Learning and Improvement, Professionalism, Interpersonal and Communication skills and Systems-based Practice).^{12,13} In the field of anaesthesiology, there is a lack of evidence as to what would constitute a specialist who is fully prepared for practice. Considering the current use of competency frameworks such as CanMEDS, one needs to evaluate whether competency equates to fitness for purpose and consider if the current means of assessing trainees via examination processes reliably indicate competency.

There are several disadvantages with the use of competency frameworks, the most significant of which is difficulty in reaching a consensus definition.¹⁵ There is a clear distinction between competence, expertise and excellence, and although often used interchangeably (incorrectly), a hierarchy exists in the attainment of knowledge and the creation of an eventual specialist.¹⁶⁻¹⁸ Understanding the distinct features of each and acknowledging their specific positions in the hierarchy assist in formulating a clearer understanding of fitness for purpose and why it is necessary. Various shortcomings with current examination processes have been highlighted¹⁹ and attempts are being made to optimise the examination process to better assess competency.²⁰ In South African anaesthesiology training, the CanMEDS competency framework forms the basis of the curriculum for teaching and for assessment; however this generic specialist training framework has not been specifically validated for anaesthesiology or for the South African context. Anaesthesiology has been considered as a unique speciality that may require roles specific to the anaesthesiologist. It is thus crucial that the CanMEDS competency framework be validated and modified, if necessary, for contextual use.

It is well established that the assessment of undergraduates assists in driving the process of knowledge acquisition²¹ and this applies to postgraduates as well. Training programmes and the assessment process therefore need to address not only knowledge

and skill but also readiness for all the roles required by a specialist.^{22,23} With the focus on training specialists who are fully competent in all roles of a specialist, there has been a shift to include the lesser-trained non-technical skills in programmes and assessments.^{24,25} Several components of the non-technical skills set have been addressed in anaesthesiology²⁶⁻²⁸ as well as in theatre staff,²⁹ however there are several that remain unexamined by the literature.

Graduating as a specialist without any deficits in technical or non-technical skills, and therefore being considered fit for purpose, remains the goal for which every graduate should strive. Undergraduates have been assessed in this regard in an attempt to better address deficits in their teaching and training.³⁰⁻³² Likewise, several studies have addressed postgraduates in an attempt to assess readiness for practice in various specialities,³³⁻³⁵ specifically in the fields of psychiatry³⁶ and paediatrics.^{37,38} Whilst most graduates feel competent with their technical skills, many feel inadequately prepared for the non-medical aspects of their roles as specialists. This may result in a variety of adverse effects and a tumultuous transition from registrar/trainee to specialist.^{39,40}

Since fitness for purpose has not been assessed in anaesthesiology, there is an opportunity to address this concept in this context internationally as well as locally. This will assist trainers, assessors and curriculum developers in their continual efforts to produce anaesthesiologists who are fully prepared for practice as specialists. The study will clarify the definition of fitness for purpose in the South African anaesthesiology context and will address the unanswered research question of whether South African anaesthesiology graduates are perceived to be fit for purpose.

After the completion of study 1, there will be a clearer understanding of what is meant by fitness for purpose in anaesthesiology and how it is positioned in the hierarchy of specialist training. At the end of study 2, evidence of what South African anaesthesiology experts consider mandatory core competencies that any graduating local anaesthesiologist should possess in order to be considered fit for purpose will be

provided. This will allow the creation of a comprehensive list of competencies against which graduates can be assessed. At the conclusion of studies 3 and 4, there will be a clearer understanding of whether local graduates are considered fit for purpose according to the criteria deemed appropriate by experts in the field. The possible discrepancies between the expected and actual competencies attained by graduates will be explored.

Fitness for purpose has not yet been described in the context of anaesthesiology. The educational concepts of competence, expertise and excellence have been explored in the discipline but their relationship to fitness for purpose has not been investigated. Defining fitness for purpose, training students to become fit for purpose and assessing them either formatively or summatively as fit for purpose will enable graduates to commence their careers as experts who have no deficiencies and will thus be less likely to experience the adverse effects associated with perceptions of unpreparedness. This new concept in anaesthesiology will contribute to the field of medical education in anaesthesiology in order to positively impact physician and patient well-being both locally and internationally.

3. AIM AND OBJECTIVES

AIM:

To explore whether current South African anaesthesiology graduates are considered fit for purpose This research aims to provide new knowledge of this concept in the context of anaesthesiology both locally and internationally.

OBJECTIVES:

To review and define the concept of fitness for purpose in general.

To determine whether the general concepts of fitness for purpose are relevant to the South African anaesthesiology context.

To determine whether senior anaesthesiology colleagues consider graduates fit for purpose.

To determine whether local graduates consider themselves fit for purpose.

4. METHODS

OVERVIEW

The research will be conducted as four separate projects, one each focusing on specific elements listed under objectives.

Study 1: This will be achieved by performing a literature review of the concept of fitness for practice in general and then specifically in medicine and in anaesthesiology.

4.1. STUDY DESIGN

Qualitative, Interpretivist

4.2. SETTING

Literature review

4.3. PARTICIPANT SELECTION

Not applicable (literature review)

4.4. MEASUREMENTS

Literature review

4.5. DATA SELECTION AND STATISTICAL ANALYSIS

Searches in: Academic search complete, Education Source, ERIC (Education resource Information center), Health Source: Nursing/Academic edition, Medline, PsychArticles and Social Sciences using the search terms: fitness OR fit for purpose AND an(a)esthesiology, fitness for practice AND an(a)esthesiology, fitness for purpose And specialists, fitness for purpose AND consultants, fitness for purpose AND competence, role of an(a)esthesiologists, characteristics of an(a)esthesiologists, purpose of an(a)esthesiologists, Quality of an(a)esthesiologists, Prepared(ness) for practice AND an(a)esthesiology, fitness for practice AND an(a)esthesiology. Several searches through references in articles already identified.

4.5.1. SAMPLE SIZE

Not applicable. Literature review

Study 2: This will be achieved by means of formulating an initial list of core competencies as suggested by currently-accepted determinants, and then assessing applicability of such, with adjustments or amendments for the local South African anaesthesiology context as deemed appropriate by local experts. This will be addressed by means of a Delphi technique comprising a questionnaire sent to a panel of experts.

4.1. STUDY DESIGN

Qualitative, Interpretivist

4.2. SETTING

Electronic Delphi process

4.3. PARTICIPANT SELECTION

Experts for Delphi process will consist of experts from both the public sector (Heads of academic departments of Anaesthesiology) as well as the private sector. (Anaesthesiologists with affiliation to or nominated by an academic department of anaesthesiology)

4.4. MEASUREMENTS

This study will be measuring the opinions of national experts of fitness for purpose in South African anaesthesiology to formulate a definition and a list of core competencies that local specialist anaesthesiologists are expected to possess on graduation that will render them fit for purpose as a specialist. The means with which this will be achieved will be a 3-step electronic Delphi process.

4.5. DATA SELECTION AND STATISTICAL ANALYSIS

Email contact with 16 anaesthesiology experts through three electronic rounds. Results from the Delphi rounds 1 and 2 and possibly 3 will be recorded as a score for each item according to a 4-point Likert scale. Items that require scoring will be reflected as competencies and meta-competencies pertinent to anaesthesiology.

Scoring of each competency: 4-point Likert scale

- 1- *not important at all*
- 2- *somewhat important*
- 3- *very important*
- 4- *absolutely essential*

Significance of each score will be considered by investigators as follows:

Score of 1 or 2 - *not important*

Score of 3 or 4 – *important*

Items deemed not important will be excluded and those deemed important will be retained in the final list of competency items. This list will be used in the subsequent two studies.

Consensus for each item scored will be deemed to be reached if 9 or more of the 16 participants (56%) deem each item to be of no importance (scores of 1 or 2) or important (scores 3 or 4). In the final Delphi round, only items deemed important via consensus from the 2 preceding rounds will be assessed. The 7 CanMEDS meta-competencies will be rated and weighted and recorded as median values with interquartile ranges.

4.5.1. SAMPLE SIZE (Delphi Technique)

-public sector anaesthesiology experts: Heads of department of anaesthesiology from all departments at all South African medical schools (8 participants)

-private sector: 1 practitioner affiliated to each university department of anaesthesiology (8 participants)

Study 3: This will be addressed by a single assessment of senior opinions of graduates according to the list of criteria deemed applicable by experts.

4.1. STUDY DESIGN

Qualitative, Interpretivist

4.2. SETTING

Single electronic survey. Research will not be conducted in a hospital and will take place from UKZN.

4.3. PARTICIPANT SELECTION

All national FCA II trainers in each of the 8 departments of anaesthesiology and all official FCA II CMSA examiners. Teachers and examiners who were part of the expert panel in study 2 will be excluded from the study 4 sample.

4.4. MEASUREMENTS

This study will be measuring the opinions of senior colleagues (teachers, trainers and assessors) of anaesthesiology graduates' fitness for purpose according to the experts' list of criteria. This will be achieved by means of a single electronic questionnaire.

4.5. DATA SELECTION AND STATISTICAL ANALYSIS

Email contact with FCA anaesthesiology trainers from all 8 national academic anaesthesiology departments and national FCA II CMSA examiners. Participants will be included into an electronic survey and asked to provide scores that reflect their opinion of graduate preparedness to be able to perform core competencies on the list created by the experts at the conclusion of round 2. This will be assessed by means of a 4-point Likert scale.

Scoring of each competency: 4-point Likert scale

1-Completely unprepared (With no related knowledge, training or experience)

2-Somewhat prepared (With related knowledge but without training and experience)

3-Prepared (With related knowledge & training and with some experience)

4-Completely prepared (With related knowledge, training and considerable experience)

Significance of each score will be considered by investigators as follows:

Score of 1 or 2 - not prepared for relevant competency

Score of 3 or 4 – prepared for relevant competency

For normally distributed data, variables will be represented by means and standard deviations. Data analysis will be performed by parametric tests (t-test). For non-normally distributed data, variables will be represented by median scores with interquartile ranges. Data analysis will be performed by means of non-parametric tests (Wilcoxon rank sum test; Mann Whitney U test)

4.5.1. SAMPLE SIZE

(electronic survey) -training/academic centre trainers of all 8 national academic/training institutions and FCA II examiners registered with CMSA

-approximately 60 participants in total (participants in study 2 will be excluded from this study sample)

Study 4: This will be assessed at the time of graduation and then at 12 months after a period of experience as a consultant. This will involve self-reflection and self-assessment at the time of graduation and then after a period of specialist experience. Twelve months was chosen to allow graduates a period of time to adjust to their new role as a specialist and to achieve the objective of a longitudinal assessment of the same group of graduates with the least impact on the study duration.

4.1. STUDY DESIGN

Qualitative, Interpretivist

4.2. SETTING

Longitudinal study at 2 separate intervals 12 months apart by means of an electronic survey.

4.3. PARTICIPANT SELECTION

All successful FCA(SA) graduates from semester 1 of 2019 CMSA examination will be evaluated and followed up after 12 months.

4.4. MEASUREMENTS

This study will be measuring the opinions of recent graduates of their perceived fitness for purpose according to the experts' list of criteria. This will be achieved via a bi-phasic self-assessment by means of an electronic questionnaire at the time of graduation and at 12 months thereafter.

4.5. DATA SELECTION AND STATISTICAL ANALYSIS

Email contact with FCA anaesthesiology graduates from semester 1 of 2019 as provided, with consent, from College of Anaesthetists of South Africa. Participants will be included into an electronic survey and asked to provide scores that reflect preparedness for competencies deemed essential by the experts at the conclusion of round 2. This will be repeated after a 12 month interval. Items will be scored with a 4-point Likert scale reflecting participant preparedness for each competency.

Scoring of each competency: 4-point Likert scale

1-Completely unprepared (With no related knowledge, training or experience)

2-Somewhat prepared (With related knowledge but without training and experience)

3-Prepared (With related knowledge & training and with some experience)

4-Completely prepared (With related knowledge, training and considerable experience)

Significance of each score will be considered by investigators as follows:

Score of 1 or 2 - *not prepared for relevant competency*

Score of 3 or 4 – *prepared for relevant competency*

For normally distributed data, variables will be represented by means and standard deviations. Data analysis will be performed by parametric tests (t-test). For non-normally distributed data, variables will be represented by median scores with interquartile ranges. Data analysis will be performed by means of non-parametric tests (Wilcoxon rank sum test; Mann Whitney U test)

4.5.1. SAMPLE SIZE (electronic survey)

- national graduates who obtain their FCA degree awarded by CMSA in May 2019.
- approximately 30-40 participants

5. ETHICAL CONSIDERATIONS

Study 1: Not applicable

Study 2/3/4: these are qualitative studies without any patient involvement or interventions. Informed electronic consent will be obtained from all participants prior to enrolment in the studies. Participants will remain anonymous to all except principal investigator.

6. BUDGET (including Funding obtained)

Funding will be applied for from the South African Society of Anaesthesiologists (SASA) as per budget below. Should this application be unsuccessful, funding will be provided by the Discipline of Anaesthesiology & Critical Care at UKZN.

ITEMS	ITEM VALUE	TOTAL VALUE
Survey Monkey subscription x 3 studies	R499.99/month x10 months	R5000.00
Research assistant - required for 3 studies (computer literate; matric qualification; experience) for following tasks: -create all survey monkey rounds -contact all participants and confirm contact details -collect data from respondents -export data to excel -feedback to respondents	R100.00/hr x 85 hours	R8500.00
Translation of all research documents and thesis	R50.00/hr x20hrs	R1000.00
Printing and binding	R500/copy x3	R1500.00
TOTAL		R 16000.00

7. TIME LINES AND PROJECT MANAGEMENT

EVENT	TIMELINE
Initial literature review	June 2016
UKZN registration	January 2017
Protocol & questionnaire finalisation	January 2017
BREC & postgrad application	February 2017
Literature review commencement	June 2017
Emailing participants for Delphi	November 2017
Completion & write-up of literature review	November 2017-June 2018
Delphi Round 1 completion	January 2018
Delphi Round 2 completion	January 2018
Delphi Round 3 completion	January 2018
Completion & submission study 1 for publication	June 2018
Completion & write up of study 2	September 2018
Submission of study 2 for publication	September 2018
Study 1 published	15 October 2018
Application for upgrade of MMedSci to PhD	October 2018
PhD proposal and application: UKZN & BREC	November 2018
UKZN PhD registration	January 2019
Study 3 & 4 commencement	February 2019
Study 3 completion	April 2019
Study 3 write up & completion	June 2019
Study 3 submission	July 2019
Study 4 completion	May 2020
Study 4 submission	June 2020
Submission of PhD for marking	September 2020

Project Management:

Study 1 – literature review

Study 2 – principal investigator will perform the following functions:

Formulate the questionnaire with participant consent

Contact all prospective participants

Inform participants of the intentions of the study

Manage the 3 Delphi rounds.

Collate all responses

Ensure anonymity of all responses

Study 3 - principal investigator will perform the following functions:

Contact all prospective participants

Inform participants of the intentions of the study

Obtain consent to participate

Manage the electronic survey process

Collate all responses

Ensure anonymity of all responses to other investigators

Study 4 - principal investigator will perform the following functions:

Contact all prospective participants

Inform participants of the intentions of the study

Obtain consent to participate

Manage the electronic survey process at 2 separate intervals

Collate all responses

Ensure anonymity of all responses to other investigators

Dissertation: investigators will collate results of all 4 studies and provide the PhD dissertation.

Central coordination as follows:

Study 1: Not applicable

Study 2/3/4: this will be co-ordinated by the principal investigator

8. CONTRIBUTORS AND AUTHORSHIP

Name	Department	Contribution	Author or acknowledgement
Dr Nicola Ann Kalafatis	Anaesthesiology & Critical Care	Principal investigator	Author
Professor Thomas Edward Sommerville	Anaesthesiology & Critical Care	Supervisor	Author
Dr Pragasan Dean Gopalan	Anaesthesiology & Critical Care	Co-supervisor	Author

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Appendix 2: Ethical approvals



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21 May 2019

Dr NA Kalafatis (202522821)
Discipline of Anaesthesiology and Critical Care
School of Clinical Medicine
nickvkalafatis@gmail.com

Dear Dr Kalafatis

Protocol: Fitness for purpose of South African Anaesthesiologists.

Study 1: Fitness for Purpose in Anaesthesiology - a review.

Study 2: Defining fitness for purpose in South African anaesthesiologists using a Delphi technique to assess the CanMEDS framework” (Amended Title)

Study 3: Do South African anaesthesiology graduates consider themselves fit for purpose? A longitudinal study.

Study 4: Are South Africans anaesthesiologists fit for purpose according to their teachers and assessors?

Degree: MMedSc upgrade to PHD
BREC reference number: BE199/17

We wish to advise you that your response received on 20 May 2019 to BREC letter dated 08 April 2019 has been noted by a sub-committee of the Biomedical Research Ethics Committee.

Your application for amendments received on 06 February 2019 to upgrade the above study to a PhD with 2 additional sub studies has now been approved by a sub-committee of the Biomedical Research Ethics Committee

The committee will be notified of the above at the next meeting to be held on 11 June 2019.

Yours sincerely

Prof V Rambiritch
Chair: Biomedical Research Ethics Committee

cc supervisor: Sommer@ukzn.ac.za cc Postgraduate Administrator

Appendix 3: Data collection tools

Questionnaire for Paper 2

In the contexts of both anaesthesiology and of South Africa, you are asked to please consider which of the following competencies you would deem as core for **all** anaesthesiologists to possess. These should be considered essential for a practitioner who is employed in state practice in a district, regional or tertiary/quaternary level hospital or who may enter the private sector as an independent specialist in South Africa. Please use the accompanying 4-point Likert scale next to each competency to express your opinion of its importance. **A score of 1 or 2 will be considered as unimportant and a score of 3 or 4 will be considered as important.**

Likert Scale (L/S)

1-Not important at all

2-Somewhat important

3-Very Important

4-Absolutely essential

Each of the 7 CanMEDS roles (A-G) are divided into **Key competencies** and **Enabling competencies** which explain the key competencies. Please score **both** types of competencies.

A. MEDICAL EXPERT

Key Competency :

1. Practise medicine within their defined scope of practice and expertise

Enabling competencies:

- 1.1 Demonstrate a commitment to high-quality care of their patients
- 1.2 Integrate the CanMEDS Intrinsic Roles into their practice of medicine
- 1.3 Apply knowledge of the clinical and biomedical sciences relevant to their discipline
- 1.4 Perform appropriately timed clinical assessments with recommendations that are presented in an organized manner
- 1.5 Carry out professional duties in the face of multiple, competing demands
- 1.6 Recognise and respond to the complexity, uncertainty, and ambiguity inherent in medical practice

Key Competency:

2. Perform a patient-centred clinical assessment and establish a management plan

Enabling competencies:

- 2.1 Prioritise issues to be addressed in a patient encounter
- 2.2 Elicit a history, perform a physical exam, select appropriate investigations, and interpret their results for the purpose of diagnosis and management, disease prevention, and health promotion
- 2.3 Establish goals of care in collaboration with patients and their families, which may include slowing disease progression, treating symptoms, achieving cure, improving function, and palliation
- 2.4 Establish a patient-centred management plan

Key Competency :

3. Plan and perform procedures and therapies for the purpose of assessment and/or management

Enabling competencies:

3.1 Determine the most appropriate procedures or therapies

3.2 Obtain and document informed consent, explaining the risks and benefits of, and the rationale for, a proposed procedure or therapy

3.3 Prioritise a procedure or therapy, taking into account clinical urgency and available resources

3.4 Perform a procedure in a skilful and safe manner, adapting to unanticipated findings or changing clinical circumstances

Key Competency :

4. Establish plans for ongoing care and, when appropriate, timely consultation

Enabling competencies:

4.1 Implement a patient-centred care plan that supports ongoing care, follow-up on investigations, response to treatment, and further consultation

Key Competency :

5. Actively contribute, as an individual and as a member of a team providing care, to the continuous improvement of healthcare quality and patient safety

Enabling competencies:

5.1 Recognise and respond to harm from health care delivery, including patient safety incidents

5.2 Adopt strategies that promote patient safety and address human and system factors

Are there any other competencies related to “MEDICAL EXPERT” that have not been mentioned and you think should be added?

FREE TEXT

B. COMMUNICATOR

Key Competency :

1. Establish professional therapeutic relationships with patients and their families

Enabling competencies:

1.1 Communicate using a patient-centred approach that encourages patient trust and autonomy and is characterised by empathy, respect, and compassion

1.2 Optimise the physical environment for patient comfort, dignity, privacy, engagement, and safety

1.3 Recognise when the values, biases, or perspectives of patients, physicians, or other health care professionals may have an impact on the quality of care, and modify the approach to the patient accordingly

1.4 Respond to a patient’s non-verbal behaviours to enhance communication

1.5 Manage disagreements and emotionally charged conversations

1.6 Adapt to the unique needs and preferences of each patient and to his or her clinical condition and circumstances

Key Competency :

2. Elicit and synthesise accurate and relevant information, incorporating the perspectives of patients and their families

Enabling competencies:

2.1 Use patient-centred interviewing skills to effectively gather relevant biomedical and psychosocial information

2.2 Provide a clear structure for and manage the flow of an entire patient encounter

2.3 Seek and synthesise relevant information from other sources, including the patient's family, with the patient's consent

Key Competency :

3. Share health care information and plans with patients and their families

Enabling competencies:

3.1 Share information and explanations that are clear, accurate, and timely, while checking for patient and family understanding

3.2 Disclose harmful patient safety incidents to patients and their families accurately and appropriately

Key Competency :

4. Engage patients and their families in developing plans that reflect the patient's health care needs and goals

Enabling competencies:

4.1 Facilitate discussions with patients and their families in a way that is respectful, non-judgmental, and culturally safe

4.2 Assist patients and their families to identify, access, and make use of information and communication technologies to support their care and manage their health

4.3 Use communication skills and strategies that help patients and their families make informed decisions regarding their health.

Key Competency :

5. Document and share written and electronic information about the medical encounter to optimise clinical decision-making, patient safety, confidentiality, and privacy

Enabling competencies:

5.1 Document clinical encounters in an accurate, complete, timely, and accessible manner, in compliance with regulatory and legal requirements

5.2 Communicate effectively using a written health record, electronic medical record, or other digital technology

5.3 Share information with patients and others in a manner that respects patient privacy and confidentiality and enhances understanding

Are there any other competencies related to “COMMUNICATOR” that have not been mentioned and you think should be added?

FREE TEXT

C. COLLABORATOR

Key Competency :

1. Work effectively with physicians and other colleagues in the healthcare professions

Enabling competencies:

1.1 Establish and maintain positive relationships with physicians and other colleagues in the health care professions to support relationship-centred collaborative care

1.2 Negotiate overlapping and shared responsibilities with physicians and other colleagues in the health care professions in episodic and ongoing care

1.3 Engage in respectful shared decision-making with physicians and other colleagues in the health care professions

Key Competency :

2. Work with physicians and other colleagues in the health care professions to promote understanding, manage differences, and resolve conflicts

Enabling competencies:

2.1 Show respect toward collaborators

2.2 Implement strategies to promote understanding, manage differences, and resolve conflicts in a manner that supports a collaborative culture

Key Competency :

3. Hand over the care of a patient to another health care professional to facilitate continuity of safe patient care.

Enabling competencies:

3.1 Determine when care should be transferred to another physician or health care professional

3.2 Demonstrate safe handover of care, using both verbal and written communication, during a patient transition to a different health care professional, setting, or stage of care

Are there any other competencies related to “COLLABORATOR” that have not been mentioned and you think should be added?

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D. LEADER

Key Competency :

1. Contribute to the improvement of health care delivery in teams, organisations, and systems

Enabling competencies:

1.1 Apply the science of quality improvement to contribute to improving systems of patient care

1.2 Contribute to a culture that promotes patient safety

1.3 Analyse patient safety incidents to enhance systems of care

1.4 Use health informatics to improve the quality of patient care and optimise patient safety

Key Competency :

2. Engage in the stewardship of health care resources

Enabling competencies:

2.1 Allocate health care resources for optimal patient care

2.2 Apply evidence and management processes to achieve cost-appropriate care

Key Competency :

3. Demonstrate leadership in professional practice

Enabling competencies:

3.1 Demonstrate leadership skills to enhance health care

3.2 Facilitate change in health care to enhance services and outcomes

Key Competency :

4. Manage career planning, finances, and health human resources in a practice

Enabling competencies:

4.1 Set priorities and manage time to integrate practice and personal life

4.2 Manage a career and a practice

4.3 Implement processes to ensure personal practice improvement

Are there any other competencies related to “LEADER” that have not been mentioned and you think should be added?

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E. HEALTH ADVOCATE

Key Competency :

1. Respond to an individual patient's health needs by advocating with the patient within and beyond the clinical environment

Enabling competencies:

1.1 Work with patients to address determinants of health that affect them and their access to needed health services or resources

1.2 Work with patients and their families to increase opportunities to adopt healthy behaviours

1.3 Incorporate disease prevention, health promotion, and health surveillance into interactions with individual patients

Key Competency :

2. Respond to the needs of the communities or populations they serve by advocating with them for system-level change in a socially accountable manner

Enabling competencies:

2.1 Work with a community or population to identify the determinants of health that affect them

2.2 Improve clinical practice by applying a process of continuous quality improvement to disease prevention, health promotion, and health surveillance activities

2.3 Contribute to a process to improve health in the community or population they serve

Are there any other competencies related to “HEALTH ADVOCATE” that have not been mentioned and you think should be added?

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F. SCHOLAR

Key Competency :

1. Engage in the continuous enhancement of their professional activities through ongoing learning.

Enabling competencies:

1.1 Develop, implement, monitor, and revise a personal learning plan to enhance professional practice

1.2 Identify opportunities for learning and improvement by regularly reflecting on and assessing their performance using various internal and external data sources

1.3 Engage in collaborative learning to continuously improve personal practice and contribute to collective improvements in practice.

Key Competency :

2. Teach students, residents, the public, and other health care professionals

Enabling competencies:

2.1 Recognise the influence of role-modelling and the impact of the formal, informal, and hidden curriculum on learners

2.2 Promote a safe learning environment

- 2.3 Ensure patient safety is maintained when learners are involved
- 2.4 Plan and deliver a learning activity
- 2.5 Provide feedback to enhance learning and performance
- 2.6 Assess and evaluate learners, teachers, and programs in an educationally appropriate manner

Key Competency :

3.Integrate best available evidence into practice

Enabling competencies:

- 3.1 Recognise practice uncertainty and knowledge gaps in clinical and other professional encounters and generate focused questions that address them
- 3.2 Identify, select, and navigate pre-appraised resources
- 3.3 Critically evaluate the integrity, reliability, and applicability of health-related research and literature
- 3.4 Integrate evidence into decision-making in their practice

Key Competency :

4.Contribute to the creation and dissemination of knowledge and practices applicable to health

Enabling competencies:

- 4.1 Demonstrate an understanding of the scientific principles of research and scholarly inquiry and the role of research evidence in health care

4.2 Identify ethical principles for research and incorporate them into obtaining informed consent, considering potential harms and benefits, and considering vulnerable populations

4.3 Contribute to the work of a research program

4.4 Pose questions amenable to scholarly inquiry and select appropriate methods to address them

4.5 Summarise and communicate to professional and lay audiences, including patients and their families, the findings of relevant research and scholarly inquiry

Are there any other competencies related to “SCHOLAR” that have not been mentioned and you think should be added?

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G. PROFESSIONAL

Key Competency :

1. Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards

Enabling competencies:

1.1 Exhibit appropriate professional behaviours and relationships in all aspects of practice, demonstrating honesty, integrity, humility, commitment, compassion, respect, altruism, respect for diversity, and maintenance of confidentiality

1.2 Demonstrate a commitment to excellence in all aspects of practice

1.3 Recognise and respond to ethical issues encountered in practice

1.4 Recognise and manage conflicts of interest

1.5 Exhibit professional behaviours in the use of technology-enabled communication

Key Competency :

2. Demonstrate a commitment to society by recognising and responding to societal expectations in health care

Enabling competencies:

2.1 Demonstrate accountability to patients, society, and the profession by responding to societal expectations of physicians

2.2 Demonstrate a commitment to patient safety and quality improvement.

Key Competency :

3. Demonstrate a commitment to the profession by adhering to standards and participating in physician-led regulation

Enabling competencies:

3.1 Fulfill and adhere to the professional and ethical codes, standards of practice, and laws governing practice

3.2 Recognise and respond to unprofessional and unethical behaviours in physicians and other colleagues in the health care professions

3.3 Participate in peer assessment and standard-setting

Key Competency :

4. Demonstrate a commitment to physician health and well-being to foster optimal patient care

Enabling competencies:

4.1 Exhibit self-awareness and manage influences on personal well-being and professional performance

4.2 Manage personal and professional demands for a sustainable practice throughout the physician life cycle

4.3 Promote a culture that recognises, supports, and responds effectively to colleagues in need

Are there any other competencies related to “PROFESSIONAL” that have not been mentioned and you think should be added?

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Are there any other competencies that you consider important for a specialist anaesthesiologist in South Africa to have that have NOT been listed by CanMEDS? If so, please list them in the space below.

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Appendix 4: Plagiarism Check report

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