Southern African Journal of Anaesthesia and Analgesia. 2020;26(6):272-278
https://doi.org/10.36303/SAJAA.2020.26.6.2397

South Afr J Anaesth Analg
ISSN 2220-1181 EISSN 2220-1173

REVIEW

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

N Kalafatis, T Sommerville, PD Gopalan

Department of Anaesthesiology and Critical Care, Nelson R Mandela School of Medicine, University of KwaZulu-Natal, South Africa
Corresponding author, email: *nickykalafatis@gmail.com*

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 unpreparedness[1-7] 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 population[24] (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-

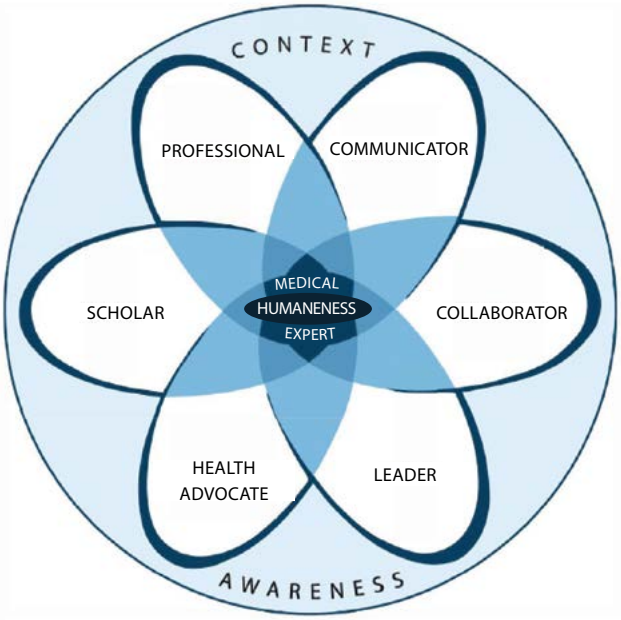

Figure 1: Modified CanMEDS for South African anaesthesiology according to Kalafatis, Sommerville and Gopalan 2019[28]

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 CanMEDS[29] 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 study[28] 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 study[28] 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

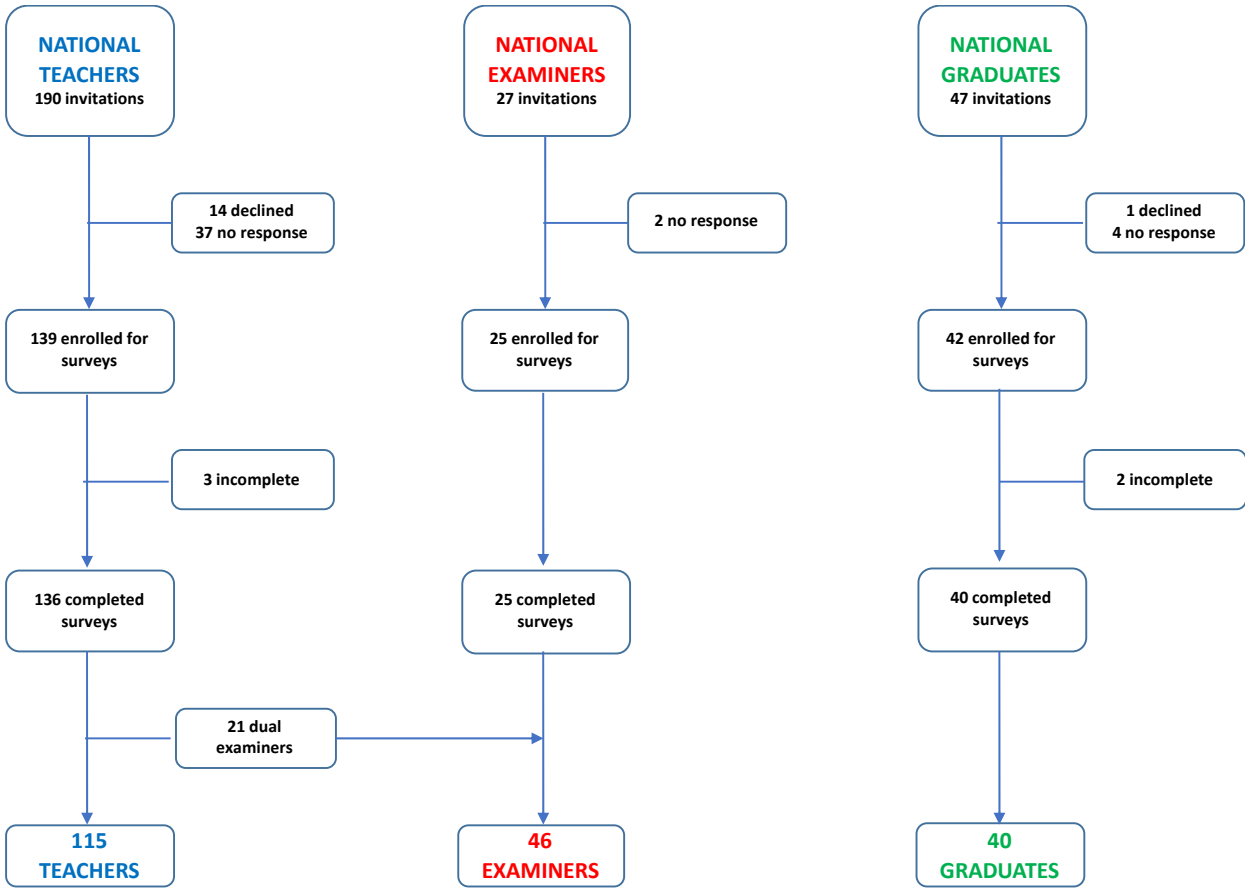

Figure 2: Process of participant inclusion into three groups

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 *n*	Unprepared *n* (%)	Prepared *n* (%)	*p*-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 specialists[34] 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 underemphasised 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 graduate 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.

Acknowledgement

The authors would like to thank Professor Reitze Rodseth for his assistance.

Conflict of interest

The authors report no conflicts of interest.

Funding source

The corresponding author was awarded the Jan Pretorius Research Grant from the South African Society of Anaesthesiologists.

Ethical approval

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

ORCID

N Kalafatis https://orcid.org/0000-0002-1675-1963
T Sommerville https://orcid.org/0000-0003-4556-8962
PD Gopalan https://orcid.org/0000-0002-3816-1171

References

1. Goldacre MJ, Taylor K, Lambert TW. Views of junior doctors about whether their medical school prepared them well for work: questionnaire surveys. BMC Med Educ. 2010;10:78. https://doi.org/10.1186/1472-6920-10-78.
2. Morrow G, Johnson N, Burford B, et al. Preparedness for practice: the perceptions of medical graduates and clinical teams. Med Teach. 2012;34(2):123-35. https://doi.org/10.3109/0142159X.2012.643260.
3. Ochsmann EB, Zier U, Drexler H, Schmid K. Well prepared for work? Junior doctors' self-assessment after medical education. BMC Med Educ. 2011;11:99. https://doi.org/10.1186/1472-6920-11-99.

4. Tallentire VR, Smith SE, Wylde K, Cameron HS. Are medical graduates ready to face the challenges of Foundation training? Postgrad Med J. 2011;87(1031):590-5. https://doi.org/10.1136/pgmj.2010.115659.
5. Tallentire VR, Smith SE, Skinner J, Cameron HS. The preparedness of UK graduates in acute care: a systematic literature review. Postgrad Med J. 2012;88(1041):365-71. https://doi.org/10.1136/postgradmedj-2011-130232.
6. Burford B, Whittle V, Vance GHS. The relationship between medical student learning opportunities and preparedness for practice: a questionnaire study. BMC Med Educ. 2014;14:223. https://doi.org/10.1186/1472-6920-14-223.
7. Dudley LD, Young TN, Rohwer AC, et al. Fit for purpose? A review of a medical curriculum and its contribution to strengthening health systems in South Africa. Afr J Health Prof Educ. 2015;7(1):81-5.
8. Evans DE, Roberts CM. Preparation for practice: how can medical schools better prepare PRHOs? Med Teach. 2006;28(6):549-52. https://doi.org/10.1080/01421590600628399.
9. Cameron A, Millar J, Szmidt N, Hanlon K, Cleland J. Can new doctors be prepared for practice? A review. Clin Teach. 2014;11(3):188-92. https://doi.org/10.1111/tct.12127.
10. Van Hamel C, Jenner LE. Prepared for practice? A national survey of UK foundation doctors and their supervisors. Med Teach. 2015;37(2):181-8. https://doi.org/10.3109/0142159X.2014.947929.
11. Amin HJ, Singhal N, Cole G. Validating objectives and training in Canadian paediatrics residency training programmes. Med Teach. 2011;33(3):e131-44. https://doi.org/10.3109/0142159X.2011.542525.
12. Beckett M, Hulbert D, Brown R. The new consultant survey 2005. Emerg Med J. 2006;23(6):461-3. https://doi.org/10.1136/emj.2005.030726.
13. Dijkstra IS, Pols J, Remmelts P, Brand PLP. Preparedness for practice: a systematic cross-specialty evaluation of the alignment between postgraduate medical education and independent practice. Med Teach. 2015;37(2):153-61. https://doi.org/10.3109/0142159X.2014.929646.
14. Higgins R, Gallen D, Whiteman S. Meeting the non-clinical education and training needs of new consultants. Postgrad Med J. 2005;81(958):519-23. https://doi.org/10.1136/pgmj.2004.028902.
15. McKinstry B, Macnicol M, Elliot K, Macpherson S. The transition from learner to provider/teacher: the learning needs of new orthopaedic consultants. BMC Med Educ. 2005;5(1):17. https://doi.org/10.1186/1472-6920-5-17.
16. Morrow G, Burford B, Redfern N, Briel R, Illing J. Does specialty training prepare doctors for senior roles? A questionnaire study of new UK consultants. Postgrad Med J. 2012;88(1044):558-65. https://doi.org/10.1136/postgradmedj-2011-130460.
17. Morrow G, Illing J, Redfern N, Burford B, Kergon C. Are specialist registrars fully prepared for the role of consultant? Clin Teach. 2009;6(2):87-90. https://doi.org/10.1111/j.1743-498X.2009.00272.x.
18. Westerman M, Teunissen PW, Fokkema JP, et al. The transition to hospital consultant and the influence of preparedness, social support, and perception: a structural equation modelling approach. Med Teach. 2013;35(4):320-7. https://doi.org/10.3109/0142159X.2012.735381.
19. Westerman M, Teunissen PW, Jørgensen RL, et al. The transition to hospital consultant: Denmark and the Netherlands compared on preparedness for practice, perceived intensity and contextual factors. Med Teach. 2013;35(6):481-9. https://doi.org/10.3109/0142159X.2013.774332.
20. Kilminster S, Zukas M, Quinton N, Roberts T. Preparedness is not enough: understanding transitions as critically intensive learning periods. Med Educ. 2011;45(10):1006-15. https://doi.org/10.1111/j.1365-2923.2011.04048.x.
21. Egger Halbeis CB, Macario A. Factors affecting supply and demand of anesthesiologists in Western Europe. Curr Opin Anaesthesiol. 2006;19:207-12. https://doi.org/10.1097/01.aco.0000192793.57054.ec.
22. Frambach JM, Manuel BAF, Fumo AMT, Van Der Vleuten CPM, Driessen EW. Students' and junior doctors' preparedness for the reality of practice in sub-Saharan Africa. Med Teach. 2015;37(1):64-73. https://doi.org/10.3109/0142159X.2014.920490.
23. Hynes H, Smith S, Henn P, McAdoo J. Fit for practice: are we there yet? Med Teach. 2012;34(3):253. https://doi.org/10.3109/0142159X.2012.645096.
24. Worldometers. worldometers.info/world-population 2019. Available from: https://www.worldometers.info/world-population/south-africa-population/.
25. Shafer SL. Anesthesiologists make a difference. Anesth Analg. 2015;120(3):497-8. https://doi.org/10.1213/ANE.0000000000000611.
26. Pálsdóttir B, Barry J, Bruno A, et al. Training for impact: the socio-economic impact of a fit for purpose health workforce on communities. Human Resources for Health. 2016;14:49. https://doi.org/10.1186/s12960-016-0143-6.
27. Kalafatis N, Sommerville T, Gopalan PD. Fitness for purpose in anaesthesiology - a review. Southern African Journal of Anaesthesia and Analgesia. 2018;24(6):148-54. https://doi.org/10.1080/22201181.2018.1529857.
28. Kalafatis N, Sommerville T, Gopalan PD. Defining fitness for purpose in South African anaesthesiologists using a Delphi technique to assess the CanMEDS framework. South African Journal of Anaesthesia & Analgesia. 2019;25(2):14-23. https://doi.org/10.36303/SAJAA.2019.25.2.2193.
29. Frank J, Snell L, Sherbino J, editors. The Draft CanMEDS 2015 Physician Competency Framework ¬¬– Series IV. Ottawa: The Royal College of Physicians and Surgeons of Canada; 2014 March.
30. Lieberman L, Hilliard RI. How well do paediatric residency programmes prepare residents for clinical practice and their future careers? Med Educ. 2006;40(6):539-46. https://doi.org/10.1111/j.1365-2929.2006.02479.x.
31. Millán T, De Carvalho K. Satisfaction with ophthalmology residency training from the perspective of recent graduates: a cross-sectional study. BMC Med Educ. 2013;13:75. https://doi.org/10.1186/1472-6920-13-75.
32. Blumenthal D, Gokhale M, Campbell EG, Weissman JS. Preparedness for clinical practice: reports of graduating residents at academic health centres. JAMA. 2001;286(9):1027-34. https://doi.org/10.1001/jama.286.9.1027.
33. Berkenbosch L, Brouns JW, Heyligers I, Busari JO. How Dutch medical residents perceive their competency as manager in the revised postgraduate medical curriculum. Postgrad Med J. 2011;87(1032):680-7. https://doi.org/10.1136/pgmj.2010.110254.
34. Ringsted C, Hansen TL, Davis D, Scherpbier A. Are some of the challenging aspects of the CanMEDS roles valid outside Canada? Med Educ. 2006;40(8):807-15. https://doi.org/10.1111/j.1365-2929.2006.02525.x.
35. Verma S, Flynn L, Seguin R. Faculty's and residents' perceptions of teaching and evaluating the role of health advocate: a study at one Canadian university. Acad Med. 2005;80(1):103-8. https://doi.org/10.1097/00001888-200501000-00024.
36. Sawdon MA, Whitehouse K, Finn GM, McLachlan JC, Murray D. Relating professionalism and conscientiousness to develop an objective, scalar, proxy measure of professionalism in anaesthetic trainees. BMC Med Educ. 2017;17:49. https://doi.org/10.1186/s12909-017-0891-6.
37. CMSA. Fellowship of the College of Anaesthetists of South Africa: FCA(SA) 2014. Available from: https://www.cmsa.co.za/view_exam.aspx?QualificationID=1.
38. Naik VN, Wong AK, Hamstra SJ. Review article: leading the future: guiding two predominant paradigm shifts in medical education through scholarship. Can J Anaesth. 2012;59(2):213-23. https://doi.org/10.1007/s12630-011-9640-1.
39. Gliem JA, Gliem RR. Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. 2003 Midwest Research to Practice Conference in Adult, Continuing, and Community Education; 2003 October 8-10; Columbus, OH: The Ohio State University..

Annexure available online.