

Do South African anaesthesiology graduates consider themselves fit for purpose? A longitudinal study

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

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

Results: The overall response rate was 79%. At graduation, graduates felt prepared for seven of the nine meta-competences (i.e. Medical Expert, Collaborator, Communicator, Professional, Scholar, Context Awareness and Humaneness), and felt unprepared for the Leader and Health Advocate meta-competences. After 12 months, graduates felt prepared for all nine 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 non-technical skills (NTS). The graduates' perceptions at the time of graduation suggest that they are not fully prepared and may, therefore, not yet be fit for purpose as specialists. Graduates' self-assessment longitudinally reflects that their perceptions of being fit for purpose change after a period of time and with specialist experience.

Keywords: fitness for purpose, anaesthesiology, medical education, competences, self-assessment

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 and graduation represents 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 being unprepared for the new role.¹⁻³ This plagues junior doctors transitioning to first-time clinician,⁴⁻¹⁰ as well as postgraduates evolving into specialists.¹¹⁻²⁰ Graduates feel more prepared for technical skills (TS) than non-technical skills (NTS), with deficits in leadership or 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). However, training programmes are centre-specific and may deliver the common national curriculum in differing ways. CanMEDS uses 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 (i.e. Communicator, Collaborator, Scholar, Leader, Professional and Health Advocate).²⁴ However, despite competency-based training, several studies have shown that graduates are considered unprepared for specialist practice either 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 by 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 101 component enabling competences



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

(Annexure A). This provided an objective means with which to assess local anaesthesiology graduates' FnP.

Specialist roles in anaesthesiology combine TS with NTS in various combinations to compose specialist meta-competences. FnP 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 TS or NTS.²⁸ Opinions of graduates themselves may be useful in assessing whether they feel prepared and appropriately trained for their specialist roles. Although self-assessment may have limitations, it forms part of a 360-degree review, allowing for self-reflection which may result in positive changes in practice. It is also interesting to ascertain how the view of oneself changes with time. Related studies have been predominantly cross-sectional, representing varying levels of participant experience (0–5 years after graduation).^{15–19,29,30} Most graduates feel more comfortable with their TS; however, some deficits exist predominantly in NTS,^{13,18,26} resulting in the need for supplemental courses.^{26,31} Other self-reflective research among graduates indicates deficits in both TS and NTS, especially skills related to leadership and management.^{12,13,15–17,32} Roberts, Starr and De Witt³³ performed a longitudinal study with 24 new graduates in paediatric primary care assessing whether preparedness changed with time and/or experience. The initial study consisted of 32 clinical practice aspects and revealed deficits in clinical and non-clinical areas. The researchers followed up on the study group five years later with a re-assessment of the same practice areas, revealing a 50% reduction in deficits and indicating the influence of experience and/or time on preparedness. 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 FnP and possible changes with time.

Aim of the study

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

Methods

Study details

The quantitative study used an electronic survey (Survey Monkey®, SVMK, San Mateo, United States of America) completed on two separate occasions by the same study group. The participants consisted of all national anaesthesiology graduates of the first semester in the 2019 FCA CMSA summative examination. The first survey was done at the time of graduation in May 2019 (T₁) and a follow-up survey was done after 12 months' experience in May 2020 (T₂). Any potential bias related

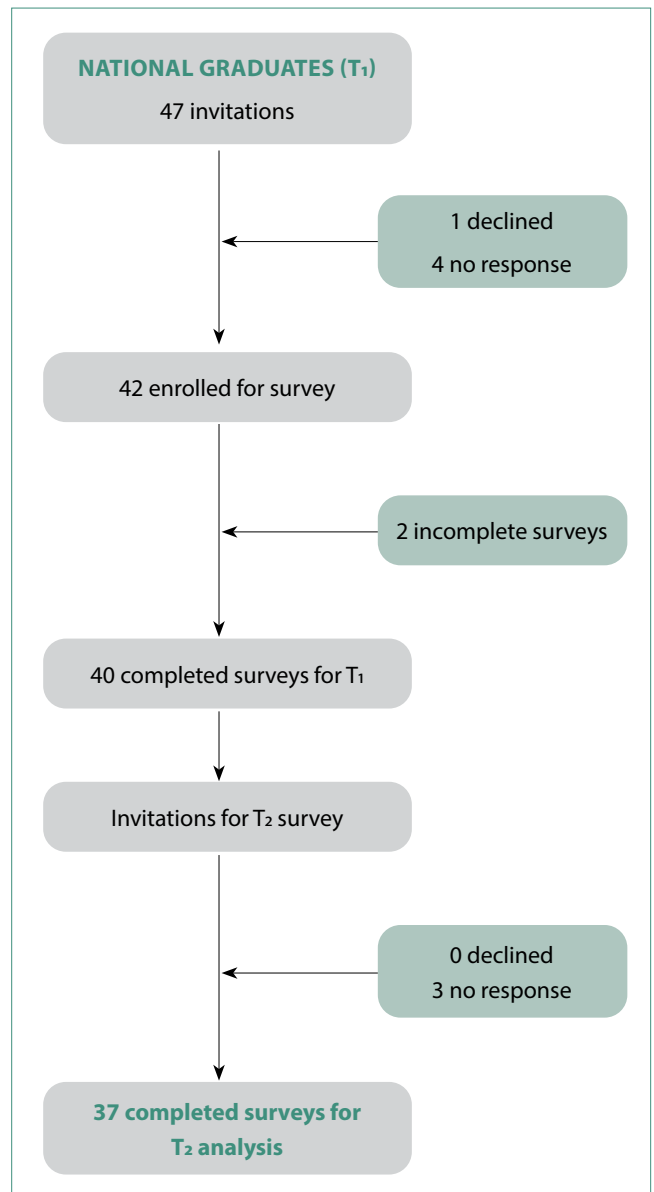


Figure 2: Participant inclusion processes at T₁ and T₂

to self-assessment performed by graduates was minimised by having the same group of participants for both times (T₁ and T₂).

The survey interrogated self-perceptions of preparedness for nine meta-competences with their associated 101 component enabling competences. These had been deemed applicable for assessment of FnFP for South African anaesthesiology graduates 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 – *some-what prepared*; 3 – *prepared*; 4 – *completely prepared*). A priori, the authors determined that if > 50% of scores for each competence were either 1 or 2, the item would be classified as unprepared. If > 50% of scores for the item were either 3 or 4, the item would be classified as prepared. These composite scores were then combined to create scores for each meta-competence. Changes in these meta-competence scores at T₂ 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. Participants' perceptions are described using mean and standard deviations for normally distributed data, and median and interquartile 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.

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 the nine (78%) meta-competences and unprepared for two, namely 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 nine meta-competences. Statistically significant differences between the groups' responses over the two time periods were noted for two meta-competences (i.e. Leader and Health Advocate), with graduates considering themselves prepared for both at T₂.

Changes in preparedness scores over time were assessed for all 101 enabling competences that compose the nine meta-

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.

Table III: Changes in Likert 1 or Likert 2 scores for the 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 a decreased no. of Likert 1 or 2 scores at T ₂ (%)	No. of enabling competences with an increased no. of Likert 1 or 2 scores at T ₂ (%)	No. of enabling competences with an 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 Likert 2 scores at T₂

Meta-competence	Enabling competence	Total no. of Likert scores of 1 or 2	
		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, caregivers 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 programmes 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 practice with sound moral standards (Honesty, altruism, integrity, humility, commitment kindness).	2	3
	Ability to remain calm under pressure.	4	5

competences. To explore graduate unpreparedness further, the total number of enabling competences that had any number of Likert 1 or Likert 2 scores 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 number of

Likert 1 or Likert 2 scores were again identified and the number of these scores was tallied. The total number of Likert 1 or Likert 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 Likert 2 scores at T₂ than T₁ (Table III, column 5) have been expanded upon in Table IV to indicate the changes.

Discussion

This study reveals that new specialists felt unprepared for the Leader and Health Advocate meta-competences at graduation. With respect to the Leader meta-competence, 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 this 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 this study population.

This study also indicates that graduates felt poorly prepared at graduation for the Health Advocate meta-competence. 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 the 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 on the preparedness of a variety of final-year trainees³² and new specialist graduates,^{16,17} including anaesthesiologists, reveal predominant deficiencies in NTS. Simon, Trawicki and Galgon²² focused specifically on preparedness in anaesthesiology by performing a national survey of final-year trainees in the USA. Results indicate that the majority of trainees felt comfortable with most of the technical procedures required of a specialist. Deficits in TS, noted in 30–40% of trainees, were considered easily remediable by means of simulation or extra courses. However, approximately 50–70% of participants were not comfortable with NTS such as leadership and professionalism, impacting on practice management.²² These anaesthesiology-specific results, together with the results of this 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

subconscious 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.

This study, similar to others,^{16,33} reveals that graduate perceptions of preparedness improve 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 by other studies, suggesting that graduate preparedness improves with time.³³ Owing to the paucity of evidence from longitudinal research, it is not clear exactly how much time is required after graduation for specialists to feel comfortable performing all their specialist roles.

In this study, 14 of the 101 enabling competences had more Likert scores of 1 and 2 after 12 months' specialist experience (Table IV). These 14 enabling competences could be grouped as follows: 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 only discovered their shortcomings after a period of time. The two enabling competences with the greatest increase in these scores were (i) the ability to communicate effectively with patients, families and caregivers, and (ii) 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 other studies that graduates may only become aware of their own shortcomings 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 the evaluation of the quality of graduate training, educational experiences,^{20,22} and the relevance and value of training programmes.¹⁵ However, it is useful to gauge academic, emotional and personal support offered to trainees while in training,^{11,15,25} and it contributes to self-reflection which is an important part of continuing professional development.⁴⁴ Self-assessment may also affect practitioners' levels of confidence to take on or to avoid certain specialist roles.¹⁶ It forms an important component of a 360-degree review of the FnFP of anaesthesiology graduates and may provide valuable insights to training programmes. Such reviews take into account opinions not only of supervisors but all stakeholders who come into contact with the graduate in order to provide feedback and formative assessment.⁴⁵ A 360-degree review also affords graduates the opportunity to compare their own self-assessments with assessments of others to gauge the accuracy of their self-assessment skill. Since training programmes and

means of assessment are not able to teach and assess every competence expected of a specialist, some deficits in either meta-competences or enabling competences will only be evident through self-reflective processes.⁴⁶ Self-assessment is an important skill one must acquire to ensure ongoing professional development and lifelong learning.^{33,46}

At graduation, new specialists may assume that they have no deficits in TS or NTS as they have been certified for specialist practice. This, together with heightened emotion and relief after years of hard work, may give them a false sense of subjective FnFP.^{17,33,47} Local anaesthesiology graduates overestimated their preparedness at graduation when their opinions were compared to the opinions of their teachers and examiners²³ with significant differences in the opinions of preparedness in more than 50% of the meta-competences. However, graduates may also underestimate their abilities through excessive self-scrutiny.²² Both over- and underestimation may result from the Dunning–Kruger effect;⁴⁸ incompetent individuals may be unable to recognise their own shortcomings.^{48–50} The ability to self-assess and self-regulate is an important part of professional practice,⁵¹ ensuring practitioner accountability to the profession, the public and themselves,²⁴ and allowing professional progression.⁵² However, not all graduates possess these abilities⁵³ 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 the 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 meta-competences.

Limitations of this study, however, also exist. First, the validity and value of graduate self-assessment may be questionable. Correlation between self-reported perceptions and measurable perceptions or actual performance is controversial, with some citing little to no correlation^{15,26,46,54} while others suggest equivalent or slightly lower correlation of graduate opinions with those of faculties.⁴⁴ However, self-assessment seems to better assess more detailed competences that may be missed by global assessments¹⁵ and may be useful in assessing the enabling competences in question in this study. Perceptions of the participants in this study were similar to those in several similar studies conducted elsewhere and in other disciplines. Second, studies making use of graduate self-assessment are potentially subject to bias.^{11,29} This bias may arise from the over- or underestimation of one's own capabilities either compared to seniors' opinions or due to a limited recall of one's training period if the assessment of graduates takes place some time after graduation.^{11,29} It is noteworthy, however, that this study was done among graduates immediately after graduation, thereby minimising the impact of lack of recall of training. Any potential bias that may have arisen from graduates was standardised over both T₁ and T₂ intervals since the same group

was being assessed at both times rather than assessing different groups of graduates or assessing graduates together with others with more experience. Third, one has to consider whether the opinions of a single graduating group are indicative of the general national perception. Future research could evaluate perceptions of multiple groups of graduates over several years to assess more generalised perceptions. Fourth, the size of this participant group is limited as the national anaesthesiology training programme is relatively small, which may limit the value of the results. Fifth, 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 participants 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. 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. The authors decided a priori that if > 50% of the Likert scores for a meta-competence were either 1 and 2, or 3 and 4, this would indicate that the graduates felt unprepared or prepared, respectively. The authors did not investigate within each meta-competence the degree of scoring. These classifications thus do not imply that 100% of the enabling competences were scored as prepared or unprepared. Rather, it is reflective of a majority score. There are several enabling competences over and above the 14% recorded, for which some graduates still felt unprepared. For the purpose of brevity as well as for a global view of perceptions, it was deemed pragmatic to record opinions of the nine meta-competences rather than of the 101 enabling competences. Finally, this study did not explore the reasons for the 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 12 months later revealed no deficiencies in any of the nine specialist meta-competences and suggest that FnFP and preparedness, although not present at graduation, may change after a period of time and experience as a specialist.

Acknowledgement

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

Conflict of interest

The authors report no conflict of interest.

Funding source


The corresponding author received funding from the Jan Pretorius Research Grant of the South African Society of Anaesthesiologists.

Ethical approval

Ethical approval was obtained from the Biomedical Research Ethics Committee (BREC) at the University of KwaZulu-Natal (BE199/17). All participants provided informed consent.

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