# Core competencies in critical care for general medical practitioners in South Africa: A Delphi study

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**Background.** Despite a high burden of disease that requires critical care services, there are a limited number of intensivists in South Africa (SA). Medical practitioners at district and regional public sector hospitals frequently manage critically ill patients in the absence of intensivists, despite these medical practitioners having had minimal exposure to critical care during their undergraduate training.
**Objectives.** To identify core competencies in critical care for medical practitioners who provide critical care services at public sector hospitals in SA where intensivists are not available to direct patient management.
**Methods.** A preliminary list of core competencies in critical care was compiled. Thereafter, 13 national and international experts were requested to achieve consensus on a final list of core competencies that are required for critical care by medical practitioners, using a modified Delphi process.
**Results.** A final list of 153 core competencies in critical care was identified.
**Conclusion.** The core competencies identified by this study could assist in developing training programmes for medical practitioners to improve the quality of critical care services provided at district and regional hospitals in SA.
**Keywords.** Core competencies, medical practitioners, Delphi.

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**Contribution of the study**
The study provides consensus on a list of core competencies in critical care that non-intensivist medical practitioners managing critically ill patients in healthcare settings in South Africa, especially where intensivists are not readily available, should have. The list can form the core content of training programmes aimed at improving critical care competence of general medical practitioners, and in this way hopefully improve the overall outcomes of critically ill patients in South Africa.

South Africa (SA) is plagued by a high burden of HIV/AIDS, tuberculosis, non-communicable diseases, maternal conditions and trauma that often requires immediate critical care.[1] Specialists other than intensivists, as well as medical practitioners with varying levels of expertise and experience, are predominantly involved in the care of these critically ill patients, especially in non-university-affiliated hospitals.[2] This situation is largely attributed to a paucity of registered intensivists in SA.

The SA population comprises ~60 million people[3] and it is estimated that between 50 and 75 registered intensive care specialists (intensivists) work in intensive care units (ICUs) in the country.[4] Most healthcare workers practise in urban areas, with very few practising in rural areas, where the majority of the population resides.[5] Every year, only a small number of intensivists complete their training and qualify, and the lack of dedicated subspecialist training posts in SA contributes substantially to the limited number of registered intensivists. Therefore, it is unlikely that there will be sufficient intensivists to provide critical care services in SA within the foreseeable future.[2]

Despite this shortage, there is little exposure to critical care at undergraduate medical education level. Critical care specialisation requires specialty training, and there are, furthermore, no postgraduate diploma courses to bridge the gap in competency between undergraduate and ICU specialist levels. Several short courses in critical care for non-specialist healthcare professionals have been designed. Joynt *et al.*[6] conducted a systematic review of eight short courses for teaching critical care skills to non-specialist doctors working in ICUs. They found that the courses varied regarding content and that only the Basic Assessment and Support in Intensive Care (BASIC) and Fundamental Critical Care Support (FCCS) courses (both available in SA) included curriculum content that was similar to the guidelines prescribed by the Society of Critical Care Medicine and the Australia and New Zealand College of Anaesthetists for residents in training.[6] BASIC is a 2-day course that focuses on essential aspects of intensive care[7] and is designed for doctors who are new to the ICU environment. The 2-day FCCS course aims to train non-intensivists to manage critically ill patients for the first 24 hours, or until a critical care consultation can be undertaken.[8] None of the courses, however, includes experiential learning or assesses whether specific competencies have been achieved.[6]

Graduates of undergraduate medical programmes in SA work either as general practitioners (private practice) or medical officers (public health service). These general practitioners and medical officers are frequently expected to provide first-line healthcare services to critically ill patients, despite critical care not being specified as an essential requirement for national undergraduate medical training in SA.[9] Exposure and training in critical care can, however, increase the knowledge, skills and confidence of doctors.[10] An additional benefit is reported by Haniffa *et al.*,[11] who found that, if doctors and nurses working in resource-limited settings received dedicated training, ICU mortality rates declined from 41% to 18%. Training of primary care physicians will have an impact on the burden and outcomes of patients who are admitted to ICUs in SA. Many of these admissions are unplanned.[12] Adequate 'high care dependency units' for postoperative care of elective surgical patients have the potential to decrease the burden on critical care resources in SA by 23%. Singh *et al.*[13] found that, in KwaZulu-Natal Province, patients who were referred to the ICU were young and had a high burden of medical and trauma conditions. Similar findings were reported from the Eastern Cape Province.[14] Decisions to accept patients to ICU were limited by available resources, and there was a need to apply ICU triage.[13]

We sought to address the problem of a lack of critical care training for general practitioners and medical officers in SA. Specifically, the findings reported in this article identify the core competencies in critical care that could be reasonably expected of medical practitioners working in critical care settings or providing critical care services at public sector hospitals in SA in the absence of intensivist supervision.

## Methods

The study used a modified Delphi process. Researchers of the Rand Corporation first developed the Delphi process as 'a method of eliciting and refining group judgements'.[15] Members of the study group answered several rounds of questionnaires anonymously, until final consensus was reached. In the modified Delphi process used for this study, curricula of international critical care training programmes, including CoBaTrICE[16] and the Chinese Critical Care Society,[17] were reviewed to identify competencies deemed essential to critical care training programmes. The core competencies compiled by the Chinese Critical Care Society were deemed suitable for low- and middle-income countries,[17] and were, therefore, used to compile the questionnaire. The questionnaire made use of a 5-point Likert scale and options for answers were 'strongly disagree', 'disagree', 'neutral', 'agree' and 'strongly agree'. A pilot study was conducted first, by submitting the questionnaire to two physicians working in the Department of Critical Care at the University of the Free State, Bloemfontein, SA, to determine aspects such as clarity of the questions, time required to complete the questionnaire, and to ensure that the questions were not biased. No changes were made to the questionnaire after the pilot study. As the participants in the pilot study did not meet inclusion criteria (as discussed below) for the study, the results of the pilot study were not included in this analysis.

National and international experts in critical care were identified and invited to participate in the modified Delphi process. The academic heads of critical care units at nine medical schools in SA were deemed to be national experts in their field and were approached to participate, or to suggest an alternative participant with at least 5 years' experience in critical care medicine for inclusion on the Delphi panel. International experts in critical care medicine were also identified by perusing the council membership of international societies of intensive care medicine or critical care medicine.

The invitation to participate was sent via email to all identified experts. Consent to participate in the study was inferred by participation. A link to an electronic questionnaire using REDCap (Research Electronic Data Capture),[18,19] was sent via email to all experts who accepted the invitation and who, thus, became Delphi panel members. Consensus was defined as agreement of ≥80% for individual questions on the questionnaire. Several rounds of the Delphi process were performed until agreement of ≥80% was achieved. Answers of agree or strongly agree were deemed to be agreement, and questions on which ≥80% agreement was achieved during the first round were removed from subsequent rounds. This process was repeated until consensus was reached for all questions. Additional competencies suggested by Delphi panel members were included in the subsequent rounds. Descriptive statistics, i.e. frequencies and percentages, were calculated for the categorical data, and the analysis was performed by the Department of Biostatistics, University of the Free State. Data analysis was performed with SAS Software, version 9.4 (SAS Institute Inc., USA).

Ethical clearance to conduct the study was obtained from the Health Sciences Research Ethics Committee of the University of the Free State (ref. no. UFS-HSD2020/1524/2411).

## Results

A total of 25 experts were invited (11 national and 14 international). Of these, 13 (52%) (7 national and 6 international) accepted the invitation and completed the first round of the Delphi process (171 questions). Consensus was reached for 126 of the core competencies. These were removed for the second round of the Delphi process, which comprised 45 questions, on which agreement was reached for 14. There were 27 core competencies for which the responses were strongly disagree, disagree or neutral during these two rounds of the Delphi process. These competencies were excluded from further rounds, as there was consistency in responses by the panel. An additional seven core competencies were suggested by members of the panel during the first round. These included that trainees should be able to liberate patients from ventilation; list indications for tracheostomy; perform elective and crash induction and intubation using anaesthetic drugs; discuss indications, benefits and risks of prone positioning; discuss indications and risks of bronchoscopy; be aware of the ICU triage process and assess both in- and out-of-hospital telephonic referrals to the ICU; recognise the care limits of the current setting; and identify patients requiring a higher level of care early. These competencies were, therefore, only included in the questionnaire during the second round and only have results for round two of the Delphi process. In the third round, six remaining core competencies were circulated. Of these, consensus was reached for only one, with the other five not agreed on. The final list of core competencies is shown in Table 1.

## Discussion

This study used a modified Delphi process to identify a list of core competencies that could be expected of non-intensivist medical practitioners working in healthcare settings where intensivists are often not available to direct medical treatment. The final list of core competencies included components of resuscitation and stabilisation of critically ill patients, disease management, practical procedures, health and safety management, transportation and end-of-life care.

Most core competencies were agreed upon after only one round. The following competencies were, however, only agreed upon after a second round: effects of positioning on respiratory physiology; assessment and management of spinal injury, gastrointestinal bleeding, liver failure and antepartum haemorrhage; performing transthoracic cardiac pacing and urinary catheterisation; discussion of indications and risks of bronchoscopy; and, finally, the need to have successfully completed a basic life-support course. It is possible that some of the Delphi panel members deemed many of these conditions, such as spinal injury, liver failure, gastrointestinal bleeding, antepartum haemorrhage and cardiac pacing, as areas specific to specialist care and not necessarily core competencies for non-specialists. SA, however, has a high rate of death due to pregnancy- and trauma-related complications,[20] which requires competency for managing these conditions at all levels of the healthcare system. Although urinary catheterisation is often performed by nursing personnel, doctors are invariably required to perform this procedure and should be sufficiently skilled to do so. Bronchoscopies are usually performed by pulmonologists, but it is important for clinicians working with intubated patients to know the indications for bronchoscopy and the risks involved. The requirement of Basic Life Support Course certification was only agreed upon during the second round of the Delphi process. It may, therefore, be that some Delphi panel members deemed pre-training courses irrelevant, as the accepted core competencies included cardiopulmonary resuscitation, which is the key component of the Basic Life Support Course.

The core competencies for general medical practitioners identified in our study are similar to those previously identified by Perkins *et al.*[21] as important for undergraduate student training as part of the Acute Care Undergraduate TEaching (ACUTE) initiative, but are not as extensive as the competencies suggested for specialist intensivists.[16,17] In SA, intensivist certification is provided by the Colleges of Medicine of South Africa (CMSA).[22] The syllabus for critical care training is designed as subspecialty training for already qualified specialists in a non-ICU discipline. This syllabus is also linked to the requirement of a dedicated 2 years, full-time ICU placement to acquire practical and procedural expertise. This is clearly an impractical approach to the training of already busy medical practitioners. A dedicated syllabus, including only the requirement for core competencies in critical care at a postgraduate diploma level, would be better suited to improve the performance of non-intensivists in dealing with critical care emergencies.

Compared with the curriculum contents of the CMSA subspecialty certificate in critical care,[22] the ACUTE initiative contains 53 of the 306 (17.3%) components, whereas our study contained 115 (37.6%). This is not unexpected, as the former is targeted at undergraduate medical students, while the core competencies identified in our study are more applicable to a training programme for qualified medical doctors who are faced with the need for a wider skill set. There is considerable overlap between the attitude and the mandatory practical skills components required for intensivists and the core components for non-intensivists identified in our study. The advisable or optional components of the subspecialty curriculum usually require specialised equipment that would not generally be available at regional or district hospitals in SA and were also not identified in our study as core competencies for general medical practitioners. There was less overlap with regard to knowledge of specific disease management, especially immunology and transplantation medicine. The curriculum of the subspecialty certificate in critical care included mandatory organisational and administrative components, which did not form part of the suggested competencies for undergraduate students or the core competencies for critical care for general medical practitioners. The competencies for the latter identified in our study can be considered as providing sufficient additional skills to address the large gap between undergraduate and specialist training.

Regarding the list of core components, the Delphi panel did not reach consensus on the intensive care management of paediatric patients. Neonatal and paediatric patients are typically managed by specialist neonatologists and paediatricians in dedicated ICUs and may therefore not be deemed a core competency for general medical practitioners at district or regional hospitals in SA. One may, however, argue that, in a resource-constrained environment with limited availability of paediatricians or paediatric intensivists, skills training in paediatrics could be beneficial.[23]

In a study among medical officers at an SA hospital, Van Deventer[24] found that the majority of the respondents lacked essential knowledge of intubation and mechanical ventilation. Similarly, junior SA doctors expressed a keen interest in managing critically ill patients, although only 13.3% were comfortable with mechanical ventilation.[25] The fixed duration of medical training limits the time available to add additional modules in critical care during undergraduate medical training, which reinforces the need for a short course or postgraduate diploma in critical care after graduation. The ideal postgraduate diploma would include supervised workplace-based training for a short period of 3 - 6 months to achieve improved competence for non-intensivists. An appropriate workplace assessment process can be incorporated into a competency-based training programme, supplemented by a summative knowledge-based component to drive learning and establish consistent standards.

**Table 1. Final list of core competencies in critical care (agreement through Delphi process)**

| Core competencies | Agreement, % Round 1 | Round 2 | Round 3 |
|---|---|---|---|
| **1. Resuscitation and initial stabilisation** | | | |
| By the end of critical care training, the trainee … | | | |
| 1.1 Adopts a structured and timely approach to the recognition, assessment and stabilisation of the acutely ill patient with disordered physiology | 100 | | |
| 1.2 Performs cardiopulmonary resuscitation | 100 | | |
| 1.3 Manages post-resuscitation cerebral protection | 100 | | |
| 1.4 Triages and prioritises patients appropriately, including timely admission to ICU | 100 | | |
| 1.5 Assesses and provides initial management of the trauma patient | 84.6 | | |
| **2. Diagnosis** | | | |
| By the end of critical care training, the trainee … | | | |
| 2.1 Obtains a medical history and performs an accurate clinical examination | 100 | | |
| 2.2 Requests timely and appropriate laboratory and imaging investigations | 100 | | |
| 2.3 Interprets and acts on the results from non-invasive haemodynamic monitoring | 100 | | |
| 2.4 Performs point-of-care ultrasound | 92.3 | | |
| 2.5 Describes indications for echocardiography (transthoracic and transoesophageal) | 100 | | |
| 2.6 Performs electrocardiography and interprets the results | 84.6 | | |
| 2.7 Obtains appropriate microbiological samples and interprets results | 100 | | |
| 2.8 Interprets the results from blood gas samples | 100 | | |
| 2.9 Interprets chest radiographs | 100 | | |
| 2.10 Liaises with radiologists to organise and interpret clinical imaging | 100 | | |
| 2.11 Monitors and responds to trends in physiological variables | 100 | | |
| 2.12 Integrates clinical findings with laboratory investigations to form a differential diagnosis | 100 | | |
| **3. Disease management** | | | |
| By the end of critical care training, the trainee … | | | |
| 3.1 Describes the implications of chronic and comorbid disease in the acutely ill patient | 100 | | |
| 3.2 Recognises and manages different types of shock | 100 | | |
| 3.3 Assesses and manages life-threatening arrhythmias | 100 | | |
| 3.4 Recognises and manages left ventricular failure and/or acute pulmonary oedema | 100 | | |
| 3.5 Recognises and manages right heart failure | 100 | | |
| 3.6 Assesses and manages myocardial infarction and acute coronary syndrome | 100 | | |
| 3.7 Recognises and manages a hypertension crisis | 100 | | |
| 3.8 Describes physiological changes of the cardiovascular system under acute conditions | 92.3 | | |
| 3.9 Assesses and manages acute and chronic respiratory failure | 100 | | |
| 3.10 Assesses and manages acute exacerbations of chronic obstructive pulmonary disease | 100 | | |
| 3.11 Assesses and manages status asthmaticus | 100 | | |
| 3.12 Assesses and manages smoke inhalation and airway burns | 92.3 | | |
| 3.13 Assesses and manages upper airway obstruction (due to infection or a foreign body) | 84.6 | | |
| 3.14 Recognises (diagnosis and grading) and manages ARDS | 92.3 | | |
| 3.15 Manages life-threatening haemoptysis | 84.6 | | |
| 3.16 Describes effects of positioning on respiratory physiology | 69.2 | 84.6 | |
| 3.17 Recognises (diagnosis and grading) and manages acute kidney injury | 92.3 | | |
| 3.18 Manages critically ill patients with chronic renal failure | 84.6 | | |
| 3.19 Manages coma patients | 100 | | |
| 3.20 Assesses and manages patients with drug overdose and intoxication | 100 | | |
| 3.21 Assesses and manages cerebral vascular accidents | 84.6 | | |
| 3.22 Manages status epilepticus | 100 | | |
| 3.23 Recognises and manages intracranial infection | 84.6 | | |
| 3.24 Assesses and manages increased intracranial pressure | 92.3 | | |
| 3.25 Assesses and manages spinal injury | 69.2 | 84.6 | |
| 3.26 Recognises and manages adrenal crisis | 92.3 | | |
| 3.27 Recognises and manages diabetes insipidus | 92.3 | | |
| 3.28 Recognises and manages diabetic ketoacidosis | 100 | | |
| 3.29 Recognises and manages hypo- or hyperthyroidism | 92.3 | | |
| 3.30 Recognises and manages sepsis, severe sepsis and septic shock | 100 | | |
| 3.31 Assesses and manages severe community-acquired infection (e.g. severe pneumonia) | 100 | | |
| 3.32 Recognises and manages nosocomial infection | 92.3 | | |
| 3.33 Assesses and manages fever in critically ill patients | 100 | | |

**(continued)**

**Table 1. (continued) Final list of core competencies in critical care (agreement through Delphi process)**

| Core competencies | Agreement, % | | |
|---|---|---|---|
| | Round 1 | Round 2 | Round 3 |
| 3.34 Describes antimicrobial resistance | 84.6 | | |
| 3.35 Recognises intra-abdominal infection and gastrointestinal perforation | 100 | | |
| 3.36 Assesses and manages HIV-related diseases | 84.6 | | |
| 3.37 Has knowledge of and uses anti-infective agents appropriately | 100 | | |
| 3.38 Manages coagulopathy | 100 | | |
| 3.39 Assesses and manages thromboembolic disease (including pulmonary embolism) | 92.3 | | |
| 3.40 Manages disseminated intravascular coagulation | 100 | | |
| 3.41 Manages traumatic coagulopathy | 92.3 | | |
| 3.42 Manages thrombocytopenia | 84.6 | | |
| 3.43 Investigates and manages causes of anaemia | 84.6 | | |
| 3.44 Has knowledge of transfusion triggers | 100 | | |
| 3.45 Assesses and manages gastrointestinal bleeding | 69.2 | 92.3 | |
| 3.46 Assesses and manages liver failure | 69.2 | 84.6 | |
| 3.47 Assesses and manages pancreatitis | 84.6 | | |
| 3.48 Assesses and manages abdominal compartment syndrome | 92.3 | | |
| 3.49 Assesses and manages acute illness in pregnancy | 92.3 | | |
| 3.50 Assesses and manages antepartum haemorrhage | 53.8 | 84.6 | |
| 3.51 Assesses and manages postpartum haemorrhage | 92.3 | | |
| 3.52 Assesses and manages hypertensive disorders during pregnancy | 84.6 | | |
| 3.53 Assesses and manages HELLP syndrome | 92.3 | | |
| **4. Therapeutic interventions** | | | |
| By the end of critical care training, the trainee … | | | |
| 4.1 Manages anaphylaxis | 100 | | |
| 4.2 Assesses and manages fluid and electrolyte disorders | 92.3 | | |
| 4.3 Assesses and manages acid-base disorders | 92.3 | | |
| 4.4 Describes and provides enteral nutrition support | 92.3 | | |
| 4.5 Provides nutrition support for patients with severe acute pancreatitis | 84.6 | | |
| 4.6 Provides nutrition support for patients with renal failure | 84.6 | | |
| 4.7 Provides nutrition support for patients with liver failure | 84.6 | | |
| 4.8 Provides nutrition support for patients with sepsis and septic shock | 92.3 | | |
| 4.9 Provides nutrition support for post-gastrointestinal surgery patients | 84.6 | | |
| 4.10 Assesses and manages pain in critically ill patients | 100 | | |
| 4.11 Describes principle and assessment of sedation | 100 | | |
| 4.12 Provides assessment, prevention and treatment of delirium | 100 | | |
| 4.13 Describes indication and choice of neuromuscular blockade | 92.3 | | |
| 4.14 Manages fluid therapy | 100 | | |
| 4.15 Manages vasoactive/inotropic medication therapy | 100 | | |
| 4.16 Describes principles of drug dose adjustment in renal failure | 100 | | |
| 4.17 Explains and appraises management of severe sepsis and septic shock | 100 | | |
| 4.18 Describes principles of antimicrobial agent selection and dosing in critically ill patients | 100 | | |
| 4.19 Describes principles of anticoagulation and antifibrinolytic therapy | 100 | | |
| 4.20 Describes principles of blood component transfusion | 92.3 | | |
| 4.21 Describes stress ulcer prophylaxis | 100 | | |
| 4.22 Assesses and manages hypothermia and hyperthermia | 92.3 | | |
| **5. Practical procedures** | | | |
| By the end of critical care training, the trainee … | | | |
| 5.1 Performs bedside ultrasound to localise pleural effusion and ascites | 84.6 | | |
| 5.2 Maintains an open airway in the non-intubated patient | 100 | | |
| 5.3 Performs bag-mask ventilation | 100 | | |
| 5.4 Performs tracheal intubation | 100 | | |
| 5.5 Performs tracheal aspiration | 92.3 | | |
| 5.6 Manages pneumothorax | 100 | | |
| 5.7 Administers oxygen therapy | 100 | | |
| 5.8 Manages non-invasive and invasive mechanical ventilation: indications, rationale, complications and weaning | 100 | | |
| 5.9 Performs thoracentesis via a chest drain | 92.3 | | |
| 5.10 Performs peripheral venous catheter insertion | 84.6 | | |

**(continued)**

**Table 1. (continued) Final list of core competencies in critical care (agreement through Delphi process)**

| Core competencies | Agreement, % | | |
|---|---|---|---|
| | Round 1 | Round 2 | Round 3 |
| 5.11 Performs arterial puncture and cannulation | 100 | | |
| 5.12 Performs central venous catheter insertion | 100 | | |
| 5.13 Performs cardioversion and defibrillation | 100 | | |
| 5.14 Performs transthoracic cardiac pacing | 76.9 | 84.6 | |
| 5.15 Performs lumbar puncture | 100 | | |
| 5.16 Performs nasogastric tube placement | 100 | | |
| 5.17 Performs abdominal paracentesis | 92.3 | | |
| 5.18 Performs and interprets intra-abdominal pressure monitor | 92.3 | | |
| 5.19 Performs urinary catheterisation | 61.5 | 92.3 | |
| 5.20 Liberates patients from ventilation | | 92.3 | |
| 5.21 Lists indications for tracheostomy | | 92.3 | |
| 5.22 Performs elective and crash induction and intubation using anaesthetic drugs | | 92.3 | |
| 5.23 Discusses indications, benefits and risks of prone positioning | | 92.3 | |
| 5.24 Discusses indications and risks of bronchoscopy | | 53.8 | 100 |
| **6. Perioperative care** | | | |
| By the end of critical care training, the trainee … | | | |
| 6.1 Manages postoperative assessment and care of the high-risk surgical patient | 84.6 | | |
| 6.2 Manages the preoperative and postoperative care of the trauma patient | 84.6 | | |
| **7. Comfort and recovery** | | | |
| By the end of critical care training, the trainee … | | | |
| 7.1 Ensures early mobilisation of patients | 92.3 | | |
| 7.2 Identifies and attempts to minimise the physical and psychosocial consequences of critical illness for patients and families | 100 | | |
| 7.3 Prevents, recognises and manages pain and delirium | 100 | | |
| 7.4 Manages the safe and timely discharge of patients from the ICU | 92.3 | | |
| 7.5 Communicates the continuing care requirements of patients at ICU discharge to healthcare professionals, patients and relatives | 100 | | |
| **8. End-of-life care** | | | |
| By the end of critical care training, the trainee … | | | |
| 8.1 Manages the process of withholding or withdrawing treatment with the multidisciplinary team | 92.3 | | |
| 8.2 Discusses end-of-life care with patients and their families/surrogates | 92.3 | | |
| 8.3 Provides palliative care for the critically ill patient | 92.3 | | |
| 8.4 Performs brainstem death testing | 84.6 | | |
| **9. Transportation** | | | |
| By the end of critical care training, the trainee … | | | |
| 9.1 Assesses the patient before transport | 100 | | |
| 9.2 Prepares equipment for transport | 92.3 | | |
| 9.3 Performs intrahospital transport | 100 | | |
| **10. Health and safety management** | | | |
| By the end of critical care training, the trainee … | | | |
| 10.1 Complies with infection control measures | 100 | | |
| 10.2 Identifies environmental hazards and promotes safety for patients and staff | 92.3 | | |
| 10.3 Identifies and minimises risk of incidents and adverse events, including complications of critical illness | 92.3 | | |
| 10.4 Organises a case conference | 84.6 | | |
| 10.5 Critically appraises and applies guidelines, protocols and care bundles | 92.3 | | |
| 10.6 Conducts morbidity and mortality meetings | 92.3 | | |
| 10.7 Should be aware of the ICU triage process and assesses in- and out-of-hospital telephonic referrals to the ICU accordingly | | 84.6 | |
| 10.8 Should recognise the care limits of the current setting and identify patients requiring a higher level of care early on | | 100 | |
| **11. Professionalism** | | | |
| By the end of critical care training, the trainee … | | | |
| 11.1 Communicates effectively with patients and relatives | 100 | | |
| 11.2 Communicates effectively with members of the healthcare team | 100 | | |
| 11.3 Maintains accurate and legible records or documentation | 100 | | |
| 11.4 Involves patients (or their surrogates if applicable) in decisions regarding care and treatment | 100 | | |

**(continued)**

**Table 1. (continued) Final list of core competencies in critical care (agreement through Delphi process)**

| Core competencies | Agreement, % | | |
|---|---|---|---|
| | Round 1 | Round 2 | Round 3 |
| 11.5 Demonstrates respect for cultural and religious beliefs and an awareness of their impact on decision-making | 100 | | |
| 11.6 Respects privacy, dignity, confidentiality and legal constraints on the use of patient data | 100 | | |
| 11.7 Collaborates and consults with appropriate healthcare providers | 100 | | |
| 11.8 Promotes effective teamwork | 100 | | |
| 11.9 Ensures continuity of care through effective handover of clinical information | 100 | | |
| 11.10 Supports clinical staff outside of the ICU to enable the delivery of effective care | 84.6 | | |
| 11.11 Recognises and manages burn-out in themselves and members of the healthcare team | 92.3 | | |
| 11.12 Takes responsibility for safe patient care | 100 | | |
| 11.13 Formulates clinical decisions with regard to ethical and legal principles | 100 | | |
| 11.14 Seeks learning opportunities and integrates new knowledge into clinical practice | 100 | | |
| **12. Pre-training certification** | | | |
| Before the start of critical care training, the trainee … | | | |
| 12.1 Successfully completed a Basic Life Support Course | 76.9 | 84.6 | |

ICU = intensive care unit; ARDS = acute respiratory distress syndrome; HELLP = haemolysis, elevated liver enzymes and low platelets.

## Study strengths and limitations

A strength of our study was that core competencies for general medical practitioners were identified by national experts who were heads of academic critical care departments in SA. Furthermore, most of the international experts were either knowledgeable of the SA critical care environment or had experience of working in low- or middle-income countries. This is important for selecting core competencies relevant to the SA healthcare setting and could easily be fed into a training programme. All participants had an equal opportunity to voice their opinion in a blinded fashion, as separate links to the electronic questionnaires were sent to each member of the panel individually. Individual Delphi panel members were unaware of the answers provided by other members until all three rounds had been completed and results reported. This eliminated the potential for the opinion of a panel member to be influenced by dominant or prominent panel members in the field of critical care.

There were several limitations to our study. Firstly, all the experts who were invited did not respond to the invitations. The email invitations were sent out three times every 72 hours to encourage participation. The experts who did not respond may have had different opinions regarding core competencies of critical care. This deficiency might be addressed by viewing the current list of core competencies as a minimum list to which can be added, if needed. Secondly, critical care experts from the rest of the African continent were not invited to participate in the study. By including experts from the rest of Africa, alternative and valuable additional insights into expected critical care core competencies in Africa might have been gained; however, the study focused on SA, where ICU practice is currently more closely aligned with wider international practice than with our closer neighbours in Africa. Thirdly, the core competencies were not weighted in terms of importance, as occurred with the curriculum contents for subspecialists in critical care,[22] where some components are mandatory and others optional. Our study aimed to identify core competencies required and did not rank their importance.

As discussed above, consensus on competencies for paediatric intensive care could not be achieved. This deficit could be corrected in the future as an additional or optional competency.

Another limitation was the timing of the data collection. The study was conducted between January and August 2022, after the peak periods of the COVID-19 pandemic in SA. During the peak periods of COVID-19, practitioners at regional and district hospitals in SA were managing critically ill COVID-19 patients, who would otherwise have been referred to central hospitals. The expectations of the experts regarding what would be core competencies may have been influenced by the severity of illness that they would be likely to see at regional and district hospitals. It is, however, unlikely that this factor would have significantly influenced the opinions of the Delphi panel members, as they were highly experienced and knowledgeable of the SA critical care setting.

Finally, the core competencies in the final list were compiled for general medical practitioners working at SA hospitals and cannot be generalised to countries with different healthcare structures to SA.

# Conclusion

By using a modified Delphi technique, a list of core competencies in critical care for medical practitioners was compiled. These competencies consist of the minimum knowledge, attitudes and skills required by medical practitioners providing critical care services outside of settings where intensivists direct the treatment of patients. We recommend that academic critical care departments at SA universities consider the list of core competencies to develop critical care training programmes for non-intensivist medical practitioners. By ensuring the competence of medical practitioners, the quality of critical care provided at district and regional hospitals in SA might be improved.

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