The development of consensus-based, pre-hospital core competencies and outcomes as a component of South African specialist emergency physician training

by

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in the Faculty of Health Sciences at the University of Cape Town

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Dedication

To my parents, Martin and Kiets, this dissertation is for you. I would not have been able to reach this important milestone in my career without all the unwavering support, innumerable sacrifices and endless love.

Acknowledgements

Waseela and Willem, thank you for believing in me and making the near impossible very much possible. I will never be able to return the time and effort you put into this, but hope to pay it forward one day in the name of greater good.

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SECTION A

Submission Ready Article

The development of consensus-based, pre-hospital core competencies and outcomes as a component of South African specialist emergency physician training

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ABSTRACT

BACKGROUND

South African Emergency Medicine registrars undertake between one and three-month pre-hospital work placements as a component of the specialist training programme. Anecdotally, the experiences of trainees nationally vary substantially which may be attributed to the lack of a curriculum to guide expected graduate outcomes, teaching, learning or assessment in Pre-Hospital Emergency Medicine (PHEM). Although efforts are underway to renew the EM curriculum in SA by the College of Emergency Medicine (CEM), this is the first body of research dedicated towards a pre-hospital curriculum for South African EM specialist training.

AIM

To seek consensus on expected graduate level pre-hospital core competencies and generate broad learning outcomes for the SA EM specialist training curriculum.

METHODS

A modified nominal group technique (NGT) was used to derive PHEM competencies and outcomes for specialist trainees. A scoping review of the literature informed the NGT by extrapolating global pre-hospital competencies and outcomes for registrars. Fourteen experts in either pre-hospital education and/or practice and specialist EM physicians were purposively recruited. A summary of core competencies and outcomes were presented to the panel over two virtual sessions. PHEM core competencies and broad-level outcomes were generated through consensus and context-specific gaps in the international literature were addressed and suggestions also presented for consensus.

RESULTS

The panel concluded that the WHO Emergency Care Systems Framework (ECSF) was appropriate to organise competencies and outcomes. The consensus process yielded 6 core competencies and 36 broad-level outcomes; eleven outcomes for scene response, 21 for transport and 4 for facility.

CONCLUSION

The consensus process allowed researchers to design a curriculum framework for a PHEM module which can inform the specialist training curriculum for the CEM SA. Aviation for Health Care Provider and Hospital Major Incident Medical Management and Support courses

potentially address specific outcomes. Self-directed and experiential learning have been highlighted as crucial teaching-learning methodologies, and opportunities identified for transprofessional collaboration. The results reported here could be used in the next steps of curriculum development.

Introduction

Emergency medicine (EM) in South Africa (SA) has rapidly developed after its recognition as a medical speciality in 2003. Since, specialist emergency physicians have the opportunity to additionally train in critical care as a sub-speciality. (1,2) EM has since been recognised in 11 other African countries. (3) The College of Emergency Medicine (CEM) – a constituent of the Colleges of Medicine South Africa (CMSA), currently only outlines main themes and topics for the pre-hospital emergency medicine (PHEM) component broadly, lacking specific outcomes or competencies. The topics include emergency medical services, pre-hospital medical devices, rural EMS systems, alternative to road medical transport, neonatal and paediatric transport, disaster medical services, mass gatherings, triage and referral to appropriate facilities and lastly injury prevention. The various topics each have an impact, frequency and subjective weighting assigned to provide a guideline for an assessment blueprint. (4)

Anecdotally, the pre-hospital experiences of the EM registrars undergoing training in SA vary substantially. This is in part due to the varying structures and functions of Emergency Medical Services (EMS) between provinces in SA; varying durations of work placements from 1 to 3 months between the different training programmes; and the lack of a structured module to guide such training.

This contrasts with high-income countries such as Denmark, Norway, Sweden, Switzerland, the United Kingdom and the United States of America, who have either developed PHEM as a subspecialty or have well-defined PHEM curricula in training programmes. (5) It is unknown if these curricula are transferable to low-to-middle income settings such as SA, especially with its unique burden of disease and systemic challenges. (6) SA, relative to the rest of Africa, has a well-developed pre-hospital emergency care system. (7)

In SA, healthcare workers in emergency departments frequently interact with emergency care personnel as part of their daily practice. (8,9) EM registrars are thus uniquely placed in the medical fraternity in the sense that professional interactions with EMS are part of daily practice but also that they have dedicated pre-hospital placements to facilitate learning. This experience alone, however, does not necessarily equate to a deep knowledge of PHEM nor how it relates to pre-hospital services. (10) Part of this is due to dedicated supervision within the pre-hospital sector. SA legislation mandates that every EMS should have an appointed

supervising medical practitioner. Their duties include a supervising clinical capacity, providing medical guidance and advice, assisting with clinical governance and providing additional supervision and training. (11) Although this requirement is stipulated in law, it does not provide legislation on specific training nor competencies for medical practitioners involved in EMS, nor how it translates to EM specialist training. Therefore, the need exists for structured and formalised curriculum to enhance these work placements to ensure that graduates emerge competent in PHEM.

Educational curricula are the expression of educational ideas in practice. (12) The need for and the value of standardised medical curricula in medical education are well established. (13,14) Some of the stated benefits are quality assurance, consistency in learning objectives, alignment with accreditation standards, facilitating transferability of knowledge and promoting evidence-based practice. (15) The World Federation of Medical Education (WFME) recognises however that medical education largely operates without a sound evidence base. (16) Owing to this lack of evidence, educational practice and content vary between social and geographical contexts, as it follows socially constructed values and ideas. To address this, WFME proposes that standards in medical education rather follow principle-based standards, than strictly prescribed outcomes. (16) In recent years however, there has been a shift towards outcomes-based education, rather than classical medical education, with the HPCSA publishing the first set of undergraduate core competencies for doctors, dentists and clinical associates in 2014. (17) Competency-based medical education has gained favour in Health Sciences Education.

One of the frequently used tools used to assess multiple domains of competence are workplace-based assessment (WBA); using multiple assessments in different points of time, followed by a valid summative decision taken by a credible group, which is touted to provide a more holistic view of the learner's progress and achievement of defined competencies. (18) Entrustable professional activities (EPAs) makes the connection between these competencies (characteristics/abilities of learners) and the professional activities to be entrusted to them on graduation, making meaning of competence by relating it to units of work. (17) This study possibly explores the basis of the EPAs for the specialist emergency medicine graduate in their pre-hospital component by outlining the outcomes and competencies required during their work placement and other educational activities.

Developing a curriculum is a complex process involving various stages and stakeholders. Kern's model of curriculum development, also known as the "Six-Step Approach," provides a structured framework specifically for designing medical education curricula. (19) The six stages are 1) problem identification and general needs assessment, 2) targeted needs assessment, 3) goals and objectives, 4) educational strategies, 5) implementation and lastly 6) feedback and feedback implementation. (19)

Although efforts are currently underway to renew the EM curriculum in SA by CEM and CMSA, the expectations of a graduate in the context of PHEM remain unclear and unstudied, with no existing competencies or nuanced outcomes to inform training (17,20). This study starts to address this specific deficit by developing a module to fulfil core competencies and outcomes in PHEM for EM registrars in SA, guided by steps one to three of Kern's model.

Aim

To seek consensus on expected graduate level pre-hospital core competencies and generate broad learning outcomes for the SA EM specialist training curriculum The specific objectives were to:

- Assess the global literature relating to pre-hospital competencies for emergency medicine registrars or residents.
- Derive graduate level pre-hospital core competencies and outcomes, from consensus findings, for EM specialist training in SA.

Methods

Study design

A modified nominal group technique (NGT) study was conducted, which was informed and guided by the literature. Experts were invited to participate as panellists in two online sessions to inform and draft the pre-hospital competencies for the SA EM Registrar. This was followed by a consensus process where experts indicated their agreement on derived competencies and outcomes. The research was approved by and conducted under the University of Cape Town HREC (514/2023).

Study setting

South Africa is an upper middle-income country that faces a unique quadruple burden of disease (maternal, newborn and child health; HIV/AIDS and tuberculosis (TB); non-communicable diseases; and violence and injury trauma). (6) Coupled with poverty and high levels of inequality, this leads to a significant burden on public healthcare resources, which is provisioned to look after more than 80% of the population. (21) South Africa's high burden of disease is reflected in Western Cape EMS operations as up to 34.3% of the workload is related to trauma, mostly interpersonal-related. (22)

Many South African doctors working in emergency healthcare lack specialist-level training, despite an increased demand on specialist-led care across Africa. (23) In South Africa, doctors can obtain specialist emergency medicine registration by completing a 4-year registrar programme at a recognised Higher Education Institution (HEI), completing a research component (as part of MMed Emergency Medicine) and culminating in a Fellowship with the College of Emergency Medicine of South Africa (FCEM SA). (24)

In 2023, 96 emergency medicine registrars were training across four provinces: Gauteng, Kwa-Zulu Natal, Western Cape, and Eastern Cape. (1) In January 2024 there were 208 registrations for specialist emergency physicians in SA. However, the number of actively practising specialists in SA remains unknown. (25) Comparing SA to high-income countries using 2020 StatsSA statistics, SA has a lower overall specialist emergency physician density of 0.3 per 100,000 people, in contrast to the USA's ratio of 14.9 per 100,000. Currently, registrars undergoing training in the Western Cape province undergo a three-month semi-structured work placement attachment with the Western Cape Department of Health and Wellness EMS which includes disaster management, special events and operational duties. (26)

Derivation of initial competencies

Preceding the NGT, a thorough search of the literature was conducted to explore existing pre-hospital curricula and assess the breadth of current pre-hospital competencies on a global scale. Articles were screened for inclusion based on their coverage of topics related to PHEM curriculum or training (see Supplement 1). Duplicate topics were eliminated, and a concise summary of the evidence was then presented to the panellists before initiating the NGT. This

approach aimed to ensure that all panel members had equal prior knowledge. A total of 58 initial broad-level outcomes (supplement 2) were drafted by NV, which were then subsequently discussed and modified by the panel.

Data collection

The research was conducted by utilising an expert panel in a modified NGT over two sessions to gain consensus on broad-level pre-hospital graduate outcomes and thereafter, core competencies. Due to work pressures and time constraints (as is commonly experienced by South African clinicians) by the participants, it was decided to conduct two separate sessions for idea generation. Due to the geographic spread of the participants, the meetings were online, recorded and securely stored following local data handling policies. Each idea generated was noted without noting who specifically noted the idea, therefore maintaining anonymity throughout the generation process.

To ensure ideas were captured accurately after idea generation, feedback from participants were invited by sending the draft broad-level outcomes following each session for checking, whereby no change was required. A consensus phase followed whereby the final core competencies and broad module outcomes derived. Consensus was obtained online using a Google Form. The experts were invited to anonymously vote on each specific item, by agreeing to include or to exclude. To maintain anonymity, consensus was looked at for each outcome as whole, without interrogating individual responses.

Participants were asked to motivate should they wish to exclude a specific item, with an open-ended text area provided after each sub-heading where additional comments or questions could be stated. All comments were read by a single researcher (NV) and de-identified, who then decided if it was a motivation for exclusion or a comment. Comments on the broad-level outcomes and core competencies included specific reasons for exclusion, phrasing of the competence, contextual factors that need consideration or an agreement in principle with competence but adding additional points. One comment in the open-ended text referred to an additional core competency which was included. These were then reviewed by the research team.

Sample and eligibility criteria

Experts were approached using a purposive sampling technique. An 'expert' was defined either as a clinician or educator. Clinicians included a doctor with >2 years of pre-hospital care experience, or EM Registrar who has preferably completed their EMS component, ALS-Paramedic with either a master's degree who has >2 years of educational, clinical or managerial experience, or a Registered Nurse specialised in trauma & emergency nursing or intensive care with >2 years of pre-hospital care experience. Educator specifically referred to a health professions educator with a post-graduate degree in health professions education, or previous research activity related to post-graduate health profession education. Additionally, current faculty of a relevant emergency medicine department with a particular interest in pre-hospital emergency medicine could also participate.

Analysis

During the meetings chaired by NV and supported by WK and WS, the panellists generated and modified initial draft broad level outcomes through a round-robin process. These outcomes were then assigned to specific domains according to the World Health Organisation Emergency Care Systems Framework (WHO ECSF) using an iterative process by both the researchers and panellists. Any unclear outcomes were clarified verbally. The researchers conducted data cleaning and deductive content analysis to merge overlapping outcomes into single ones and ensure appropriate allocation. WK additionally translated broad-level outcomes into core competencies. The draft competencies and outcomes were then presented to the panellists for consensus voting as described above. The consensus threshold was set at 75% as recommended by Diamond et al. (27) Simple descriptive analysis was then used to decide if a competence or outcome met consensus criteria or not. Although not originally an aim of the study, suggested assessment methodologies appropriate to meet those outcomes emerged as important considerations from the panel. Therefore, panellists were asked to rank each assessment methodology which was generated during the meeting. Items were ranked by order of importance and appropriateness, with most important and appropriate (score = 1) to least important and appropriate (score = 5). Each methodology's score was then tallied up and ranked, with the methodology scoring the lowest, and the most preferred.

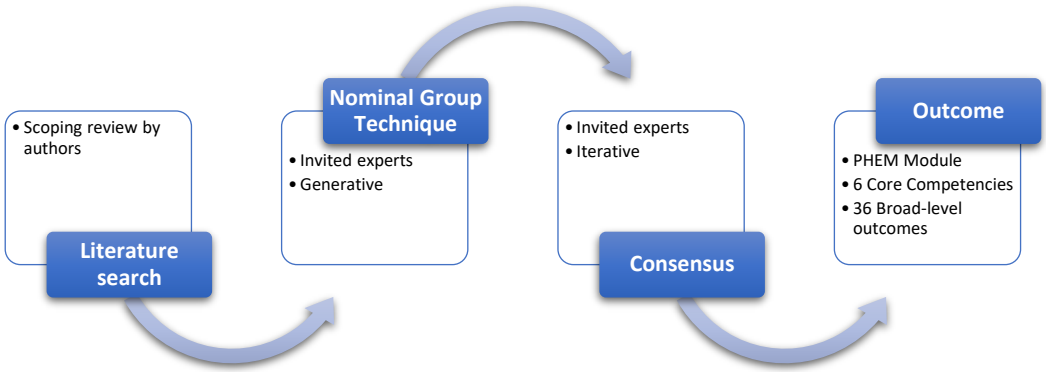

Figure 1 – Outline of research process

Results

Expert panel composition

A total of twenty-eight experts were invited to participate in the study as panellists. All the invited participants met the minimum requirements to participate in the study. Fourteen experts agreed to participate as panellists, yielding a 50% response rate. Table one describes the demographic information, years of pre-hospital experience in years, and supervision status of the expert panel.

As part of the informed consent process, participants were asked to self-identify their area of practice, occupation, and experience in pre-hospital practice and specific occupation. Lastly, they indicated if they had previously directly supervised EM Registrars either in clinical practice or educationally.

Table 1 – Characteristics of expert panellists

	Geography	**Occupation**	**Experience**		**EM Registrar Supervision**
			Prehospital	***Occupational (Years)***	
E1	Gauteng	Paramedic	Yes	>10	No
E2	Free-State	Paramedic	Yes	>10	No
E3	Western Cape	Paramedic	Yes	>10	Yes
E4	Gauteng	Specialist EP	Yes	5 – 10	Yes
E5	Western Cape	Specialist EP	Yes	5 – 10	Yes
E6	North-West	Paramedic/Educator	Yes	>10	No
E7	Western Cape	Paramedic	Yes	>10	Yes
E8	Gauteng	Paramedic	Yes	>10	Yes
E9	Western Cape	Specialist EP	Yes	>10	Yes
E10	Gauteng	Doctor	Yes	5-10	No
E11	Gauteng	Doctor	Yes	>10	No
E12	Western Cape	Paramedic	Yes	>10	Yes
E13	Gauteng	Paramedic/Educator	Yes	>10	Yes
E14	Eastern Cape	Specialist EP	Yes	>10	Yes

Outcomes as draft module

It was suggested during the NGT that the WHO ECSF would be appropriate for organising competencies and outcomes. (28) This allowed for a clear understanding of the pre-hospital system and processes against which the competencies and outcomes could be mapped.

The consensus process yielded 6 core competencies and 36 broad-level outcomes (Table 2); eleven outcomes related to scene response, 21 concerning transport, and 4 associated with

facility management. Notably, 10 outcomes[1] were identified as falling outside the framework established by the WHO ECSF.

*[1] These 10 outcomes revolved around 4 themes (denoted by * in Table 2) that emerged as crucial from expert deliberations: legal framework, communication, rescue operations, and hospital major incident management.*

Table 2 – Proposed core competencies and outcomes

Pre-Hospital Emergency Medicine Module
Core Competencies • The graduate must demonstrate an understanding of EMS systems as it pertains to clinical governance, available resources, and all modes of patient transfers, and apply this to the management of both the individual patient as well as multiple patients, both in the in-hospital and out-of-hospital context. • Demonstrate an understanding of the WHO systems framework, and how this may be applied to local context. • Demonstrate the adaptation of critical skills to the out-of-hospital context. • Evaluate and manage EMS resources as it pertains to out-of-hospital emergency patient care. • Demonstrate leadership in the pre-hospital setting. • Have a understanding of access to care, the role of formal and informal response systems, communication and dispatch, EMS and health system organisation.

Module Outcomes			
Module	**Outcome**	**Resources**	**Consensus Achieved (n=11)**
SCENE			
Legal framework*	Develop a basic knowledge of the Ambulance Act, National Standards and EMS Regulations	Government Gazette[1]	100% (11/11)
Bystander Response	Describe EMS as an integral component of the health system	SDL[2]/ WHO ECS Framework[3]	91% (10/11)
	Critique the role of EMS as an access point to the health system		91%
	Demonstrate a working knowledge of the WHO ECS framework		91%
Dispatch	Have a basic understanding of call centre functions, operations and resources	Experiential[4]/SDL	100%
	Apply the understanding of different tiers of health systems to EMS dispatch. (local vs provincial, government vs private services)	Experiential/SDL	100%
	Identify a HAZMAT scenario, and apply local guidelines in the management of such a scenario (use Emergency Response Guidelines (ERG) as guide)	SDL/ ER Guidelines Book[5]	91%
	Contextual application of disaster management principles, including disaster preparedness and surge capacity planning	DisMed Course[6]/ SDL	100%
	Knowledge of an events/mass gatherings risk matrix	EMSSA – Document[7]	91%

	Demonstrate an understanding of the role of external role players (including but not limited to: fire & rescue, military health services, environmental, public health; forensic pathology service) and apply this to dispatch and scene management.	Experiential/SDL	100%
Provider Response	Apply an understanding of the different cadres of pre-hospital personnel and request the appropriate resources for primary response and interfacility transfers.	Experiential/SDL	100%
Transport			
Patient Transport	Differentiate between patient carrying vs non-patient carrying vehicles	Experiential/SDL	82% (9/11)
	Know the components, indications, and limitations of critical care retrieval services.	ECSSA Document[8]	91%
	Know the indications for aeromedical transport (rotor and fixed-wing)	AHCP[9]	91%
	Demonstrate an understanding of special considerations related to aeromedicine, in the management of the transported patient.	AHCP	91%
Transport Care	Apply an understanding of the different cadres of pre-hospital personnel, as it relates to competency and licensed scope of practice.	HPCSA[10]	100%
	Explain the availability and limitations of equipment in the pre-hospital setting	Experiential/SDL	100%
	Apply an understanding of environmental factors and stressors in patient transport care	Experiential/SDL	100%
	Contextually adapt and demonstrate in-hospital patient management knowledge to pre-hospital settings as it relates to		
	Airway	Experiential/SDL	100%
	Breathing		
	Circulation		
	Disability		
	Neonatal patients		
	Hostile/mental health care user patients		
	Entrapped patient		91%
	Pre-hospital palliative care/organ donation referral		100%
Communication*	Anticipate on-scene communication challenges and mitigate these by demonstrating effective closed-loop communication.	Experiential/SDL	100%
	Demonstrate effective radio technique		91%
	Produce concise and complete record keeping appropriate for the pre-hospital context		91%
	Engage in effective scene to facility communication when appropriate		100%
	Have a basic understanding of rescue resources and operations	Experiential/SDL	100%

Rescue*	Understand the role of rescue operations in patient entrapment		82%
Facility			
Reception	Compare and contrast different verbal and electronic handover processes, tools and frameworks (e.g. SBAR vs DeMIST)	Experiential/SDL	91%
	Describe which medical conditions would warrant health system notification: either pre-notification or triage prioritisation.		82%
Hospital Major Incident Management*	Complete HMIMMS Course Objectives • The type and incidence of major incidents and therefore the need for proper response and management planning. • Understand and able to implement and follow the seven principles encapsulated in the CSCATTT approach to successfully managing a major incident. • Understand the need for major incident training—focusing on those aspects of the plan which do not occur in day-to-day practice, i.e., command, control, communication and triage. • Able to deliver the medical support needed for major incidents in the hospital setting using the concept of collapsible hierarchies	HMIMMS course[11] or similar	100%

***** Denotes categories not part of WHO ECSF.

[1]Gazette https://www.gov.za/sites/default/files/gcis_document/201607/40140gon830.pdf

[2]SDL refers to self-directed learning, which might include additional resources including, but not limited to textbooks or bespoke educational materials.

[3]WHO ECS Framework: https://www.who.int/publications-detail-redirect/who-emergency-care-system-framework

[4]Experiential learning refers to work placement.

[5]ERG Book: https://www.phmsa.dot.gov/training/hazmat/erg/emergency-response-guidebook-erg

[6]DisMed Course: https://health.uct.ac.za/continuing-education-unit/disaster-medicine

[7]EMSSA Medical Resource Matrix: https://emssa.org.za/wp-content/uploads/2017/10/em009.pdf

[8]ECCSA CCRS Definition: https://www.ecssa.org.za/images/pdf/ccr_def.pdf

[9]AHCP: https://www.aiem.co.za/course/ahcp

[10]HPCSA Document: https://www.hpcsa.co.za/Content/upload/professional_boards/emb/guidelines/List_of_Capabilities_and_Medications_April_2022.pdf

[11]HMIMMS: https://www.alsg.org/en/files/JFactsheet.pdf

Consensus was reached on 36 of out 37 (97%) of the proposed outcomes. The outcome "Describe telephonic triage and protocols for dispatch" was omitted from scene response due to an inability to reach a consensus. Some dissenting opinions argued that graduates should not be expected to possess knowledge in this area. The core competencies and outcomes presented all met predefined consensus criteria (>75%).

The WHO ECSF also stipulates various facility-based items but was excluded from the pre-hospital competencies as it was viewed as a central theme to EM registrar training and not unique to pre-hospital care. These were emergency unit care, disposition, and early inpatient care.

Additional outcomes (clinical governance, finance and logistics, people management and information management) that were better suited to the WHO Health Systems Building Blocks topics of service delivery, health workforce, health information systems, access to essential medicine, financing, leadership and governance were discussed and noted. (29) These were also excluded as the panel stated that this is an inherent part of registrar training, and that specific pre-hospital contextual knowledge would be more appropriate to a PHEM subspecialty programme.

Assessment methodologies

Following the process as outlined in methods (*analysis)*, participants referred to appropriate assessment methodologies. These were ranked by order of importance and appropriateness, with most important and appropriate to least important and appropriate. Table 4 outlines the results of the panellists' vote along with the composite score achieved.

Table 3 – Assessment Methodologies Ranking Result

Methodology	**Total Score**	
Simulation-based medical education (SBME)	27	Most important and appropriate
Logbook or Portfolio of Evidence (PoE)	28	⇩
Standardised case studies	29	
Work-Based Assessments (WBA)	33	
Tabletop exercises only	33	Least important and appropriate

Other findings from the NGT referred to the alignment of assessment to outcomes; quality teaching/supervision and the importance of exposure with work placements assessed via

work-based assessments (WBA). The importance of trained supervisors was identified as crucial to ensure quality of assessments. The need for transprofessional and interdisciplinary collaborative engagement was also highlighted by panellists.

In terms of assessments, panellists also stated that simulation is better suited for assessment for learning than summative assessment and that discrete pre-hospital skills may be very effectively evaluated by observed structured clinical examinations (OSCE). (30) The ideal number of required shifts for optimal exposure to meet outcomes is unknown, but it was highlighted that shift reports should form part of a learning portfolio. It was also noted that ideally tabletop exercises should mostly form part of simulation-based medical education and the sole utility of it as an assessment tool is questioned.

The suggested educational resources for the anticipated module were compiled using a using a combination of the researchers' tacit knowledge of the subject matter, recommendations from panellists during meetings and course objectives from existing courses. Supplement 3 includes the complete draft module for PHEM, including educational resources and assessment.

Discussion

The study aimed to develop pre-hospital core competencies and outcomes for South African EM registrars. Using the NGT as a consensus process, a total of 6 core competencies and 36 broad-level outcomes were derived and mapped on the WHO ECS framework. Most of the outcomes (21 out of 36) were related to the transport component, 11 were related to the scene management, and 4 pertained to facility-based outcomes.

The panel consisting of fourteen experts have significant experience in pre-hospital practice, with 11 of 14 indicating more than 10 years professional experience. Originating from five provinces, it is argued that due to the high level of consensus achieved, that this study provides representative results. The NGT process is inherently inclusive in that each panel member has equal input, which allows for all ideas to be heard and included. (31) It is however important to highlight that the module presented here represents the output of

consensus and is not necessarily the same as agreement. Consensus represents guidelines which by their nature, identify areas that require further debate and research. (32)

The discussion that follows highlights special consideration for a PHEM curriculum, relates the learning theory of CoP to this study and views the potential impact of this study utilising the lens of CoP, and potential advancements on this curriculum for the future.

Considerations of a PHEM curriculum

It is unclear if the results of this study covers the breadth of PHEM. This requires implementation and cyclical re-evaluation to identify gaps and opportunities for curriculum renewal. (19)

One must remain mindful that the curriculum constructed is feasible for implementation. The risk of causing 'curriculum overload' in medical education is a real threat, with the ever expanding modern knowledge base and need to include additional content into existing curricula. (33)

Implementation may present significant difficulties in the environment where EMS systems do not already involve the active collaboration of physicians or EM registrars on an operational level. As it stands, this module would rely on strong operational systems that would be amenable to health operation and educational partnerships. Anecdotally, this is varied throughout South Africa with different EMS capabilities and resources available to different districts. It is crucial to involve health department representatives, pre-hospital and in-hospital health services and academic stakeholders in the implementation of this curriculum to mitigate against a hidden curriculum and to ensure optimal exposures and teaching-learning opportunities for trainees. (34)

The 'hidden curriculum' is defined as "*a set of influences that function at the level of the organizational structure and culture to impact learning*,". It is well noted as a potential shortcoming when interpreting existing written curricula and translating them into practice. (34) It can play an important role in shaping students' experiences within educational settings. Sarikhani and colleagues describe ten components of the hidden curriculum across four

categories (social-, cultural, structural- and educational factors) pertaining to the hidden curriculum in medical education. (35)

Factors affecting curriculum viability are known as *enablers* and *inhibitors*. (36) Leaders or supervisors in registrar training programs will have to work closely with provincial or district EMS managers to develop lasting connections to act as enablers of curriculum viability, ensuring that learning exposure is adequate providing the opportunity for outcomes to be met. To address uncertainty and implementation feasibility, it might be important to assess what is set out in this module and what is currently available in terms of operational EMS systems. Previously, curriculum gaps have been addressed with a variety of methods, including a gap analysis or benchmarking exercises which highlights an important area of future research. (37)

Self-directed- and experiential learning were highlighted as crucial teaching-learning methodologies (30 of 36 outcomes), which is not uncommon in postgraduate medical education. (38) As far as the authors are aware, there is currently no textbook or material in existence that could serve as an appropriate and comprehensive reference to fulfil all the competencies and outcomes for South African registrars. Existing resources will have to be utilised until such a time that appropriate resources are developed. It was previously identified that educational podcasts or free open access online meducation (FOAMed) is the preferred method of learning of EM registrars, which would be one appropriate suggestion considering it is a low cost intervention, to fill this lack of resources, provided its use is guided by educators. (39)

However, without a curriculum there would be no standard setting leading to loss of credibility in educational programmes. (16) It would be worthwhile exploring in future studies the value and impact this module by exploring registrar's lived experiences with the module, to also gain a deeper understanding of its effectiveness, once implemented.

Relating Situated Learning Theory and CoP to this study

The term "Community of Practice" (CoP) first introduced in 1991, is characterised as a collective of individuals who have a shared interest or passion for a specific topic (community), and continuously enhance their understanding and proficiency (practice), through regular

interactions (domain). (40,41) The five goals of CoP (educate, support, cultivate, encourage and integrate) facilitates learning, from experienced members to newcomers and the exchange of knowledge among all those interested in fostering personal and global knowledge repositories. It since has become an influential concept in social learning systems. (41) The main advantage of fostering relationships and by establishing a CoP, would be the set-up of an inclusive environment where the learning outcomes will be guided by all involved and the registrar maximally benefits from situated learning.

CoP emerges from situated learning theory (SLT). This describes the process and development of learning when individuals can participate in a community of practice, in addition to learning from modelled behaviours by participants in that setting. (42) The concepts contributing to the definition of SLT include: (a) acquisition of skills and knowledge through engagement in a community of practice; (b) the learning environment; (c) individuals new to a community, learning from experienced members; and (d) those with extensive expertise on the subject being learned. (42)

A logical way of facilitating this would involve work placement learning (WPL). This module is implicitly situated in SLT and would not be implementable if WPL is not adequately provided for. The module does not ask the question of the role of doctors in the pre-hospital setting, but rather outlines core competences and outcomes for EM graduates. Placement of the registrar in the pre-hospital setting, would provide opportunities for authentic and immersive teaching-learning through SLT. WPL already adds value as it is central to SLT, even in the absence of a module or curriculum. Formalising this interaction and outlining specific outcomes potentially adds to the credibility of SA EM training programme, and maintains an educational standard irrespective of where the registrar is trained. In addition to the student's rich learning experience in WPL, it could include realised social and economic benefits through the student's work and contribution. (43) Aligning educational outcomes in teaching-learning interactions in WPL could bring mutual benefits through educational gains for trainees as well as pre-hospital practitioners, thereby meaningfully contributing to the greater healthcare system.

Realising the potential impact of this study through the lens of CoP

No identified CoP currently makes provision for the incorporation of doctors and nurses into pre-hospital practice nationally. This module has the potential to spearhead and foster a CoP for PHEM in SA. Furthermore, herein lies an opportunity to widen the CoP through interdisciplinary and transprofessional collaboration, with the inclusion of pre-hospital practitioners and nursing by sharing in the knowledge exchange. This will make for richer teaching-learning experiences through shared practice.

It may also impact doctors other than EM registrars, as is the case with supervising medical practitioners that are contracted by EMS (as set out in the National Health Act). Larger and more specific questions exist regarding the exact qualities that classifies as "sufficient experience and exposure" for supervising medical practitioners. To further define the role of doctors in PHEM it would be suggested assessing daily activities of doctors in the pre-hospital setting; the frequency and reasons for consultation; content of the advice given and the implementation, governance, and impact thereof and how they address perceived inherent needs of EMS, as these questions remain unstudied and should be prioritised.

Undergraduate exposure to PHEM in South Africa is not well documented. (44) Nijhawan emphasised the potential for valuable learning experiences through medical student involvement in ambulance observer shifts, which can enhance interdisciplinary and inter-personal understanding. Similar findings were reported in Australia regarding the value of pre-hospital medical student placements. (45) A South African publication sought to study the understanding of final-year healthcare students' perceptions and knowledge of an emergency care practitioner capabilities and scope or practice. (10) They found low levels of understanding in medical, nursing and clinical associate programmes which underscore the need for increased interdisciplinary education and transprofessional collaborations to promote patient-centred practices. In addition this is stated to cultivate respect amongst healthcare professionals from different disciplines. (10) According to the authors' best knowledge, the Western Cape EMS is the only South African EMS to make provision for a formalised clinical placement using a undergraduate medical student elective curriculum. (46)

By exposing undergraduate medical students to EMS, could lay a useful basis that could narrow the gap between undergraduate and postgraduate knowledge. Foundational concepts

with regards to how health systems operate and how patients access the health service might play an important role in professional development of the doctor. Additionally, the postgraduate student could also benefit by having prior exposure to and training in an otherwise unfamiliar environment.

The World Health Organisation defines interprofessional collaborative practice (IPCP) as "multiple health workers from different professional backgrounds work together with patients, families, carers, and communities to deliver the highest quality of care". (47) In the emergency department, ICPC occurs daily as the emergency physician engages with other disciplines, nursing staff and allied health staff to provide for different patients' needs. (48)Extending training and collaborative practice with pre-hospital practitioners can lead to a deeper understanding of the training and abilities of both in-hospital and out-of-hospital practitioners. Reaching outside the emergency department, ICPC in unscheduled emergency care has already successfully been established in the United Kingdom. It shows immense potential to reduce burden on emergency departments by allowing EMS to make informed decisions regarding transporting patients to hospital through improved communication and collaboration. (49) This represents an important component of successful IPCP; improved communication and collaboration. (47)

Fostering cooperative and collaborative practices through expanded communities of practice between emergency physicians and EMS (with formalised training as a single part), has the potential to reduce the burden on emergency departments, which are plagued by overcrowding. (47,50) This concept known as 'community emergency medicine' which has not yet been described in South Africa and has immense potential for EPs to have significant impact outside the emergency department. (51)

Competing educational needs

Many specialist emergency physicians across Africa have trained in SA, and are contributing to the development of pre-hospital care systems in various countries. (52) Because trainees in SA have diverse backgrounds and exposure to different EMS systems, there is a need for greater emphasis on training that addresses the unique challenges faced by regions without formalised EMS. Additionally, some of these emergency physicians have returned to their

home countries and initiated the establishment of emergency medicine practice. (53) Conflicting educational interests arise from requiring a registrar to acquire only working knowledge within pre-hospital care as opposed to becoming an expert capable of creating healthcare systems where they are currently lacking. Not so surprisingly, only 60% of current existing emergency medicine registrar training across Africa includes a rotation or exposure to pre-hospital medicine in any form. (3) Strengthening existing mentorship and leadership programmes might be the most appropriate way to assist young professional specialist physicians in building and developing systems, especially within broader professional needs, as opposed to expanding the current curriculum leading to a risk of curriculum overload. (54)

Future directions

Going forward, addressing the growing interest in specialist-led EM across Africa, along with the increasing healthcare needs of the population in an already burdened healthcare system with limited resources, will require innovative solutions. This places specific emphasis on PHEM and the pivotal role PHEM could play in developing community emergency medicine to overcome barriers of access to care, in addition to decrease the burden in emergency departments. By developing and addressing pre-hospital competencies through defining the competencies and outcomes highlights what the EM registrar should achieve whilst operating in this environment, facilitated by SLT. This structured exposure will provide essential tools to operate in an otherwise unfamiliar environment, and also serve to showcase the collaborative role other healthcare players could play in delivering care outside the emergency department. However, context-specific educational resources are lacking, but through establishing a community of practice there is the potential to include all the voices of stakeholders that operate in the pre-hospital setting. The community of practice will only exist by active participation, which could be facilitated by incorporating key stakeholders fostering mentorship. Outlining the module for pre-hospital EM registrars could catalyse discussions of how we can empower future generations of emergency care professionals to transform the delivery of healthcare by breaking down professional silos and expanding care outside traditional healthcare facilities.

Limitations

This study with the resulting proposed PHEM module represents a partial component of Kern's model of curriculum development. It is a single iteration of the proposed competencies and outcomes that an EM registrar should master in the pre-hospital setting. (19) Notably, the educational strategies, implementation and feedback phases fell outside the scope of this study. Stakeholders such as CMSA, registrar representatives, EMS representatives and programme coordinators need to be included in the steps going forward to identify and address major limitations before the module is implemented as it exists currently. The module should ideally be open to feedback and adaptive in response to learners needs. (12)

While an attempt was made to obtain a representative sample, it is important to acknowledge that the expert panel sample may not completely represent South Africa. The absence of experts from Mpumalanga, Limpopo, Northern Cape and Kwa-Zulu Natal might have resulted in unique but relevant context specific issues not addressed in this study. It is therefore suggested that a feasibility study be undertaken to assess any specific deficiencies or systemic barriers to implementation be conducted.

Of the invited experts, only 50% agreed to participate. This low response rate is an inherent issue with consensus methods and is seen in previous studies in a similar setting, which reported response rates of between 41% and 61%. (55,56) This means limiting the external validity of consensus findings to the provinces included in the expert panel, as well as selection bias that could be a threat to internal validity in this study. Furthermore, 11 of the 14 panellists voted in the consensus phase, representing a 21% attrition rate. This however is not uncommon in multi-stage studies and in keeping with similar studies conducted in South Africa, however might be a source of attrition bias. (57)

Furthermore, certain components already included in pre-hospital training—such as disaster management training and aeromedical transportation courses like Major Incident Medical Management and Support (MIMMS), Hospital Major Incident Medical Management and Support (HMIMMS) and Aviation for Healthcare Providers (AHCP) —were not evaluated for their content or effectiveness. Outsourcing specific training could offer valuable opportunities for programs lacking expertise within their local systems until they can acquire the necessary capacity and incorporate relevant content at a later time.

Conclusion

Through a process of consensus, a proposed pre-hospital module framework containing six core competencies and thirty-six broad-level outcomes was derived that could be used as a guide for training in the South African emergency medicine registrar curriculum. The implementation and effectiveness of this module remain unstudied. Existing resources such as the Aviation for Healthcare Provider and Hospital Major Incident Medical Management and Support course potentially already address specific outcomes. Self-directed- and experiential learning does however serve as most of the required resources, which could have potential implications as this would rely on existing operational systems. The proposed module can play a central role in creating an inclusive community of practice, fostering collaborative practice among emergency medicine professionals. Sustaining and expanding this community will require ongoing efforts such as regular workshops, conferences, and collaborative platforms that promote knowledge sharing and continuous improvement. A proposed solution in the form of formalisation of work placement (and standards thereof) to fulfil the training requirements is suggested.

List of Abbreviations

CEM - College of Emergency Medicine

CoP – Community of Practice

CMSA - Colleges of Medicine South Africa

EM - Emergency Medicine

HPCSA - Health Professions Council of South Africa

NGT – Nominal Group Technique

PHEM - Pre-Hospital Emergency Medicine

SA – South Africa

SLT – Situated Learning Theory

WBA – Work Based Assessment

WHO ECSF – World Health Organization Emergency Care Systems Framework

WPL – Work Placement Learning

Declarations

Ethics approval and consent to participate

Research approved by University of Cape Town HREC 514/2023

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analysed during this study are included in this published article [and its supplementary information files].

Competing interests

The authors have no interests to declare.

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Authors' contributions

NV contributed 80% of the article, WS 10% and WK 10%.

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Authors' information

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Supplement 1 – Global Derived Competencies/Outcomes

Title	Author	Country of origin	Competencies/domains/topics described
CMSA FCEM II Blueprint(4)	Not specified	South Africa	Emergency Medical Services Pre-hospital medical devices Rural EMS systems Alternatives to road medical transport Neonatal and paediatric transport Disaster medical services Mass gatherings Triage and referral to appropriate facilities Injury prevention
Simulation-Based Orientation for Emergency Medicine Residents Participating in EMS Ride-Alongs (58)	Jared M. Kutzin Samuel E. Sondheim, Samantha LeDonne Nathan Louras Michael Redlener Kevin Munjal	Mt Sinai USA	Equipment Environment Personnel *Simulation/cased based exposure* • Case 1: Orientation to EEP • Case 2: Hostile Patient • Case 3: Chest Pain • Case 4: Paediatric Anaphylaxis • Case 5: Burn • Case 6: ALOC and refusal of care
Pre-hospital emergency medicine (5)	Mark H Wilson Karel Habig Christopher Wright Amy Hughes Gareth Davies Chirstopher H E Imray	United Kingdom	**Factors affecting pre-hospital care** Personnel Environment Resource and logisitics Time-dependence **Meaningful Interventions and Safety** Drug-assisted intubation Thoracotomy

			Management of haemorrhage Neurological injury Other emergencies **Pre-hospital practitioners** Competency, training and simulation Quality and governance **Non-clinical skills and technology** Delivery Transport **Scene Management** **Triage** **Major Incidents** **Crew Resource Management**
Model Curriculum in Emergency Medical Services for Emergency Medicine Residency Programs(59)	Vincent Verdile Jon R. Krohmer Robert A. Swor Daniel W Spaite	USA Michigan	History of EMS EMS Structure and Components Personnel Equipment Agencies Receiving facilities Medical Direction Communications Patient Care Rural EMS Aeromedical Care Legal aspects Disaster and Mass Gatherings Political/Administrative Aspects
Evaluation of a Prehospital Rotation by Senior Residents: A Web-Based Survey(60)	Laurent Suppan Michèle Chan Birgit Gartner Simon Regard Mathieu Campana	Switzerland	Pharmacological knowledge Leadership skills Decision making skills Clinical evaluation Confidence regarding emergency situations

	Ghislaine Chatellard Philippe Cottet Robert Larribau François Pierre Sarasin Marc Niquille		Relation with the patient's entourage Faculties of judgement assessment
Development of a Prehospital Care Rotation for Emergency Medicine Residents in Haiti(61)	Sean M. Kivlehan Lourdes Rachelle Faikha Colinet Cassandre Edmond Hank Song Chen Wei Linda Rimpel Shada A. Rouhani Keegan A. Checkett	USA	**Didactic** EMS overview and history EMS structure and components Medical Direction Pre-hospital core conditions Ethical and legal issues Policy and administration **Ambulance Driver Training Program** Initial Assessment Trauma Conditions Medical Conditions Paediatrics Documentation and Communication
The Development of a National Emergency Medical Services Curriculum Framework for Physicians in Canada(62)	Russell D. MacDonald Joseph Ip Karen Wanger Adrienne Rothney Kirstie McLelland Andrew H. Travers P. Richard Verbeek Sunil Sookram Erik Vu Ed Cain Michael Feldman Brian Schwartz	Canada	EMS History EMS System Design EMS Personnel EMS Equipment Communications Receiving Facilities Medical Control Patient Care Air Medical Legal Considerations Disaster and Mass Gatherings Community Involvement Education

			Administrative Aspects Research Experiential Activities
UK PHEM Sub-Speciality Training Framework. Curriculum, syllabus and Assessment System(63)	Peter JP Holden Nathan J Howes	United Kingdom	**Cross cutting themes** **A. Operational practice** A.1 Apply the curriculum framework to local operations A.2 Respond to incidents by road A.3 Respond to incidents by air A.4 Utilise telecommunications and voice procedure A.5 Apply principles of dynamic risk assessment at incident scenes A.6 Provide scene management A.7 Maintain records A.8 Apply infection prevention and control principles and procedures A.9 Apply moving and handling principles and procedures A.10 Apply principles of Equality and Diversity **B. Team Resource Management** B.1 Understand human factors and their role in patient and team safety B.2 Maintain situational awareness B.3 Understand and apply principles of decision making B.4 Communicate effectively B.5 Employ effective team working B.6 Demonstrate leadership and followership B.7 Manage stress and fatigue B.8 Understand and apply principles of error investigation and management **C. Clinical Governance** C.1 Understand and apply principles of clinical governance as applied to pre-hospital practice C.2 Manage and support continuous professional development C.3 Utilise clinical evidence to support clinical practice C.4 Utilise and prepare documents that guide practice C.5 Support and apply clinical audit C.6 Understand and apply organisational risk management processes

			C.7 Support training and development C.8 Understand and apply quality management processes **Subspeciality Specific Theme** **D. Working in emergency medical systems** D.1 Understand Emergency Medical Services (EMS) Systems models and components 1.2 Understand pre-hospital operational environments 1.3 Understand the training and regulation of pre-hospital healthcare personnel 1.4 Understand the process of ambulance emergency call handling, prioritisation, dispatch categorisation and resource management 1.5 Understand the role of pre-hospital emergency medical services within EMS 1.6 Understand the law relevant to Pre-hospital Emergency Medicine practice 1.7 Work effectively with emergency services 1.8 Work effectively with acute hospital services 1.9 Provide EMS clinical advice, support and co-ordination 1.10 Understand the pre-hospital and acute sector management structures within the wider healthcare system **E. Providing pre-hospital emergency medical care** 2.1 Assess patients in the pre-hospital phase 2.2 Provide immediate pre-hospital clinical care 2.3 Provide cardiopulmonary resuscitation in the pre-hospital environment 2.4 Manage acute medical emergencies in the pre-hospital environment 2.5 Manage injury in the pre-hospital environment 2.6 Provide analgesia, procedural sedation and anaesthesia in the pre-hospital environment 2.7 Manage obstetric emergencies in the pre-hospital environment 2.8 Manage the newborn in the pre-hospital environment 2.9 Manage injured or ill children in the pre-hospital environment 2.10 Manage the bariatric patient in the pre-hospital environment 2.11 Manage elderly patients in the pre-hospital environment 2.12 Manage acute behavioural disturbance in the pre-hospital environment 2.13 Provide end-of-life care and immediate management of bereavement

			F. Using pre-hospital equipment 3.1 Apply equipment governance principles and practice 3.2 Understand and use personal protective equipment 3.3 Operate all types of commonly used pre-hospital emergency medical device 3.4 Operate common non-medical pre-hospital equipment 3.5 Manage and administer medicines **G. Supporting rescue and extrication** 4.1 Work within the rescue environment 4.2 Understand entrapment 4.3 Support extrication 4.4 Clinically manage the trapped patient **H. Supporting safe patient transfer** 5.1 Understand the concepts underpinning transfer medicine 5.2 Understand the applied physiology of patient transfer 5.3 Co-ordinate and plan patient transfer 5.4 Prepare patients for transport 5.5 Utilise a range of patient transport modalities 5.6 Clinically manage patients during transport **I. Supporting emergency preparedness and response** 6.1 Understand principles of emergency preparedness, response and recovery 6.2 Respond to emergencies at operational (bronze) level 6.3 Respond to emergencies at tactical (silver) level 6.4 Manage chemical, biological and radiological (CBR) emergencies 6.5 Understand the psychosocial and mental health aspects of multiple casualty incidents
Training of Italian emergency medicine residents in prehospital emergency medicine: state of	Matteo Paganini Andrea Cellini Giulia Mormando Fabrizio Fabris Carlo Merkel	Italy	**Theoretical Training** National EMS system Local EMS system Dispatch/Primary retrieval logistics Direct Medical Oversight Interhospital transfer Major Incident Management

the art and perspectives of improvement(64)			Helicopter EMS Adult Cardiac Emergencies Paediatric Emergencies Prehospital Emergencies Prehospital Trauma **Practical Activities** Direct Medical Oversight Dispatch First retrieval (doctor) Physician emergency response vehicle Helicopter EMS Interhospital transfer (doctor) Interhospital transfer (HEMS) Mass gatherings Education Quality Improvement Disaster medicine Wilderness medicine
A General EMS Curriculum for Residency Training(65)	Jon W. Lowry Albert J. Lauro	USA Louisiana	Orientation Overview of the specialty Defining the specialty General Context of EMS Systems History of legislation Federal agencies State and local agencies and organizations Components of EMS System EMS Act, guidelines, and other standards Transportation Ambulance design standards, costs Ambulance equipment standards Placement of ambulances, response times, organization

			Communications Basic communications Radio-telemetry Control center, patient access, 911 system Facilities Hospital categorization, critical care Accreditation standards, transfer agreements Disaster planning Training Public education Evaluation of EMS system Measuring patient outcomes, cost effectiveness Emergency Physician as Community and Professional Leader
Emergency Medical Services Education in Emergency Medicine Residency Programs: A National Survey (66)	Robert Katzer Jose G. Cabanas Christian Martin-Gill	USA Pennsylvania	Ride-along Ground Air Direct Medical Oversight Education of prehospital health care providers Mass gathering events (e.g., football games, marathons, etc.) EMS quality improvement Disaster-preparedness Dispatch observation Physician response vehicle Wilderness medicine

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Supplement 2 – Initial Derived Competencies/Outcomes

Domain - Systems
Theme – EMS Systems
Clinical Governance
○ Describe what constitutes an adverse event ○ Describe basic KPI's relating to an EMS service ○ Be familiar with the National Ambulance Act ○ Describe a clinical audit/QI cycle ○ Use clinical evidence to guide practice
Rescue
○ Know what constitutes a "rescue" ○ Be familiar with different modalities of rescue ○ o Define USAR
Aeromedical
○ Describe the indications for rotor wing transport ○ Describe the indications for fixed wing transport ○ Describe special considerations relating to aeromedicine
Primary response
○ Know the role of a primary response vehicle
Interfacility transfer
○ Know the components of a critical care retrieval service
Mass gatherings
○ Critically appraise an event plan ○ Apply a medical resource matrix for events
Major incidents
○ Describe CSCATTT approach ○ Describe Bronze, Silver and Gold Command
Theme – EMS Operations
EMS Framework
○ Describe the WHO's emergency care systems framework components
EMS Control Centre
○ Understand the components of a control centre ○ Knows the national emergency number 112
External Role Players
○ Understand the role of fire and rescue ○ Understand the role of traffic services ○ Understand the role of disaster management ○ Understand the role of military ○ Understand the role of environmental health
Theme – Procedures
RSI
○ Describe pre-hospital RSI modifications
NIV
○ Set-up pre-hospital adult NIV ○ Set-up pre-hospital neonatal/paediatric NIV

Thoracotomy
○ Know indications for pre-hospital thoracotomy
Management of major haemorrhage
○ Effectively manage compressible haemorrhage ○ Effectively manage non-compressible haemorrhage
Neurological injury
○ Describe secondary neuroprotection ○ Be familiar with popular pre-hospital stroke screening tools
Entrapped patient
○ Identify the patient at risk of crush syndrome ○ Understand the treatment limitations due to limited access
Hostile patient
○ Have an approach to the hostile patient ○ Know the duties of SAPS on scene
Neonatal care
○ Describe fundamentals of pre-hospital neonatal care ○ Describe transport stressors in neonates
Domain - Staff ***Theme – Personal***
Crew Resource Management
○ Describe crew resource management ○ Describe elements of scene safety assessment ○ Describe cognitive bandwith
Theme – Team
Leadership
○ Describe basic leadership styles
Communication
○ Demonstrate closed-loop communication ○ Describe difficulties of on-scene communication ○ Demonstrate effective radio technique
• EMS Personnel
○ Differentiate BLS, ILS, ALS ○ Briefly describe BLS, ILS, ALS scopes of practice ○ Have a basic understanding of short courses(old) vs university models of training(new)
Fire & Rescue
○ Describe the role of fire and rescue services ○ Identify HAZMAT scenario and role of EMS
Domain - Stuff ***Theme – Tools***
Patient Monitor
○ Describe the ideal monitor
Transport Ventilator
○ Describe the ideal ventilator
Incubator
○ Describe the ideal transport incubator

EMS Environment
○ Describe common dangers to personal safety
Rescue Tools
○ Describe basic extrication tools
Record Keeping
○ Describe the components of a patient report form ○ Describe how an adverse event is documented

Supplement 3 – Proposed Draft Module: Overview

Pre-Hospital Emergency Medicine Module

Core Competencies

- The graduate must demonstrate an understanding of EMS systems as it pertains to clinical governance, available resources, and all modes of patient transfers, and apply this to the management of both the individual patient as well as multiple patients, both in the in-hospital and out-of-hospital context.
- Demonstrate an understanding of the WHO systems framework, and how this may be applied to local context.
- Demonstrate the adaptation of critical skills to the out-of-hospital context.
- Evaluate and manage EMS resources as it pertains to out-of-hospital emergency patient care.
- Demonstrate leadership in the pre-hospital setting.
- Have a understanding of access to care, the role of formal and informal response systems, communication and dispatch, EMS and health system organisation

Module Outcomes

Module	Outcome	Resources	Assessment
SCENE			• Simulation-based medical education • Logbook or Portfolio of Evidence • Standardised Case Studies • Work based assessments *Disaster Medicine Course & evaluation* *Aviation Course & evaluation*
Legal framework	Develop a basic knowledge of the Ambulance Act, National Standards and EMS Regulations	Government Gazette[1]	
Bystander Response	Describe EMS as an integral component of the health system	SDL[2]/ WHO ECS Framework[3]	
	Critique the role of EMS as an access point to the health system		
	Demonstrate a working knowledge of WHO ECS framework		
Dispatch	Have a basic understanding of call center functions, operations and resources	Experiential[4]/SDL	
	Apply the understanding of different tiers of health systems to EMS dispatch. (local vs provincial, government vs private services)	Experiential/SDL	
	Identify a HAZMAT scenario, and apply local guidelines in the management of such a scenario (use Emergency Response Guidelines (ERG) as guide)	SDL/ ER Guidelines Book[5]	

	Contextual application of disaster management principles, including disaster preparedness and surge capacity planning	DisMed Course[6]/ SDL
	Knowledge of an events/mass gatherings risk matrix	EMSSA – Document[7]
	Demonstrate an understanding of the role of external role players (including but not limited to: fire & rescue, military health services, environmental, public health; forensic pathology service) and apply this to dispatch and scene management.	Experiential/SDL
Provider Response	Apply an understanding of the different cadres of pre-hospital personnel and request the appropriate resources for primary response and interfacility transfers.	Experiential/SDL
Transport		
Patient Transport	Differentiate between patient carrying vs non-patient carrying vehicles	Experiential/SDL
	Know the components, indications, and limitations of critical care retrieval services.	ECSSA Document[8]
	Know the indications for aeromedical transport (rotor and fixed-wing)	AHCP[9]
	Demonstrate an understanding of special considerations related to aeromedicine, in the management of the transported patient.	AHCP
Transport Care	Apply an understanding of the different cadres of pre-hospital personnel, as it relates to competency and licensed scope of practice.	HPCSA[10]
	Explain the availability and limitations of equipment in the pre-hospital setting	Experiential/SDL
	Apply an understanding of environmental factors and stressors in patient transport care	Experiential/SDL
	Contextually adapt and demonstrate in-hospital patient management knowledge to pre-hospital settings as it relates to	
	Airway	Experiential/SDL
	Breathing	
	Circulation	
	Disability	
	Neonatal patients	
	Hostile/mental health care user patients	
	Entrapped patient	

	Pre-hospital palliative care/organ donation referral		
Communication	Anticipate on-scene communication challenges and mitigate these by demonstrating effective closed-loop communication.	Experiential/SDL	
	Demonstrate effective radio technique		
	Produce concise and complete record keeping appropriate for the pre-hospital context		
	Engage in effective scene to facility communication when appropriate		
Rescue	Have a basic understanding of rescue resources and operations	Experiential/SDL	
	Understand the role of rescue operations in patient entrapment		
Facility			
Reception	Compare and contrast different verbal and electronic handover processes, tools and frameworks (e.g. SBAR vs DeMIST)	Experiential/SDL	
	Describe which medical conditions would warrant and benefit from health system notification; pre-notification and prioritisation.		
Hospital Major Incident Management	Complete HMIMMS Course Objectives • The type and incidence of major incidents and therefore the need for proper response and management planning. • Understand and able to implement and follow the seven principles encapsulated in the CSCATTT approach to successfully managing a major incident. • Understand the need for major incident training—focusing on those aspects of the plan which do not occur in day-to-day practice, i.e., command, control, communication and triage. • Able to deliver the medical support needed for major incidents in the hospital setting using the concept of collapsible hierarchies	HMIMMS course[11] or similar	

[1]Gazette https://www.gov.za/sites/default/files/gcis_document/201607/40140gon830.pdf

[2]SDL refers to self-directed learning, which might include additional resources including, but not limited to textbooks or bespoke educational materials.

[3]WHO ECS Framework: https://www.who.int/publications-detail-redirect/who-emergency-care-system-framework
[4]Experiential learning refers to work placement.
[5]ERG Book: https://www.phmsa.dot.gov/training/hazmat/erg/emergency-response-guidebook-erg
[6]DisMed Course: https://health.uct.ac.za/continuing-education-unit/disaster-medicine
[7]EMSSA Medical Resource Matrix: https://emssa.org.za/wp-content/uploads/2017/10/em009.pdf
[8]ECCSA CCRS Definition: https://www.ecssa.org.za/images/pdf/ccr_def.pdf
[9]AHCP: https://www.aiem.co.za/course/ahcp
[10]HPCSA Document:
https://www.hpcsa.co.za/Content/upload/professional_boards/emb/guidelines/List_of_Capabilities_and_Medications_April_2022.pdf
[11]HMIMMS: https://www.alsg.org/en/files/JFactsheet.pdf

SECTION B

Additional Documents

Appendix A - Sample Research Information Sheet and Informed Consent

The development of consensus-based pre-hospital core competencies and outcomes as a component of specialist emergency physician training - a South African-based study

This informed consent form is for participants in the nominal group meeting for the abovementioned study. The goal of the meeting is to provide structured input into the development of a pre-hospital curriculum for emergency medicine registrar education that is appropriate for the South African context.

Names of Investigators: Drs Neville Vlok

Names of Supervisors: Drs Waseela Khan, Willem Stassen

Name of Affiliations: Division of Emergency Medicine, University of Cape Town

This informed consent form has two parts:

- Information Sheet
- Consent

You will be provided with a full copy of the informed consent form.

PART 1: Information Sheet

Introduction

Pre-hospital emergency care is one of the key processes in the WHO's emergency care systems framework. With specialist emergency medicine physician training now well established in South Africa since 2003, guidance as what educational outcomes should be achieved with regards to prehospital competencies are lacking. With the ongoing efforts to renew the curriculum to become living and relevant, we now shift our focus on to be informed of what the outcomes should be achieved during emergency medicine registrar training. We are therefore asking your expertise by means of critical thinking to achieve the aim of this study, which is to generate pre-hospital competencies and broad level outcomes which could be achieved during specialist training in order to achieve this.

Voluntary Participation

Being part of this research is entirely your choice and voluntary. Whether you decide to be part of the research or not there will be no consequences to you. You may also change your mind later and stop taking part in the research, even I you agreed earlier. However, input provided cannot be withdrawn, as your views will be integrated along with those of the other participants and can therefore not be isolated.

Description of the Process

During the research the following will happen:

- After a series of presentations, guided discussions will seek to elucidate your views on a variety of topics as outlined in the appended agenda.

- The entire stakeholder meeting will take approximately 5 hours.
- During the meeting, notes will be made which will later inform the curriculum and a scientific publication.

Risks or Benefits

There are no foreseen risks to your participation in this meeting. You will not be compensated for your participation in this meeting. However, you will be invited as co-author to the publication arising from this NGT study. To qualify for co-authorship, you need to meet the criteria for authorship as described by the International Committee of Medical Journal Editors. These criteria are:

- Substantial contributions to the conception or design of the work or the acquisition, analysis, or interpretation of data for the work; AND

- Drafting the work or revising it critically for important intellectual content; AND

- Final approval of the version to be published; AND

- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

If you do not wish to contribute as author, and with your permission, your contribution will be acknowledged in the publication.

Confidentiality

The information that we collect in the study will be kept confidential. You will remain anonymous during the entire analysis of the data. You will also be anonymous during the reporting of the data.

Right to Refuse or Withdraw

You are not obliged to participate in this meeting if you do not want to do so. You may withdraw your participation during the meeting by recusing yourself. As feedback will be collated in real time individual inputs cannot be withdrawn later.

Ethics Clearance and Approval

This project has been approved by the University of Cape Town's Human Research Ethics Committee (HREC Ref 514/2023). The project complies with the ethical codes of the Helsinki Declaration and the South African Good Clinical Practice Guidelines.

Who to Contact

If you have any question(s) you can ask them now or later. If you want to ask questions at a later stage, you may contact Neville Vlok on neville.vlok@westerncape.gov.za, Willem Stassen on willem.stassen@uct.ac.za or Waseela Khan on Waseela.khan@uct.ac.za. For questions regarding the ethical approval of the study please contact the UCT HREC on 021 406-6626.

Part 2: Consent

The development of consensus-based pre-hospital core competencies and outcomes as a component of specialist emergency physician training - a South African-based study

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have had has been answered to my satisfaction. I consent voluntarily to participate in this stakeholder meeting including recording of the proceedings.

Print Name of Participant: _____

Signature of Participant: _____

Date: _____

Statement by the researcher/person taking consent:

I confirm that the participant was given an opportunity to ask questions regarding the research study. I confirm that the meeting participant has not been coerced into giving consent for this research study and that consent has been given freely and voluntarily.

A copy of this informed consent form has been provided to the participant.

Print Name of Researcher: _____

Signature of Researcher: _____

Date: _____

Appendix B – HREC Approval Letter

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room 45 E-52-E-Floor- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-submissions@uct.ac.za
Website: www.health.uct.ac.za/home/human-research-ethics

15 November 2023

HREC REF: 514/2023

Dr W Khan
Division of Emergency Medicine
F-51 OMB
Email: Waseela.khan@uct.ac.za
Student: nevillevlok@gmail.com/neville.vlok@westerncape.gov.za

Dear Dr Khan

PROJECT TITLE: THE DEVELOPMENT OF CONSENSUS-BASED PRE-HOSPITAL CORE COMPETENCIES AND OUTCOMES AS A COMPONENT OF SPECIALIST EMERGENCY PHYSICIAN TRAINING - A SOUTH AFRICAN-BASED STUDY. (MMED – DR NEVILLE VLOK)

Thank you for your response letter dated 22 October 2023, addressing the issues raised by the Faculty of Health Sciences Human Research Ethics Committee (HREC).

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 November 2024.

Please submit a progress form, using the standardised Annual Report Form (FHS016) or FHS017 if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Dr Neville Vlok will also be involved in this study.

Please quote HREC REF 514/2023 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637. Institutional Review Board (IRB) number: IRB00001938 NHREC-registration number: REC-210208-007
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of

Appendix C – Submission Guidelines *BMC Medical Education*

Available from: https://bmcmededuc.biomedcentral.com/submission-guidelines/preparing-your-manuscript

Research article

Criteria

Research articles should report on original primary research, but may report on systematic reviews of published research provided they adhere to the appropriate reporting guidelines which are detailed in our editorial policies. Please note that non-commissioned pooled analyses of selected published research will not be considered. Studies reporting descriptive results from a single institution or region will only be considered if analogous data have not been previously published in a peer reviewed journal and the conclusions provide distinct insights that are of relevance to a regional or international audience.

BMC Medical Education strongly encourages that all datasets on which the conclusions of the paper rely should be available to readers. We encourage authors to ensure that their datasets are either deposited in publicly available repositories (where available and appropriate) or presented in the main manuscript or additional supporting files whenever possible. Please see Springer Nature's data repository guidance.

Authors who need help depositing and curating data may wish to consider contacting our Research Data Support Helpdesk.

Preparing your manuscript

The information below details the section headings that you should include in your manuscript and what information should be within each section.

Please note that your manuscript must include a 'Declarations' section including all of the subheadings (please see below for more information).

Title page

The title page should: present a title that includes, if appropriate, the study design e.g.:

"A versus B in the treatment of C: a randomized controlled trial", "X is a risk factor for Y: a case control study", "What is the impact of factor X on subject Y: A systematic review"

or for non-clinical or non-research studies a description of what the article reports

list the full names and institutional addresses for all authors

if a collaboration group should be listed as an author, please list the Group name as an author. If you would like the names of the individual members of the Group to be searchable through their individual PubMed records, please include this information in the "Acknowledgements" section in accordance with the instructions below

Large Language Models (LLMs), such as ChatGPT, do not currently satisfy our authorship criteria. Notably an attribution of authorship carries with it accountability for the work, which cannot be effectively applied to LLMs. Use of an LLM should be properly documented in the Methods section (and if a Methods section is not available, in a suitable alternative part) of the manuscript.

indicate the corresponding author

Abstract

The Abstract should not exceed 350 words. Please minimize the use of abbreviations and do not cite references in the abstract. Reports of randomized controlled trials should follow the CONSORT extension for abstracts. The abstract must include the following separate sections:

Background: the context and purpose of the study

Methods: how the study was performed and statistical tests used

Results: the main findings

Conclusions: brief summary and potential implications

Trial registration: If your article reports the results of a health care intervention on human participants, it must be registered in an appropriate registry and the registration number and date of registration should be stated in this section. If it was not registered prospectively (before enrollment of the first participant), you should include the words 'retrospectively registered'. See our editorial policies for more information on trial registration

Keywords

Three to ten keywords representing the main content of the article.

Background

The Background section should explain the background to the study, its aims, a summary of the existing literature and why this study was necessary or its contribution to the field.

Methods

The methods section should include:

the aim, design and setting of the study

the characteristics of participants or description of materials

a clear description of all processes, interventions and comparisons. Generic drug names should generally be used. When proprietary brands are used in research, include the brand names in parentheses

the type of statistical analysis used, including a power calculation if appropriate

Results

This should include the findings of the study including, if appropriate, results of statistical analysis which must be included either in the text or as tables and figures.

Discussion

This section should discuss the implications of the findings in context of existing research and highlight limitations of the study.

Conclusions

This should state clearly the main conclusions and provide an explanation of the importance and relevance of the study reported.

List of abbreviations

If abbreviations are used in the text they should be defined in the text at first use, and a list of abbreviations should be provided.

Declarations

All manuscripts must contain the following sections under the heading 'Declarations':

Ethics approval and consent to participate

Consent for publication

Availability of data and materials

Competing interests

Funding

Authors' contributions

Acknowledgements

Authors' information (optional)

Please see below for details on the information to be included in these sections.

If any of the sections are not relevant to your manuscript, please include the heading and write 'Not applicable' for that section.

Ethics approval and consent to participate

Manuscripts reporting studies involving human participants, human data or human tissue must:

include a statement on ethics approval and consent (even where the need for approval was waived)

include the name of the ethics committee that approved the study and the committee's reference number if appropriate

Studies involving animals must include a statement on ethics approval and for experimental studies involving client-owned animals, authors must also include a statement on informed consent from the client or owner.

See our editorial policies for more information.

If your manuscript does not report on or involve the use of any animal or human data or tissue, please state "Not applicable" in this section.

Consent for publication

If your manuscript contains any individual person's data in any form (including any individual details, images or videos), consent for publication must be obtained from that person, or in the case of children, their parent or legal guardian. All presentations of case reports must have consent for publication.

You can use your institutional consent form or our consent form if you prefer. You should not send the form to us on submission, but we may request to see a copy at any stage (including after publication).

See our editorial policies for more information on consent for publication.

If your manuscript does not contain data from any individual person, please state "Not applicable" in this section.

Availability of data and materials

All manuscripts must include an 'Availability of data and materials' statement. Data availability statements should include information on where data supporting the results reported in the article can be found including, where applicable, hyperlinks to publicly archived datasets analysed or generated during the study. By data we mean the minimal dataset that would be necessary to interpret, replicate and build upon the findings reported in the article. We recognise it is not always possible to share research data publicly, for instance when individual privacy could be compromised, and in such instances data availability should still be stated in the manuscript along with any conditions for access.

Authors are also encouraged to preserve search strings on searchRxiv https://searchrxiv.org/, an archive to support researchers to report, store and share their searches consistently and to enable them to review and re-use existing searches. searchRxiv enables researchers to obtain a digital object identifier (DOI) for their search, allowing it to be cited.

Data availability statements can take one of the following forms (or a combination of more than one if required for multiple datasets):

The datasets generated and/or analysed during the current study are available in the [NAME] repository, [PERSISTENT WEB LINK TO DATASETS]

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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