

Emergency care research priorities in South Africa

D J van Hoving, MB ChB, Dip PEC (SA), MMed (Em Med), MScMedSci (Clin Epi); B K Barnetson, MB ChB;
L A Wallis, MB ChB, FCEM, MD

Division of Emergency Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University, Tygerberg, Cape Town, South Africa

Corresponding author: D J van Hoving (nvhoving@sun.ac.za)

Background. Emergency care research is rarely undertaken in low- and middle-income countries. A manageable 'road map' for research in South African (SA) emergency care is needed to address research gaps.

Objective. To identify, collate and prioritise research topics from identified knowledge gaps in emergency care in SA.

Methods. Seventy-six individuals were invited to participate in a modified Delphi study. Participants were requested to suggest important research topics before rating them. Consensus was achieved when >75% of participants strongly agreed or disagreed. Participants then ranked the agreed statements before selecting the most appropriate methodology relating to study design, funding and collaboration.

Results. Three hundred and fifty topics were suggested by 31 participants. Topics were collated into 123 statements before participants rated them. Consensus was achieved for 39 statements. The highest-ranked priority in the prehospital group was to determine which prehospital interventions improve outcomes in critically ill patients. The competence of emergency care providers in performing common lifesaving skills was deemed the most important in clinical emergency care. Implementing and reviewing quality improvement systems scored the highest under general systems and safety management. Only 22 statements achieved consensus regarding study design. The National Department of Health was the preferred funding source, while private organisations and emergency care societies were identified as possible collaborative partners.

Conclusion. This study provides expert consensus on priority research areas in emergency care in SA as a guide for emergency care providers to ensure evidence-based care that is relevant to the SA population.

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Health research has a high value to society and has resulted in a noteworthy improvement in healthcare. South Africa (SA) has a quadruple burden of disease that is being addressed by the strategic priorities of the National Department of Health (NDoH).^[1] A continuous reduction in morbidity and mortality can only be guaranteed if research is ongoing, if the efficacy and adverse effects of medical interventions are continuously monitored, and by ensuring that research is relevant to a specific patient population.^[2]

High-quality healthcare implies practice that is consistent with the current best evidence.^[3] It is essential to know which interventions work and which do not, and which are likely to be harmful. This becomes vitally important in settings with a mismatch between the burden of disease and available resources. While healthcare professionals in low- and middle-income countries (LMICs) should use evidence-based decisions in day-to-day patient care, implementing evidence-based medicine remains difficult.^[4] Since the majority of studies are done in high-income countries for high-income countries relating to health conditions important to high-income countries,^[5] their limited applicability and transferability to LMICs creates a knowledge vacuum in LMICs, including SA.^[4]

Research in the field of emergency care specifically related to LMICs is sparse. A single consensus study related to clinical research priorities, emergency centre management and administration exists,^[6] but there are no lists or identified gaps for any aspects of emergency or acute care specific to SA.

Research related to emergency care in SA demands a manageable 'road map' to address the research gaps. This study aimed to identify, collate and prioritise research topics from identified knowledge gaps in emergency care in SA.

Methods

Study design

A three-phase modified Delphi study was undertaken from 1 March 2012 to 5 April 2013. The Delphi study design was modified in that each phase was limited to only two or three rounds (Fig. 1).

Ethics approval was obtained from the Human Research Ethics Committee, Stellenbosch University, Tygerberg, Cape Town (Reference S12/02/034).

Study population

Seventy-six participants were invited to represent the expert panel (Appendix 1). They included doctors, nurses, prehospital care providers, and policy makers from all the provinces in SA. Invited panel members were given the option of appointing a representative in their place.

Data collection and management

All potential panel members were invited by e-mail, and participation implied consent. An online survey tool (SurveyMonkey) was used to facilitate the process. The views of all participating panellists were given equal weight. Participants were given 4 weeks to complete each round; weekly reminders were sent by e-mail until a response was received or the 4 weeks had expired.

All panel members were invited to participate in rounds 1 and 2 of phase 1 and re-invited for the first round of phases 2 and 3.

In phase 1 (identifying research topics), participants were requested to suggest important research topics in five categories of emergency care (adult emergency care, paediatric emergency care, prehospital emergency care, emergency nursing care, and a 'general' section for any other area related to emergency care). An example was provided for each category, and categories were randomised to avoid question order bias. The suggested research topics were then collated

Phase 1. Identifying research topics

- Round 1: Submission of free-text suggestions regarding important research needed in emergency care
- Round 2: Rate agreement of proposed research statements
- Round 3: Determine consensus on research statements

Phase 2. Prioritising research topics

- Round 1: Ranking of agreed research statements
- Round 2: Determine consensus on ranking of statements

Phase 3. Best approach to prioritised research topics

- Round 1: Select the most appropriate method to address the research statements related to study design, funding and collaboration
- Round 2: Determine consensus regarding most appropriate study design

Fig. 1. The Delphi process used to attain a coherent list of research topics for emergency care in SA.

Table 1. Examples to determine rank order of research statements

	Ranked value			Average per statement	Ranking
	Participant A	Participant B	Participant C		
Statement A	1	2	N/A	1.5	1
Statement B	2	3	N/A	2.5	3
Statement C	3	4	3	3.3	4
Statement D	4	1	1	2	2
Statement E	N/A	5	2	3.5	5

N/A = not applicable.

into 123 research statements. Participants were then asked to rate their agreement that each statement was a priority for research in emergency care in SA. A 10-point Likert scale was used, and consensus was achieved when >75% of participants strongly agreed (scores 8 - 10) or strongly disagreed (scores 1 - 3). The mean score for each statement was calculated, while statements completed as 'not applicable' were excluded. Surveys were then individualised, and participants were presented with all non-consensus statements. Both the participant's rating score and the mean rating score for each non-consensus statement were provided to allow participants to consider an alternative rating score.

In phase 2 (prioritising research topics), consensus statements from phase 1 were regrouped into three new categories: (i) pre-hospital; (ii) clinical; and (iii) general systems and safety. Panellists were asked to rank the statements in each category in order of importance. Categories *per se* and statements within each category were randomised to prevent question order bias. Participants could exclude statements by indicating them as 'not applicable' to their area of expertise. Submission was blocked until all statements were either ranked or excluded. The overall rank order per category was subsequently determined. For each participant, the first ranked statement (i.e. most important) was given a value of 1. The lowest-ranked or least important statement received the value of the number of statements in that category less the number of statements selected as 'not applicable'. An average ranking score was calculated for every

statement by adding the values given by all participants, and dividing that by the number of participants that ranked that specific statement; the top ranking statement would therefore have the lowest average score (Table 1).

The ranked statements were presented to the participants. The categories were randomised, but the statements in each category were presented in the order of the average ranking scores achieved. Both the participant's ranking score and the mean ranking score were provided to allow participants to consider an alternative ranking score.

For the final phase (best approach to prioritised research topics), participants were requested to choose one or more study design options. Participants were also given the option of using free text to suggest funding and collaboration options for each statement. Participants were again allowed to select 'not applicable' to exclude themselves from that statement if they considered the topic out of their area of expertise. Only the study design options for each research statement were redistributed to determine consensus.

Collected data were transferred to and analysed on a password-protected electronic spreadsheet (Microsoft Office Excel 2010, Microsoft Corporation, USA).

Results

Seventy-six panel members were invited to participate in the study. Two medical and three nursing panel members appointed

representatives in their place. The response statistics for all study phases are summarised in Fig. 2.

Three hundred and fifty research topics were suggested by 31 participants (41%). The suggested topics were collated into 123 research statements. Seventy-five of the original 76 panel members were invited to rate their agreement of the proposed collated research statements as a priority for research in emergency care in SA (one panel member was unintentionally not invited). Thirty-one (41%) responded, and consensus was achieved for 11 statements. The remaining statements were resented for re-rating. Consensus was achieved for 39 statements after 25 participants (81%) changed their initial scores.

These statements were then grouped into the three categories as described under 'Methods'. One of the statements was only identified late in the study and was subsequently not included. The consensus statements were ranked by 29 panel members (39%). Statements were re-ordered according to their average ranking scores achieved. The

Delphi process used to determine consensus regarding the ranking of the research statements was completed by 19 participants (65%). Tables 2, 3 and 4 provide the final consensus ranking order of consensus priority statements in each category.

The response rate for suggesting study design options was 28% (n=21); only three statements initially achieved consensus. The last round of the study (reconsidering study design options) was completed by 15 participants (71%). An additional 22 statements achieved consensus regarding the most appropriate study design to use (Tables 2 - 4).

One to three suggestions per statement for funding options were received for 32 (84%) of the 38 statements. The NDoH (n=26) and private organisations (n=12) were most often indicated as potential funding sources. One to two collaboration suggestions per statement were provided for 29 statements (76%). Private organisations (n=7) and emergency care-related societies (n=7) were considered as options with which to do collaborative work.

Discussion

Thirty-nine statements related to emergency care were identified as high priorities for the SA setting.

Prehospital emergency care

Prehospital interventions on patient outcomes were ranked first among prehospital research priorities. The need to substantiate clinical care by evidence and to use clinically relevant performance measures was echoed by studies from Europe and the USA, including both adult and child populations.^[7-9] There have been substantial international debates regarding the scope of prehospital care, and it is clear that the issue has not been resolved. The SA emergency medical services system has adopted the Anglo-American system, which minimises on-scene time (as opposed to the Franco-German model, which includes prehospital physicians with an extensive scope of practice and very advanced technology).^[10] A prolonged on-scene time, usually as a result of additional prehospital interventions, has been shown to be detrimental to patient outcomes (especially in trauma); it is therefore important to ensure that only the necessary interventions, backed by substantial evidence, are performed.^[11]

Appropriate management strategies ranked second in the prehospital group. Any prehospital system faces challenges with the acquisition and appropriate allocation of assets and resources, including human resources.^[12] SA has been losing significant numbers of prehospital practitioners with advanced training over the past decade.^[13] Poor working conditions, physical security and economic considerations were identified as some of the main 'push' factors.^[13] Govender *et al.*^[14] also hinted that current measures are inadequate to actively manage the shortages of prehospital practitioners with advanced training and their migration out of SA.

Clinical emergency care

Emergency care (prehospital, medical and nursing) is a procedure-orientated field that

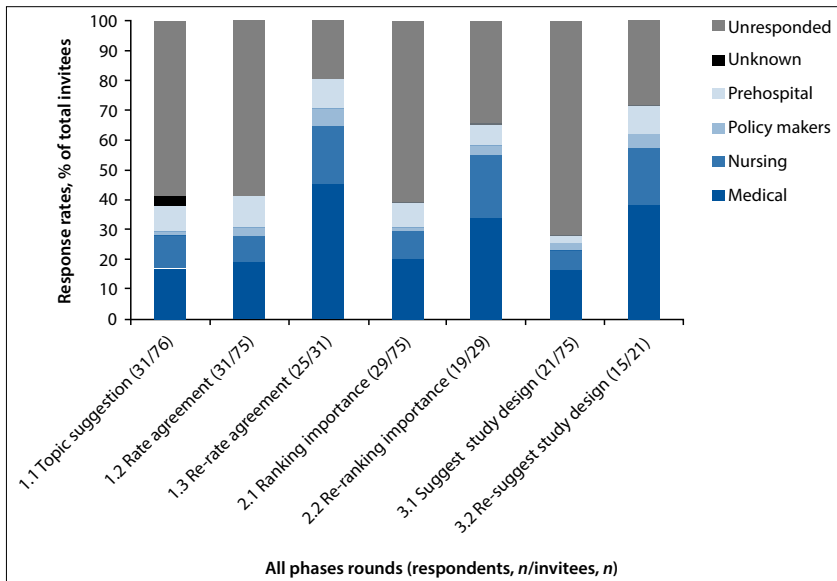


Fig. 2. Summary of response statistics for all study phases.

Table 2. Ranked research priority topics related to prehospital emergency care

Rank	Research statement	Study design
1	Determine which prehospital interventions improve outcomes in trauma or critically ill patients	Randomised controlled trial
2	Determine the most appropriate prehospital management strategies in southern Africa	Systematic review ± meta-analysis
Tie 3rd	Optimise the use of resources in terms of transfers and transport in emergency medical services	Non-consensus
Tie 3rd	Compile evidence-based guidelines for the critical care transfer of patients	Systematic review ± meta-analysis
5	Determine the outcomes of prehospital drug-facilitated intubations	Non-consensus
6	Determine an appropriate mass casualty system for southern Africa	Systematic review ± meta-analysis
7	Implications of the abuse of ambulance services to transport non-emergency cases	Descriptive study
8	Define the role of aeromedical transport in rural areas	Descriptive study

Table 3. Ranked research priority topics related to clinical emergency care

Rank	Research statement	Study design
1	Determine how competent emergency care providers are in performing common lifesaving skills within their scope of practice	Non-consensus
2	Determine whether emergency care providers are competent in recognising and handling a failed airway	Descriptive study
3	Determine the burden of disease and patient conditions that present to the emergency centre	Descriptive study
4	Determine how competent emergency nurses are in recognising critically ill patients	Descriptive study
5	Determine markers of severity in the trauma or critically ill patient	Systematic review ± meta-analysis
6	Determine how competent emergency care providers are in providing paediatric critical care	Descriptive study
7	Develop effective pain management strategies for all acute-care patients	Systematic review ± meta-analysis
8	Determine the knowledge and utilisation of non-invasive ventilation by emergency care providers	Descriptive study
9	Determine the efficacy of nurse-led triage	Non-consensus
10	Determine the need for a national poison information centre	Descriptive study
11	Determine appropriate spinal immobilisation techniques in the SA context	Non-consensus
12	Determine whether paediatric seizures are managed appropriately by all emergency care providers	Descriptive study
13	Determine whether toxicological cases are appropriately managed by all emergency care providers	Non-consensus
14	Determine whether paediatric febrile illnesses are managed appropriately	Descriptive study
15	Determine the impact of low-dose digital X-ray (LODOX) machines on emergency trauma patient management	Non-consensus

Table 4. Ranked research priority topics related to general systems and safety management

Rank	Research statement	Study design
1	Implement and review quality improvement systems	Non-consensus
2	Determine whether evidence-based healthcare is adhered to in providing emergency care	Descriptive study
3	Develop strategies to reduce child and infant morbidity and mortality	Systematic review ± meta-analysis
4	Comparison of the different acute-care systems in order to improve understanding and implement integrated care pathways	Systematic review ± meta-analysis
Tie 5th	Determine whether lifesaving equipment is checked before commencing duty	Systematic review ± meta-analysis or descriptive study
Tie 5th	Determine the cost-effectiveness of providing emergency care	Systematic review ± meta-analysis
7	Determine the true implication of prolonged length of stay in emergency centres	Non-consensus
8	Determine the impact of National Health Insurance on emergency care	Non-consensus
9	Determine efficacy of infection control measures in various acute-care settings	Non-consensus
10	Determine valid and reliable assessment methods for emergency care educational examinations	Non-consensus
11	Determine the efficacy of hospital case load policies	Non-consensus
12	Determine whether informed consent is appropriately undertaken in the emergency care setting	Descriptive study
13	Determine whether adequate emergency centre discharge instructions are given to patients	Descriptive study
14	Determine how emergency care trainees perceive their future in emergency care in southern Africa	Descriptive study
15	Determine the impact of occupation-specific dispensation on recruitment and retention of emergency centre staff	Descriptive study

requires adequate knowledge and skills to diagnose and manage acute aspects of illnesses and injuries.^[15] Overcrowding and prolonged length of patient stay mean that the management of critically ill and trauma patients frequently extends beyond initial stabilisation in the emergency centre when intensive care unit capacity is limited (and exhausted). The consequences were reflected in the research priorities related to clinical emergency care, where statements relating to competence in managing critically ill patients featured repeatedly.

However, SA-trained healthcare providers have always been sought after internationally owing to the high quality and standard of their medical education and their hands-on experience.^[16] The focus on competence is also in stark contrast to other international studies, which highlighted clinical outcomes as their top research priorities.^[17,18] Emergency medicine is still a relatively young specialty in SA, with the focus on competence revealing that it is still establishing its place in the broader medical field.

The burden of disease and patient conditions presenting to emergency centres ranked third in the clinical emergency care section. Knowing the acuity mix of patients presenting to emergency centres is essential to plan service delivery accurately. The efficient deployment of staff relative to temporal patterns of patient presentations and developing strategies for dealing with non-referred minor cases has been highlighted previously.^[19] This information can also help in identifying key areas to optimise patient flow from as early as the initial presentation to the emergency medical service, so that emergencies can be dealt with promptly and appropriately.^[19]

The emergency medicine setting is a unique environment of high patient volumes, brief clinical encounters, and patients from all age groups representing a spectrum of acuity. Risk stratification is the initial step towards a personalised patient care plan to ensure that patients are safely managed and appropriately investigated. Although the identification of appropriate markers of severity (5th-ranked statement) was identified as an international priority,^[17] it would be just as useful, or even more useful, in resource-limited settings. The early identification of disease severity and subsequent focused management of high-risk patients is therefore as important from a healthcare economics point of view as from a morbidity and mortality perspective.

General systems and safety management

The expectation and requirement to deliver safe and high-quality emergency care have never been greater. Healthcare systems are not as reliable as has been thought, and high-quality care is often lacking.^[20,21] Cost-effectiveness of emergency medical interventions and quality assurance are considered global priorities.^[6,21] According to the Institute of Medicine in the USA, a healthcare system should aim to be safe, effective, efficient, patient-centred, timely and equitable.^[20] Components of emergency care that can improve quality and patient safety include well-trained and motivated staff, appropriate physical structures, effective processes to enable high-quality care, co-ordinated clinical pathways supported by best evidence-based practice, and monitoring objective outcome measures to reflect continuous quality improvement (e.g. diagnostic errors, mortality and morbidity rates, etc.).^[22]

Study limitations

Purposeful sampling was used for the panel selection, the criteria being that experts were identified by their specialist qualification and roles as leaders in their fields or heads of academic institutions or societies. Policymakers remained largely non-contactable, limiting the knowledge gained pertaining to policies and resource allocation at provincial or national levels.

Participants in a Delphi study have an interest and involvement in the question being examined. Researcher and subject bias is a known limitation, but the wide range of panellists should offset this. The opinion of a subset of experts with special interests in certain aspects of emergency care (e.g. paediatric emergency care) may have been under-represented.

The lack of participant discussion may have prevented participants from changing their views and responding according to the majority opinion.

Collating free text statements was undertaken in an effort to reduce the number of statements to avoid panel fatigue and attrition. Abstraction may have led to omission of details and potential oversimplification of suggested priority topics.

The response rate and consensus thresholds (75%) mean that final agreement is not implied; guidelines for further research were essentially identified.

Conclusion

This study provides expert consensus on the current priority research areas in emergency care in SA. It can ultimately guide emergency care providers to serve the SA population with evidence-based emergency medical care that is relevant.

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Appendix 1

Invited panel list

Group	Panel member	Position
Medical		
Emergency medicine academic programme head	Prof. Efraim Kramer	University of the Witwatersrand
Emergency medicine academic programme head	Prof. Dries Engelbrecht	University of Pretoria
Emergency medicine academic programme head	Prof. Lee Wallis	Stellenbosch University/University of Cape Town
Emergency medicine academic programme head	Dr William Lubinga	University of Limpopo
Emergency medicine academic programme head	Dr Darryl Wood	University of KwaZulu-Natal
Selected other medical doctors	Dr Hein Lamprecht	Head: Continuous Quality Improvement, Western Cape EMS
Selected other medical doctors	Dr Roger Dickerson	SA College of Emergency Medicine
Selected other medical doctors	Dr Basil Bonner	Emergency physician (private sector)
Selected other medical doctors	Dr Tim Hardcastle	Trauma surgeon
Selected other medical doctors	Dr Steve Holt	Emergency physician (private sector)
Selected other medical doctors	Dr Niël van Hoving	Emergency physician
Selected other medical doctors	Dr P H Hargovan	University of KwaZulu-Natal
Selected other medical doctors	Dr Baljit Cheema	Paediatric emergency physician
Selected other medical doctors	Dr Charl van Loggerenberg	Medical Director: International SOS
Selected other medical doctors	Dr Mike Wells	Emergency physician
Selected other medical doctors	Dr Wayne Smith	Head: Disaster Medicine (Western Cape)
Selected other medical doctors	Dr Heike Geduld	Head: Education (Western Cape)
Emergency medicine-related society	Dr Jonathan Witt for Prof. Walter Kloeck	Head: Research task force team at Resuscitation Council of South Africa
Emergency medicine-related society	Dr Melanie Stander	Emergency Medicine Society of South Africa
Emergency medicine-related society	Dr Elmin Steyn	Trauma Society of South Africa
Nursing		
Academic nursing institutions	Ms Jean Augustyn	Medi-Clinic
Academic nursing institutions	Ms Tanya Heyns on behalf of Prof. Mulder	Senior lecturer: Emergency Nursing at University of Pretoria
Academic nursing institutions	Ms S Schmollgruber for Prof. L Maree	Head: Nursing Education, University of the Witwatersrand
Academic nursing institutions	Prof. S Duma	University of Cape Town
Academic nursing institutions	Mande Toubkin	Netcare
Academic nursing institutions	Prof. B Ncama	University of KwaZulu-Natal
Academic nursing institutions	Janet Bell on behalf of Prof. Marina Clarke	Stellenbosch University
Academic nursing institutions	Dr Doriccah Peu	University of Pretoria
Academic nursing institutions	Dr Carin Maree	University of Pretoria
Academic nursing institutions	Theo Lighthelm	School for Military Health Training
Other nursing professionals	Prof. Petra Bryciewicz	Professional emergency care nurse
Emergency medicine-related society	Lynette Thomas	Emergency care education
Emergency medicine-related society	Kathy Bodmer	Emergency Nurses Society of South Africa
Emergency medicine-related society	Yolande Magerman	Emergency Nurses Society of South Africa
Policy makers		
Prehospital directors	Dr Cleeve Robertson	Western Cape, EMS Director

Continued ...

Prehospital directors	Mr N Sithole	KwaZulu-Natal, EMS Director
Prehospital directors	Mr AK Munilal	Free State, EMS Director
Prehospital directors	Mr A Dhai	Northern Cape, EMS Director
Prehospital directors	Mr T Dlodlu	Gauteng, EMS Director
National government	Mr Peter Fuhri	National EMS, EMS Director
National government	Dr Charles Theu	DoH National EMS Director
Provincial government	Dr Beth Engelbrecht	Western Cape: Deputy-Director General Health
Provincial government	Dr Samuel Beja	Chief Directorate: Clinical Support, Eastern Cape
Provincial government	Dr Theys	Head: Health, Northern Cape
Provincial government	Dr Moji	Deputy Director-General, Free State
Provincial government	Dr Nomonde Xundu	Head: Health, Gauteng
Provincial government	Dr Sibongiseni Dlomo	MEC Health, KZN
Provincial government	Dr Sibongile Zungu	Head: Health, KZN
Provincial government	Dr Clifford Mkasi	MEC Health, Mpumalanga
Provincial government	Dr Lydia Sebegu	Head: Health, North West
Provincial government	Dr Aggrey Morake	Head: Health and Social Development, Limpopo
Prehospital		
Prehospital training programmes	Ian Howard (on behalf of Cheryl Pedersen)	South African Air Mercy Service
Prehospital training programmes	Mr Raveen Naidoo	Durban University of Technology
Prehospital training programmes	Mr W van der Net	COJEMS Training Academy
Prehospital training programmes	Ms A Millum	Academy of Emergency Medical Training
Prehospital training programmes	Mr D J Taylor	Human Emergency Life Programme (H.E.L.P) Emergency Medical Training
Prehospital training programmes	Mr A Malgas	Lebone College of Emergency Care
Prehospital training programmes	Ms Rosslyn Prinsloo	Mankwe Ambulance Training Centre
Prehospital training programmes	Mr Craig Lambert	University of Johannesburg
Prehospital training programmes	Mr N C Gargan	Ambutek
Prehospital training programmes	Mr Ajesh Nundlall	Central University of Technology, Free State
Prehospital training programmes	Dr R Holgate	ER24
Prehospital training programmes	Mr K D Rowe-Rowe	Free State College of Emergency Care
Prehospital training programmes	Mr K Moodley	Western Cape College of Emergency Care
Prehospital training programmes	Mr L D Christopher	Cape Peninsula University of Technology
Prehospital training programmes	Mr S J Mfeka	College of Emergency Care, KwaZulu-Natal
Prehospital training programmes	Mr S Naguran	Durban University of Technology
Prehospital training programmes	Mr A W Muller	Eastern Cape Ambulance Training College
Prehospital training programmes	Mr S M Makwala	Limpopo College of Emergency Care
Prehospital training programmes	Mr N M Zungu	Mpumalanga Ambulance Training College
Prehospital training programmes	Mr R Menkveld	North West Province EMS Rescue Services College
Prehospital training programmes	Mr S Ramduth	Netcare 911 School of Emergency and Critical Care
Prehospital training programmes	Col I Bux	School for Military Health Training
Prehospital training programmes	Mr A Keruparshad	Sharaj Training Service
Prehospital training programmes	Mr Adrian Trollip	Academy of Dynamic Emergency Training
Emergency medicine-related society	Mr Cristopher Stein	Emergency Care Society of South Africa