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A cross-sectional descriptive study of pre-hospital care providers' training, knowledge and skills in austere environments emergency medicine in South Africa: A framework for a consensus statement for Wilderness Emergency Medicine

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PREFACE

This research was motivated by the need to develop wilderness emergency medicine in South Africa, with an increase in local research output and guidelines development, which is congruent with international standards and experience. This originates from local anecdotal experiences of the discrepancies in care offered to patients in varied environments that encompass the domain of wilderness emergency medicine practice.

The premise is that with improved evidence-based care in remote, austere environments, this could have repercussions for improved care in rural and remote general pre-hospital practice in South Africa, with a potential to alleviate the burden to remote clinics and rural district health facilities.

This could potentially improve the outcome for patients that have difficulty in accessing basic health services.

DECLARATION

I, Dr Jaybalan Allan Matthew, declare as follows:

1. That the work described in this dissertation has not been previously submitted to the University of Kwa-Zulu Natal (UKZN) or any other tertiary institution for purposes of obtaining an academic qualification, whether by myself or any other party.
2. That my contribution to the project was as follows:

I drafted the initial proposal which was submitted to both my supervisors for approval and then submitted to UKZN for post-graduate and ethical approval. I subsequently developed the surveys and uploaded it to the online survey tool. I conducted the recruitment and enrolment into the study, as well as collated the data once collected. The data was initially analysed by myself. Subsequent assistance was obtained from Prof Benn Sartorius for reviewing this data analysis. Once the data was analysed, the primary manuscript for publication was drafted by myself for submission to the South African Medical Journal (SAMJ). It was reviewed by both my supervisors and all suggestions and recommendations were incorporated by me. The manuscript was submitted and reviewed by the SAMJ. Their recommendations were included into the revised version of the manuscript by myself. This review also included detailed statistical analysis by Dr Colleen Saunders from the Cape Peninsula University of Technology, who acted as an additional co-author. After acceptance by myself and the co-author of the primary manuscript, as well as that of both my supervisors, the manuscript was submitted for publication to the African Journal of Emergency Medicine (AfJEM), with the change of journals due to the fact that AfJEM had obtained Department of Higher Education accreditation subsequent to the SAMJ submission, and that AfJEM serves a more appropriate

readership. This manuscript has been reviewed and returned for corrections prior to re-consideration.

The second manuscript was drafted by myself as lead author and principal investigator and submitted to both my supervisors for approval. Fundamental statistical assistance was further obtained from Dr Colleen Saunders who opted out of authorship in this manuscript.

This manuscript was also submitted to AfJEM for publication and has been reviewed and returned for corrections prior to re-consideration.

The editorial was drafted by myself and submitted independently to AfJEM on invitation from the Editor-in-Chief, Dr Stevan Bruijns.

The dissertation was drafted by myself and reviewed by my supervisors, with all suggestions and corrections implemented or addressed.

3. That the contributions of others to the project were as follows:

Dr Colleen Saunders provided detailed extensive data analysis and manuscript review for the primary manuscript submitted to AfJEM and acted as co-author to that publication. Drs Roshen Maharaj and Damian Clarke acted as supervisors to the project, providing research guidance throughout, reviewing all submissions and providing recommendations, which were incorporated, and acted as co-authors to the primary and secondary manuscripts which were submitted for publication.



4. Signed _____ Date 19 April 2017

DEDICATION

To Jessica, Keridyn and Thomas for being patient throughout this process and the motivation to persevere.

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LIST OF ABBREVIATIONS

ACEP	American College of Emergency Physicians
ACLS	Advanced Cardiovascular Life Support
ACLS-EP	Advanced Cardiovascular Life Support for Experienced Providers
AfJEM	African Journal of Emergency Medicine
AHCP	Aviation Healthcare Provider
AIDS	Acquired Immune Deficiency Syndrome
AIME	Airway Interventions and Management in Emergencies
ALS	Advanced Life Support
AMLS	Advanced Medical Life Support
ANOVA	Analysis of variance
APLS	Advanced Paediatric Life Support
ATLS	Advanced Trauma Life Support
AWEM	Advanced Wilderness Emergency Medicine
BLS(HCP)	Basic Life Support for Healthcare Providers
BREC	Biomedical Research Ethics Committee
BVM	Bag valve mask
ECP	Emergency Care Practitioner
ED	Emergency department
EM	Emergency medicine
EMRA	Emergency Medicine Residents' Association
EMS	Emergency Medical Service
EMSSA	Emergency Medicine Society of South Africa
FAWM	Fellowship of the Academy of Wilderness Medicine
FCEM(SA)	Fellowship of the College of Emergency Medicine (of South Africa)
HIV	Human Immunodeficiency Virus
HMIMMS	Hospital Major Incident Medical Management and Support
HPCSA	Health Professions Council of South Africa
ICEM	International Conference on Emergency Medicine

ITLS	International Trauma Life Support
LSA	Lifesaving South Africa
MCSA	Mountain Club of South Africa
MIMMS	Major Incident Medical Management and Support
M.Med	Master of Medicine (in Emergency Medicine)
M.Phil.	Master of Philosophy
M.Sc.	Master of Science
NQF	National Qualifications Framework
ORRU	Off-Road Rescue Unit
PALS	Paediatric Advanced Life Support
PBEC	Professional Board for Emergency Care
PHCP	Pre-hospital care providers
PhD	Doctor of Philosophy
PHTLS	Pre-hospital Trauma Life Support
POCUS	Point-of-care ultrasound
SA	South Africa
SAQA	South Africa Qualifications Authority
SAR	Search and rescue
WEM	Wilderness emergency medicine
WEMSSA	Wilderness and Expedition Medicine Society of Southern Africa
WEMT	Wilderness emergency medical technician
WFA	Wilderness First Aid
WFR	Wilderness First Responder
WMS	Wilderness Medical Society
WSAR	Wilderness search and rescue

EXECUTIVE SUMMARY

There is a lack of research into the resource capabilities and capacity for wilderness emergency medicine practice in South Africa (SA). This is despite SA having vast expanses of populated austere geography that remains difficult to access by conventional health care systems and the country increasingly becoming an attractive ecotourist destination.

With increasing needs for skilled health care personnel to deal with medical emergencies in this environment, it is first necessary to determine the extent of the current resources present within SA. This research looked at the human resource potential to deal with medical emergencies in the wilderness emergency environment in SA.

Chapter one considers the conceptual and contextual framework of this research in light of the above and a review of the available literature.

Chapter two presents research from a study that determined the self-reported extent of training, knowledge and skills that capacitated Emergency Care Practitioners (ECP) registered with the Health Professions Council of South Africa (HPCSA) when operating in the wilderness environment and when dealing with medical emergencies.

Chapter three examines data gained from a survey conducted among emergency medicine specialists regarding the competency in knowledge, training and skills that are ideally required in the practice of wilderness emergency medicine (WEM).

Chapter four compares the self-reported knowledge, training and skills of ECPs in the wilderness emergency environment, with what is suggested by emergency medicine specialists as the expected level of knowledge, training and skills for practice in this field.

Chapter five presents a published editorial that highlights the potential value of this specialised WEM practice in resource-limited countries. This editorial suggests that proper wilderness emergency medicine training, knowledge and skills could perhaps be an alternative solution for frugal innovation for resource-limited pre-hospital and in-hospital practice.

There is a need for further training and skills uptake in WEM. Additionally, a local framework for a consensus statement on the practice of WEM needs to be established.

CHAPTER 1: INTRODUCTION

Background and context of the study

Traditional evidence-based emergency medicine training and practice focuses on select resource-appropriate environments, with an emphasis on high-fidelity simulation training.^[1,2] However, human endeavours mandate an understanding of health care needs and priorities in environments far removed from these conventional areas of health care service delivery. This is noted particularly in Australia and in South Africa (SA).^[3,4]

This is especially true when healthcare providers find themselves providing care in austere environments for which they are not trained, such as wilderness and other remote environments. The skill set and knowledge base does not routinely and necessarily prepare healthcare providers for these extreme environments.

Practice in the austere wilderness environment demands a unique and flexible skill set and cognitive framework to deal with medical emergencies in this setting.^[5] There are vast expanses of populated SA still remotely accessible to health care providers, whom themselves have limited access to health services.^[6] There is therefore a need for local health care providers to be suitably trained and skilled with adequate cognitive and technical abilities to appreciate and deal with the risks for patient care in these environments.

Several skills and core knowledge taught under the umbrella of Wilderness Emergency Medicine (WEM) training, can be easily cross-applied in any realm of medicine where there are limited resources.^[5] The difficulty though is that with no single database of human resource capabilities, one cannot be sure of local capacity to deal with any medical emergency in the wilderness field in SA.

There are a few wilderness first aid courses offered in the private sector, and universities that train Emergency Care Practitioners (ECP) do usually include a component on field medical care in austere environments.^[7-9] There is no consistent reference point to determine what the basic skill set, medical knowledge and overall training is available to or should be available to these practitioners in SA.

Core research problem and its significance

In SA, ECPs conduct wilderness search and rescue, and provide emergency medical care to patients in these austere environments. There is no literature documenting the levels of training, knowledge or skills among these health care workers, and there has been no studies to quantify their abilities to deal with emergencies in these remote difficult environments.

This study started with a survey documenting ECPs' abilities to deal with emergencies in these wilderness environments by assessing their levels of knowledge, training and skills, and compared it to what a cohort of emergency medicine specialists would expect to be the fundamental knowledge, training and skills needed. Emergency medicine specialists were selected as a standardised reference group for emergency medical care in the absence of a large group of WEM specialists.

Aim of the study

The aim of this study is to develop a fundamental framework for a future consensus statement for WEM training in SA. This was done by quantifying the level of training, knowledge and skills among ECPs in SA, and by further surveying likely experts in emergency medicine in SA as to what *should* constitute competencies in knowledge, training and skills in this field. The premise that this study is based on is that WEM practice would fall under the scope of emergency medicine in SA, as it does in international academic settings.

Objectives

The first objective was to develop and conduct an online survey of a cohort of ECPs registered in SA, and describe their levels of knowledge, training and skills in general pre-hospital emergency care and specifically in wilderness emergency care.

The second objective was to develop and conduct an online pilot survey of a cohort of emergency medicine specialists as an expert group for pre-hospital emergency care to determine what they would regard as essential knowledge, training and skills necessary for wilderness emergency medicine practice.

Literature review

Concept of Wilderness Emergency Medicine

Wilderness emergency medicine is that field of medicine which, using limited resources, offers remote and improvised care to patients engaged in unique activities in remote locations. These patients may have sustained minor or serious injuries, or become inflicted with usual or environmentally specific illnesses. Alternately, their chronic diseases may have become exacerbated in extreme environments. Typically these incidents are associated with delayed evacuation and prolonged environmental exposure which could result in increased risk to both patients and health care providers.

[10]

Development of Wilderness Emergency Medicine

Historically, human activity in austere wilderness environmental settings that resulted in medical or rescue emergencies, resulted in a primary response of non-medically trained rescue volunteers and professionals, or other service professionals such as law enforcement officers, whose main concern was the search for and rescue of the victims.

[11] Once this was done, the patient was then extracted to field first aiders who did what

they could to stabilise their injuries or medical afflictions before further transfer to appropriate emergent care. [12]

Definitive care was far removed from all of this with victims having to wait days for definitive care in wilderness environments. These unique challenges of both distance and time were further compounded by lack of resources, adverse weather conditions and natural hazards that both the rescuer and patient were exposed to.[12]

As the field of pre-hospital medical practice was introduced and developed, more medical care was taught to practitioners and offered to patients in the wilderness setting. However, this was always seen as an extension of urban pre-hospital care, and the primary goal of this care was the rapid stabilisation and transfer of patients to medical facilities that offered better emergency and definitive care.[12,13]

However, this did not mitigate the fact that definitive care was still delayed, and adapted field care may not necessarily be the answer when facilities are still very far away.[14,15] As an example, inadequacy of adapting conventional urban pre-hospital care in the wilderness setting is particularly noted for pain management.[16] This has resulted in alternate situation-specific options for pain management in austere wilderness medicine settings.[17]

Emergency care providers face a quadruple burden of disease in SA. This is made up of pre-transitional diseases, the emerging chronic diseases, injuries and the Human Immunodeficiency Virus (HIV) / Acquired Immune Deficiency Syndrome (AIDS).[18] This current disease profile necessitates that training for emergency care and emergency medicine providers focus more on this burden of disease demographics. With less, if any, emphasis placed on the austere environment, practitioners facing these situations appear to be at a relative disadvantage from a training perspective.

Wilderness Emergency Medicine developed internationally as a field of emergency medicine that offered more than just field first aid and pre-hospital driven medical care. WEM practitioners could do more for their patients equivalent to most interventions offered in Emergency Departments (ED).^[12,13,19,20]

In-hospital emergency medicine principles and techniques were now expanded into the field where definitive care was most likely to be delayed for wilderness situations. Whereas previously, as an example, pain management in the wilderness emergency environment was only possible with intra-venous opioids, current in-hospital techniques such as regional anaesthesia can be performed during protracted field care of patients where appropriate.^[21] This can even be done under ultrasound guidance in the setting of disasters.^[22]

Indeed, ultrasonography in general has been deployed in the austere environment setting and has proven beneficial.^[23,24] For wilderness specific problems, ultrasonography has been useful in determining volume status in patients with acute mountain sickness as well as identifying pulmonary oedema at high altitude by the visualisation of the “comet tail” phenomenon suggestive of pulmonary oedema.^[25,26]

Based on these hospital-based levels of care, training programmes were then developed within organisations first as wilderness medicine short courses, and then into post-graduate diplomas and Masters programmes done through formal university training.^[13,27] Organisations then began to start and grow throughout the developed world, offering more evidence-based guidance to care in the field.^[12,13,27,28,29]

The need for Wilderness Emergency Medicine training

South Africa is a fast growing developing country, often seen as a playground for ecotourists.^[30] Added to this is the vast expanse of areas that are populated but considered far removed from urban and peri-urban centres, making accessibility a

paramount concern.^[31] When one considers our limited and under-resourced emergency care system, one can appreciate that even in urban centres, emergent care and transport to definitive care could be delayed.^[32]

From a WEM perspective, several organisations internationally have already identified the poor access to similar areas, and despite best efforts from all parties concerned, getting patients from these areas to definitive medical care still poses a challenge.^[12,27,29] One possible solution then is to improve the level of care offered to these patients whilst waiting for long periods for extraction.

Patients in remote and austere wilderness environments present with a multitude of medical illnesses and injuries that, even in urban centres with short transit times, can pose challenges for care. In controlled situations such as on wilderness courses, injury rates are reported as 1,18 per 1000 programme days and illness rates were 1,08 per 1000 programme days.^[33] Whilst no fatalities were recorded on wilderness courses, orthopaedic injuries, gastrointestinal illnesses, and to a lesser extent hypothermia, heat stroke and seizures occurred.^[33] Problems requiring evacuation on these courses were fractures, dental emergencies, tick bite fever and relatively serious orthopaedic injuries.
[33]

In relatively controlled wilderness sporting and mass gathering events, injury and illness rates are 1 to 10 per 1000 person days of exposure.^[29] If these events last many days or are in extreme environments or are very competitive, then the rates approximate 10 to 100 per 1000 person days of exposure. Illness and injury rates approximate 1000 encounters per 1000 race days when professional adventure racers are involved.^[29]

In uncontrolled situations, injuries and illnesses have been more severe, with higher recorded mortalities. In a case series of 100 fatalities, 59% were unintentional trauma and 12% were medical-related mortalities, with 27% being a combination of suicides and homicides.^[34] Whilst 55% of these deaths were witnessed, 80% of these happened

before Search and Rescue (SAR) teams could reach the victims.^[34] There are no published statistics for SA, but it is possible that, with the problem of under-reporting of our incidents, SA would demonstrate at least similar statistics.

Wilderness emergency medicine training

In international remote site and wilderness settings, first responders are trained to at least a minimum level for wilderness care, that of the Wilderness First Aid (WFA) certification.^[27,35] Advanced non-doctor pre-hospital practitioners can even achieve the Wilderness Emergency Medical Technician (WEMT) certification.^[36] However, we do not know what the levels of training are, as most of this information is protected and anecdotal.^[36] There has been a move though to standardise wilderness medicine training internationally, and to develop a scope of practice, although this is restricted so far to lower levels of training.^[37] Certainly in SA, nothing has been published regarding levels of skills, knowledge and training among ECPs providing search, safety, rescue and medical care to patients in wilderness settings.

Rescues in the wilderness setting in SA are usually conducted by a team of varied professionals, most often non-medically trained, which is similar to international trends. This includes fireman, police, military and mountain climbing volunteers. Among the medically trained and qualified rescuers, this is usually first aiders to advanced level life support paramedics, and sometimes medical practitioners.^[38,39,40]

There still remains no formalised training for this in SA. Short courses do exist for wilderness first aid and WEM.^[41] At university level, ECPs are trained in search and rescue in this setting, but the wilderness medicine component is not well emphasised. Practice so far is based on preparing all practitioners for urban and peri-urban care.

International research has already established the need for specialised training for this unique and high-risk environment.^[42,43] In fact, WEM has been established as an

accepted extension of rural medicine in Canada, with relevance not just for medical rescue and rural practice, but for expedition medicine, disaster relief and military medicine in remote environments.^[44]

The foundations of WEM may have been from military operations and exploration, with the military long ago identifying the need to provide the best possible care with limited resources in hostile environments far removed from any and all definitive means of care for soldiers in the frontline.^[45] However, even though these beginnings were from a military background, WEM now finds its place within humanitarian responses to global crises.^[46,47] In fact, global health clinical skills in low resource settings share similar competencies with wilderness medicine competencies.^[46,47]

Conceptual framework

In undertaking this research project, it was important to establish what the role this research was going to play in the improvement of WEM, and medicine in general, in SA. The first realisation was that WEM is a relatively undeveloped concept in SA. There are anecdotally only a few organisations and individual practitioners in the field, but this is without any cohesive academic and research focus.

The establishment of the Wilderness and Expedition Medicine Society of Southern Africa as a special interest group under the auspices of the Emergency Medicine Society of South Africa at the International Conference on Emergency Medicine 2016 in Cape Town provided a platform to bring together all fragmented role-players of this neglected field.^[48]

The Mountain Club of South Africa (MCSA), Wilderness Search and Rescue in the Western Cape Province of SA and the Off Road Rescue Unit are probably the forerunners for wilderness medicine in SA, but their work has not been documented in the literature, and there has been no concerted effort to establish academic output from

the exceptional operational work that has been done.^[49-51] The same applies to organisations such as the MCSA in Kwa-Zulu Natal and RescueTech in Durban, Kwa-Zulu Natal.^[52,53]

Organisations such as WildMedix in Cape Town and Wilderness Medicine KZN in Durban began running formal training courses for commercial gain.^[41,48] Whilst this afforded some intrusion into the conventional training that medical and paramedical practitioners received, it was still fragmented and probably without official academic and research-based support.

Arguably then, if most of medicine was moving towards evidence-based outcomes-focused end points, wilderness medicine has to keep up. One can question how a field of medicine can be brought to the same level as international standards, when locally it has not gotten a basic footing in formal academic circles.

The challenge is for practitioners of WEM to perpetuate this field as an academic and research one, and not an operational extension of other sub-divisions of emergency medicine. This implies a need for a standardised training system that is endorsed by university departments that can embrace this as a specialised field within the greater umbrella of emergency medical care.

To achieve that then would require a standardised conceptualisation of what the training should entail. In order to develop this there needs to be a conceptual document from different role-players.

Firstly, one should establish what the needs are for WEM practitioners to be operational in this setting. This is best achieved through an analysis of what the health care needs are of people that enter into the various wilderness environments in SA. Data are limited in this respect as studies have not documented what emergencies or other health care

priorities exist for people engaging in recreational and other activities in the wild. Future research and literature should detail the health care needs of wilderness visitors.

At least from the perspective of surf rescues, drowning and other related first aid interventions, data is slowly being collected and presented for academic consumption. Lifesaving South Africa (LSA) has made inroads into developing a more robust and reliable data collection system for aquatic injuries and illnesses with the intention of publishing this data for academic consumption (Personal communication, Dhaya Sewduth, Lifesaving SA, 2016).

Preliminary data was presented at various local conferences by members of LSA. This shows that researchers are, to some extent, determining what health care resources and training should be provided to wilderness medicine practitioners insofar as surf rescue, drowning and first aid is concerned.

Unpublished data from RescueTech, a Durban-based high-angle rescue team show some promise for future development of training programmes (Personal communication, Jon Sargood, RescueTech, 2014). Unpublished data from rescuers returning from humanitarian missions in resource-limited austere environments such as the Haiti disaster also show similar trends towards a need for training and education in WEM (Personal communication, Travis Trower, Durban University of Technology, 2015).

Whilst waiting then for epidemiological data to be produced by local researchers, a theoretical standard for WEM practice, and consequently WEM training, can be drafted. This can then be fine tuned once reliable disease-specific data is produced from local WEM epidemiological research.

General methodology summary

A proposal was drafted and submitted for approval to both the post-graduate office and the Biomedical Research Ethics Committee (BREC) of the School of Clinical Medicine of the University of Kwa-Zulu Natal. The proposal is attached as appendix 1. The approval from the post-graduate office and BREC are attached as appendix 2 and 3, respectively. Owing to the length of the project, ethics approval extension had to be obtained in 2016, which is further attached as appendix 4.

This research project was based on online surveys conducted with research participants registered with the Health Professions Council of South Africa (HPCSA) as either specialists in emergency medicine or ECPs. A cross-sectional descriptive approach was adopted, where the ECPs were surveyed as to their knowledge, training and skills levels with regard to various aspects of general and wilderness emergency care. The emergency medicine specialists were surveyed as to what they regarded as important for knowledge, training and skills levels in general and wilderness emergency practice. Detailed methodology is presented in each of the following chapters with regard to the individual arms of the research project. The detailed surveys are attached as appendix 5 and 6.

The next chapter presents the first part of the research study which looks at the levels of knowledge, training and skills of Emergency Care Practitioners in general and wilderness emergency medicine. This was a pilot study reviewing only a cohort of pre-hospital practitioners. The manuscript as presented was submitted to the African Journal of Emergency Medicine (AfJEM) for publication, was returned after review for corrections prior to re-submission, and is currently undergoing author revision.

**CHAPTER 2: EMERGENCY CARE PRACTITIONERS' TRAINING,
KNOWLEDGE AND SKILLS IN WILDERNESS EMERGENCY MEDICINE IN
SOUTH AFRICA**

Emergency Care Practitioners' training, knowledge and skills in austere environments emergency medicine in South Africa: A framework for a consensus statement for Wilderness Emergency Medicine

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Disclaimer

The views expressed in this submitted manuscript are those of the authors and not an official position statement or representation of any of the affiliate organisations.

Conflicts of interest

The authors declare no conflicts of interest.

Abstract

Background. Emergency Care Practitioners respond to wilderness emergency situations in South Africa during their operational duties. However, there is limited data describing the knowledge, training and skills required in these environments.

Objective. To describe the self-reported level of training, knowledge and skills among Emergency Care Practitioners with respect to wilderness emergency medicine practice in South Africa.

Methods. A cross-sectional descriptive survey of registered Emergency Care Practitioners was conducted. Self-reported descriptors of training, knowledge and skills relating to general and wilderness emergency medicine practice were collected.

Results. Of the 241 Emergency Care Practitioners surveyed, one 131 participants completed the survey. The majority of respondents were male and employed in the South African pre-hospital environment. Just over half the respondents were working in the wilderness environment. Emergency Care Practitioners working in the wilderness emergency medicine environment considered themselves to be very knowledgeable in more general emergency medicine topics, but not wilderness emergency medicine topics, compared to Emergency Care Practitioners who did not work in the wilderness emergency medicine environment. Emergency Care Practitioners working in South Africa reported lower levels of self-reported knowledge and skills competency, as well as completion of less training courses compared to expatriate Emergency Care Practitioners. Self-reported skills competency was lower in female Emergency Care Practitioners when compared to their male counterparts.

Conclusion. These observations highlight several areas that require further investigation including the assessment of training opportunities within South Africa in terms of availability and access, as well as understanding barriers to confidence and competency within wilderness emergency medicine in South Africa.

Introduction

Wilderness medicine is that field of medicine which, using limited resources, offers remote and improvised care to patients engaged in unique activities in remote locations who have sustained routine or exotic illnesses or trauma. Typically these incidents are associated with delayed evacuation and prolonged environmental exposure and result in increased risk to both patients and health care providers.^[10]

Historically, human activities in wilderness environments that resulted in medical or rescue emergencies have prompted a primary response from non-medically trained personnel. Typically these incidents are associated with delayed evacuation and prolonged environmental exposure and the primary focus was the physical retrieval and evacuation of patients, with limited focus on their medical needs beyond first aid.^[11]

As the academic discipline of pre-hospital care expanded, Emergency Care Practitioners (ECPs) have been taught diagnostic and therapeutic skills that could be applied in the wilderness environment. However, these skills are seen as extensions of urban pre-hospital care, and the main focus is the rapid stabilisation and transfer to definitive care.^[12,14] With definitive care still delayed, modified conventional urban field care is not always appropriate when facilities are far away.^[14,15]

Providing an improved level of care to patients whilst waiting for evacuation has been identified as a solution to mitigate the effects of poor access to these patients and delayed transfer to definitive care.^[18,28] Internationally, first responders in wilderness emergency settings are trained to at least wilderness first aid level,^[35] and the need for specialised training in this field has been established.^[42,43] In Canada, Wilderness Medicine has been developed as an extension of rural medicine and has relevance for medical rescue and rural practice as well as for expedition medicine, disaster relief and military medicine in remote environments.^[44]

South Africa (SA) is an affordable ecotourism destination and therefore attracts visitors who wish to experience the remote wilderness environment.^[54] In addition, a significant

proportion of the SA population resides in sparsely populated areas that are remote from urban centres.^[55] An overburdened healthcare system has also resulted in unequal access to appropriate pre-hospital care even within urban areas.^[56,57]

Whilst components of wilderness medicine and survival are taught to ECPs at tertiary institutions in SA, there is a lack of published data evaluating this training and the resultant knowledge and skills of the ECPs exiting these training programs. Understanding the current ECPs armamentarium of training, knowledge and skills in the context of wilderness medicine will allow for the identification of focus areas to improve the provision of healthcare services in remote areas of SA.

This is of importance to South Africans living in rural areas as well as in supporting the contribution of ecotourism to the South African economy. The aim of this study was, therefore, to describe the level of wilderness emergency medicine (WEM) training, knowledge and skills among ECPs in SA.

Methods

A cross-sectional descriptive survey was conducted using an online survey tool. Contact details for all ECPs registered with the Professional Board for Emergency Care were obtained from the Health Professions Council of South Africa (HPCSA) in full compliance with the Protection of Personal Information Act (Act 4 of 2013).

ECPs were selected as they are the highest level of advanced life support (ALS) paramedics registered with the HPCSA in SA and they form a relatively uniformly trained group of pre-hospital providers. These ECPs were contacted and invited to participate in an online survey. Other ALS providers were excluded from the study to maintain consistency in verifiable training. Other registered pre-hospital providers not at ALS level were also excluded from the study, again to maintain training consistency.

All respondents completed the online survey after providing informed consent, included in the survey. This study was approved by the Biomedical Research Ethics Committee of the University of Kwa-Zulu Natal (ref. BE508/14).

The online survey tool was developed using the Survey Planet website (www.surveyplanet.com) and was divided into demographic, knowledge, training and skills components. The knowledge, training and skills components were further subdivided into general pre-hospital aspects and wilderness-specific aspects. In particular, the survey included six questions defining the respondent profiles, 24 questions recording knowledge of general and wilderness-specific pre-hospital topics, 15 questions recording information on pre-hospital medicine training, as well as 44 questions recording skills competencies in general and wilderness-specific pre-hospital emergency care procedures (Appendix 5).

For the knowledge component, participants were asked whether they considered themselves to be very knowledgeable, of average knowledge or lacking in knowledge on various aspects of pre-hospital or wilderness-specific emergency care. For the training component, participants were asked whether they had undergone any of a selection of short courses in either general or wilderness emergency medicine. For the skills component, participants were asked whether they had confidence in performing several skills in general and wilderness emergency medicine.

Data was analysed using STATISTICA Version 13 (StatSoft Inc., Tulsa, OK, USA). Demographic variables are presented as percentages of the total number of participants. Knowledge component data is presented as the percentage of knowledge component items for which participants considered themselves to be very knowledgeable, of average knowledge or lacking in knowledge. In addition, a knowledge score was calculated for each individual by allocating zero (0) for “little or no knowledge,” one (1) for “average knowledge” or two (2) for “very knowledgeable”. The knowledge score is the sum of each knowledge component question for each participant with a higher score indicating a higher self-perception of knowledge.

For training and skills components, data is presented as the percentage of training courses completed or skills competencies each participant reported, respectively. Summary data is presented as means and standard deviations. Differences between groups were calculated using one-way analysis of variance (ANOVA), with an alpha value of 0,05. Using an online post-hoc statistical power calculator available at <https://www.danielsoper.com/statcalc/calculator.aspx?id=49>, the power of the study was calculated as 0.8.

Results

Of the 241 ECPs invited to participate in the survey, 131 (54%) agreed to participate and completed the survey. Table 2.1 lists the study participants' summative profile.

Table 2.1: Demographic profile of Emergency Care Practitioners who responded to survey

Characteristic	Number, n (%)
Sex	
Males	95 (72,5)
Females	36 (27,5)
Age Group	
< 30 years	28 (21,4)
31-40 years	78 (59,5)
41-50 years	25 (19,1)
Working location	
SA	109 (83,2)
Not SA	22 (16,8)
Working in the wilderness environment	
Yes	68 (51,9)
No	63 (48,1)

Table 2.2 depicts the percentage knowledge components per sex, age group and working location.

Table 2.2: A summary of the proportion of knowledge component questions for which participants reported different levels of knowledge

Knowledge score (/48)	All knowledge (% of questions)			General knowledge (% of questions)			WEM knowledge (% of questions)			
	None	Average	Very	None	Average	Very	None	Average	Very	
Sex										
Males (95)	26,6±6,0	31,2±15,7	26,1±15,0	42,7±14,5	0,7±3,9	16,3±20,9	83,0±21,2	49,5±24,9	31,9±19,7	18,5±15,8
Females (36)	25,5±5,0	35,8±15,6	24,0±15,3	40,3±10,0	1,5±5,4	17,3±20,3	81,2±21,4	56,3±24,0	28,0±18,4	15,7±11,7
P-value	0,152	0,142	0,497	0,355	0,327	0,801	0,653	0,164	0,297	0,338
Age Group										
< 30 years	26,5±5,2	31,0±15,6	27,4±15,7	41,2±11,6	1,6±5,8	20,6±25,2	77,8±24,9	48,6±24,1	31,4±18,4	20,0±15,3
31-40 years	25,9±5,9	34,3±16,5	23,2±15,4	42,5±12,8	0,6±3,5	14,4±18,9	85,0±19,4	54,5±26,0	28,5±20,3	16,9±13,4
41-50 years	26,8±6,2	28,5±13,1	30,3±15,7	41,2±17,2	1,3±4,9	18,7±20,2	80,8±21,5	44,8±20,1	37,3±16,4	17,9±18,2
P-value	0,730	0,238	0,110	0,903	0,505	0,332	0,240	0,183	0,141	0,643
Working location										
SA (109)	25,6±5,5	34,2±15,4	24,7±15,9	41,1±12,7	1,1±4,8	16,6±19,6	82,3±20,2	54,1±24,0	29,6±19,7	16,3±13,9
Not SA (22)	29,3±6,3	23,9±15,3	29,2±14,3	47,0±15,9	0	16,2±25,8	83,8±25,8	38,2±24,5	37,0±17,1	24,8±17,1
P-value	0,005	0,005	0,227	0,059	0,237	0,925	0,752	0,006	0,104	0,013
Working in the wilderness environment										
Yes (68)	26,3±5,4	34,7±16,1	20,5±14,7	44,7±11,1	0,2±1,3	10,9±15,2	88,9±15,1	55,5±25,7	26,3±20,0	18,2±14,4
No (63)	26,2±6,2	30,0±15,2	30,8±15,0	39,2±15,1	1,8±6,1	22,6±23,9	75,7±24,5	46,9±23,0	35,8±17,5	17,2±15,3
P-value	0,831	0,087	0,0001	0,017	0,036	0,001	0,0003	0,049	0,005	0,704

Values given represent the mean percentage (± standard deviation) of knowledge topics for which participants self-reported to have little or no knowledge (None), average knowledge (Average), or to be very knowledgeable (Very). *P*-values represent one-way analysis of variance between groups. Bold values indicate statistically significant differences between groups.

Participants achieved a mean knowledge score of $26,2 \pm 5,8$ out of a possible 48 points. Participants reported little to no knowledge for $32,5 \pm 15,8\%$, average knowledge for $25,5 \pm 15,7\%$ and very knowledgeable on $42,0 \pm 13,4\%$ of knowledge component questions. There were no significant differences in self-reported knowledge between age groups ($p=0,730$) nor sexes ($p=0,152$). ECP's working in SA reported little to no knowledge for a higher proportion of knowledge component questions ($34,2 \pm 15,4\%$) than those working outside of South Africa ($23,9 \pm 25,3\%$; $p=0,005$).

This was also true when considering only the WEM knowledge topics ($p=0,006$). In addition, ECP's working in SA considered themselves to be very knowledgeable on less WEM knowledge topics ($16,3 \pm 13,9\%$) than those working outside of SA ($24,8 \pm 17,1\%$; $p=0,013$). There were significant differences in self-reported knowledge between ECP's who work in the WEM environment and those who do not. Those working within the WEM environment considered themselves to be very knowledgeable on a higher proportion of knowledge component topics ($44,7 \pm 11,1\%$) than those who do not work in the WEM environment ($39,2 \pm 15,1\%$; $p=0,017$). This was also true for general emergency medicine topics relevant to the pre-hospital environment ($p=0,0003$) but, interestingly, not for WEM knowledge topics ($p=0,704$).

On average, participants indicated that they had completed $34,8 \pm 17,5\%$ of the 15 listed courses related to pre-hospital emergency care. When divided into general training and WEM specific training, participants indicated they had completed $37,4 \pm 18,7\%$ and $24,2 \pm 24,8\%$ of courses, respectively.

Table 2.3 shows the proportion of participants that had successfully completed each of the 15 listed training courses.

Table 2.3: Comparison of the proportion of training courses completed by ECPs working, and not working, in the wilderness environment, and those working in, and outside of, South Africa

Training component	Working in WEM			Current working location		
	No (n=63)	Yes (n=68)	<i>P</i> -value	SA (n=109)	Not in SA (n=22)	<i>P</i> -value
All training courses completed (%)	34,3 ± 17,5	35,2 ± 17,7	0,767	32,5 ± 16,5	45,8 ± 18,7	0,001
General training courses completed (%)	38,0 ± 19,8	36,9 ± 17,8	0,744	35,4 ± 18,0	47,3 ± 19,5	0,006
WEM training courses completed (%)	19,6 ± 21,3	28,4 ± 27,2	0,041	21,1 ± 22,5	39,4 ± 30,2	0,001

Values given represent the mean percentage (\pm standard deviation) of listed training courses completed. *P*-values represent one-way analysis of variance between groups. Bold values indicate statistically significant differences between groups.

There were no significant differences in training between age groups ($p=0,572$), nor between sexes ($p=0,568$). However, participants who were working in SA at the time of the study had completed less of the listed training courses ($32,5 \pm 16,5\%$) than those working outside of SA ($45,8 \pm 18,7\%$; $p=0,001$). Participants who worked in the wilderness environment at the time of the study had completed significantly more ($28,4 \pm 27,2\%$) of the listed wilderness medicine related training courses than those who did not work in the wilderness environment ($19,6 \pm 21,3\%$; $p=0,041$).

Table 2.4 shows the proportion of participants who reported competency in each of the 44 skills listed.

Table 2.4: Comparison of the proportion of self-reported skills by sex and work location

Self-reported skill competency	Sex			Current working location		
	Males (n=95)	Females (n=36)	<i>P</i> -value	SA (n=109)	Not in SA (n=22)	<i>P</i> -value
All skills (%)	70,0 ± 12,4	63,6 ± 9,4	0,006	66,8 ± 11,5	75,3 ± 12,1	0,002
General skills (%)	87,7 ± 8,5	84,0 ± 6,6	0,017	85,3 ± 7,9	93,4 ± 5,8	<0,0001
WEM skills (%)	57,7 ± 16,4	49,5 ± 12,9	0,008	54,0 ± 15,2	62,8 ± 17,7	0,018

Values given represent the mean percentage (\pm standard deviation) of listed training courses completed. *P*-values represent one-way analysis of variance between groups. Bold values indicate statistically significant differences between groups.

On average, participants considered themselves to be competent in $68,2 \pm 12,0\%$ of skills. Participants reported competency in $86,7 \pm 8,1\%$ of general emergency care skills and $55,5 \pm 15,9\%$ of WEM related skills. There were no significant differences in self-reported skill competencies between age groups ($p=0,948$), nor between participants who worked in the wilderness environment and those who did not ($p=0,382$).

However, self-reported competency was indicated for a larger proportion of the skills listed for males ($70,0 \pm 12,4\%$) when compared to females ($63,6 \pm 9,4\%$; $p=0,006$). This was particularly true for WEM related skills (males: $57,7 \pm 16,4\%$; females: $49,5 \pm 12,9\%$; $p=0,008$). In addition, participants working in SA at the time of the study reported competency in less skills ($66,8 \pm 11,5\%$) when compared to those working outside of SA ($75,3 \pm 12,1\%$; $p=0,002$).

Discussion

This study presents a current description of the self-perceived knowledge levels, training undertaken and skills competencies among South African ECPs. On average, we have shown that participants are very knowledgeable on $42,0\%$ of knowledge topics,

had indicated that they had completed 34,8% of the listed courses related to pre-hospital emergency care and considered themselves to be competent in 68,2% of listed skills.

Knowledge levels were variable across general pre-hospital and wilderness-specific topics and this is reflected in international trends as well.^[58] This is most likely due to knowledge decay, whereby knowledge acquired and not used in clinical practice tends to be forgotten over time. This has been previously identified in the literature.^[59]

Unfortunately, a review of the literature did not reveal any significant research with respect to levels of training among paramedics in general and wilderness-specific emergency care in other countries. This paucity of data makes it difficult to draw any comparisons. However, one can probably assume that, in countries with a more robust regulatory environment, with mandatory requirements for all levels of pre-hospital practitioners to participate in continuing medical education, their participation in training courses should be significantly higher than what we found. At least in Ireland 95% of paramedics agreed that Continuing Professional Competence should be mandatory for registration, and that blended learning with clinical and practical skills supplemented by e-learning was preferred.^[60] Journal articles were the least preferred form of training.^[61] We certainly noted less training courses attended among ECPs working within SA and more among those working outside the borders of SA.

Skill levels demonstrated a similar trend with expatriate ECPs reporting greater skills proficiencies. Female ECP's surveyed reported competency in fewer general pre-hospital skills than their male counterparts. This was particularly apparent when restricted to WEM-related skills. As the actual degree of skill competency was not measured in this study, this observation may reflect different perceptions of skill competency between sexes. In particular, females may perceive themselves as being more limited in their physical abilities and less competent than their male counterparts. This was certainly seen among family medicine residency graduates when surveyed about procedures performed.^[62]

Whilst limited by the small number of participants who were not working in SA at the time of the study (n=22), it is interesting to note the differences in self-reported knowledge, training and skills competencies between ECPs working in SA and ECPs working outside of SA. In particular, ECP's working outside of SA had completed more training courses, and reported competency in more skills, than those working in SA at the time of the study.

They also reported to have little or no knowledge for less knowledge topics than those working in SA. This was particularly true when considering WEM based knowledge components, where ECP's working outside of SA also reported to be very knowledgeable on more WEM knowledge topics than those working in SA.

Noteworthy differences in self-reported general and WEM-related knowledge were observed between ECP's who did and those who did not work in the WEM environment. In particular, ECP's who were working in the WEM environment at the time of the study considered themselves to be very knowledgeable in more general knowledge topics, but surprisingly not in WEM specific knowledge topics. There is no evidence in the literature to support this finding, and one would have expected that ECPs working in the WEM environment would have had more WEM knowledge significantly more than their non-WEM counterparts. Certainly for paediatric emergencies, it has been shown that paramedics who spend more time in continuing education activities around paediatric emergency subjects, are more knowledgeable and more comfortable with their skills in dealing with a paediatric emergency.^[63]

The data presented here suggests that ECP's working in the WEM environment were more likely to report little to no knowledge, and less likely to report an average level of knowledge, in WEM specific topics than those ECPs not working in the WEM environment. Given that these ECP's also completed more WEM specific training courses than those not working in the WEM environment, the results may indicate that

experience working in the WEM environment may lead to increased awareness of the required skills and self-awareness of knowledge limitations.

It is therefore reassuring to observe that South African ECP's working in the WEM environment are seeking out relevant and specialised training courses, as seen by the fact that WEM-related courses have been completed by the study group. Industry standards for WEM training and practice are not well established, however international advocates recommend certain competency levels in WEM.^[12,14,15] This is born out of the increasing demands of practicing in that environment.^[11]

The observations reported here suggest that future research in this area should more accurately determine the level of WEM-specific knowledge and skills competency in ECP's working in SA. It should further include non-ECP practitioners who may also be involved in the WEM environment.

With just over half of South African ECP's working in the wilderness environment, and a high chance of exposure to these environments even for ECP's not consistently operating in these environments, it is important to understand the profile of illnesses and injuries in the SA WEM setting. Incorporating this knowledge into local WEM training will increase the preparedness, confidence and competency of ECP's operating in the wilderness environment.

Incidentally, a previous study in SA looking at staff turnover reported similar gender and age demographics for respondents.^[64] However, our study showed different results when compared to other published data regarding where SA paramedics worked.^[65] Approximately 83% of our study population still worked within the country, which is significantly more than the previously reported number of approximately 47%.^[65] This is probably because different subsets of paramedics were recruited for both the studies. Unfortunately, there was limited literature regarding demographic analysis of paramedics in other countries.

The main limitation of this study was that we only surveyed ECPs. A more objective assessment of characteristics of a more varied sample of pre-hospital practitioners working in the wilderness emergency environment would have been ideal, but a self-reported appraisal was easier to measure with a smaller homogenous group and this group was more easily accessible and contactable.

In conclusion, we have shown that ECPs working in the WEM environment tended to have completed more WEM-related training courses than their non-WEM counterparts, but were more likely to report little to no knowledge, and less likely to report an average level of knowledge, in WEM specific topics than those ECPs not working in the WEM environment.

We suspect that the results indicate that experience working in the WEM environment may lead to increased awareness of the required skills and self-awareness of knowledge limitations. Since there was not a substantial number of ECPs actively involved in the WEM environment in SA, and those in such an environment were more likely to be working outside SA, it is possible that ECPs working in WEM environments in SA were not only not undergoing training in WEM-related courses, but were not aware of their knowledge limitations with WEM-specific topics. Furthermore, those ECPs who are working outside the country are more likely to be better trained and more skilful when dealing with WEM emergencies.

We recommend that there be greater inclusion of WEM-related topics in undergraduate ECP training, or that specialised post-graduate courses and certifications be developed to enhance SA ECP knowledge and skills in this field. It may be of benefit to have some element of international collaboration to help develop the training in this field in SA.

Also, as a country offering ecotourist opportunities, part of our responsibility is to understand the health care needs of people engaging in such activities in the wilderness environment in SA. We further need to establish whether these needs are appropriately

met by the competencies of the ECP operating in this setting. We therefore require an initial epidemiological benchmark of what is currently happening in the wilderness environments in SA.

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This study showed that ECPs working in the WEM environment tended to have completed more WEM-related training courses than their non-WEM counterparts, but were more likely to report little to no knowledge, and less likely to report an average level of knowledge, in WEM specific topics than those ECPs not working in the WEM environment.

The results may indicate that experience working in the WEM environment may lead to increased awareness of the required skills and self-awareness of knowledge limitations. Since there was not a substantial number of ECPs actively involved in the WEM environment in SA, and those in such an environment were more likely to be working outside SA, it is possible that ECPs working in WEM environments in SA were not only not undergoing training in WEM-related courses, but were not aware of their knowledge limitations with WEM-specific topics.

We have concluded from this study that those ECPs who are working outside the country are more likely to be better trained and more skilful when dealing with WEM emergencies.

The next chapter presents the second part of the research study which looks at a survey of the opinions of specialists in emergency medicine in SA as a potential expert group, and what they regard as required levels of knowledge, training and skills for wilderness emergency medicine practice.

CHAPTER 3: EMERGENCY MEDICINE SPECIALISTS EXPECTATIONS OF KNOWLEDGE, TRAINING AND SKILLS FOR WILDERNESS EMERGENCY MEDICINE PRACTICE

A survey of emergency medicine specialists on the requisite levels of knowledge, training and skills for wilderness emergency medicine practice in South Africa: A framework for comparison and curriculum development.

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Disclaimer

The views expressed in this submitted manuscript are those of the authors and not an official position statement or representation of any of the affiliate organisations.

Conflicts of interest

The authors declare no conflicts of interest.

Abstract

Background. Wilderness emergency medicine practitioners in South Africa are variably trained and skilled with no consensus as to what this level of training should entail, nor what skills and knowledge are essential for wilderness emergency medicine practice in SA.

Objective. To survey emergency medicine specialists in SA as an expert group as to what should constitute levels of knowledge and skills, and requisite training essential for wilderness emergency medicine practice in SA.

Methods. A cross-sectional descriptive survey of registered emergency medicine specialists was conducted. Descriptors of requisite levels of knowledge and skills, as well as training were collected.

Results. Of the 97 emergency medicine specialists registered with the Health Professions Council of South Africa at the time of the study, 77 completed the survey. For most types of general pre-hospital and wilderness-specific emergency medicine training except ultrasonography, the respondents confirmed these as a requirement. There was consistency for a variety of knowledge aspects, both for general and wilderness emergency medicine topics. General and wilderness emergency medicine skills were considered essential, but not primary health care skills and ultrasonography that may be required for protracted general wilderness care.

Conclusion. These observations confirm the necessity for validated and outcomes-based formal wilderness emergency medicine training in SA.

Introduction

Wilderness medicine is a sub-specialist field of pre-hospital medicine which provides remote and improvised care to patients participating in specific wilderness-related activities who have sustained routine or environmentally specific illnesses or trauma. This is often using limited resources in a protracted time-frame due to delayed evacuation to definitive care. Prolonged environmental exposure places both the patient and the health care providers at risk from environmental hazards.^[10]

Wilderness emergency medicine is a relatively young and developing field of emergency medicine in most countries where it is practiced. It does have a strong academic focus with the *Journal of Wilderness Medicine* first being published in 1990.^[66] This journal represents the publication arm of the Wilderness Medical Society (WMS) formed in 1983, which is recognised as the international authority on environmental medicine.^[67] The journal subsequently changed its name to *Wilderness and Environmental Medicine* and has since then represented academic and operational medical and paramedical practitioners in extreme environments. The WMS, through the journal, has published various evidence-based guidelines on all aspects of environmental and extreme medicine.

Other publications that have helped shape the core content and body of knowledge of wilderness medicine include, *inter alia*, *High Altitude Medicine and Biology* affiliated to the International Society for Mountain Medicine, *Aerospace Medicine and Human Performance* (formerly *Aviation, Space and Environmental Medicine*) affiliated to the Aerospace Medical Association, and *Undersea and Hyperbaric Medicine* representing the Undersea and Hyperbaric Medical Society.^[10]

Contributions to each of these publications are received from experts in the field as well as emerging researchers, and further represents practice and potential curriculum content all over the globe. Countries that have developed wilderness emergency medicine have established societies representing this field, and have further been instrumental in growing the academia through research and publications in these

respective journals.^[68] According to the Emergency Medicine Residents' Association of the United States of America (EMRA), there are thirteen wilderness medicine fellowship residencies in the United States of America alone.^[69]

The WMS, through its Academy of Wilderness Medicine, has established a Fellowship and Masters programme in Wilderness Medicine.^[70] The University of Exeter has developed a Masters in Extreme Medicine, whilst the Royal College of Surgeons of Edinburgh has a post-graduate Diploma in Remote and Off-Shore Medicine.^[71,72]

However, in South Africa (SA), wilderness medicine is a fledgling concept at best, with a few practitioners working in the field, and even fewer practitioners developing the field as an academic and research-based offering. Inroads have been made to introduce the concept to mainstream medical practitioners by the establishment of the Wilderness and Expedition Medicine Society of Southern Africa under the auspices of the Emergency Medicine Society of South Africa.^[73] It has a growing online presence, and further markets short course offerings run by its affiliates and partners. The Environmental Medicine Symposium held in Durban in 2016 under the auspices of the Division of Emergency Medicine at the University of Kwa-Zulu Natal was another step in the right direction for the development of wilderness medicine in SA.^[74]

This synopsis comparing international development of wilderness emergency medicine education with the SA scenario shows us that we are indeed lacking in terms of the progress made in other countries. This leads us to accept the fact that expertise in SA may not be readily available for wilderness medicine practice at the level of our international counterparts but needs to be developed.

However, Emergency Care Practitioners (ECP) have been practising this field in SA, and SA universities training ECPs are including wilderness emergency medicine in their curriculum.^[7-9] Whether this is standardised across all educational institutions is unknown, and a search of the South African Qualifications Authority database online revealed only two standards which is the closest to wilderness emergency medicine practice, related to technical rescue only.^[75,76]

In such a fledgling environment then it becomes difficult to identify local expertise to help create a framework for wilderness emergency medicine practice. One could then appreciate that, with a solution providing a basic foundation, this can always be adapted to suit not only international standards, but can also be adapted for local geographical and resource settings.

Emergency physicians trained in SA should theoretically be able to provide some insight into the requirements of this field as they are trained in pre-hospital medicine. [77-80] It is for this reason that, in the light of not having true expertise in wilderness emergency medicine in SA, practising emergency physicians were selected as the alternative to inform on expected levels of knowledge, training and skills for wilderness emergency medicine practice in SA. The aim then was to survey emergency medicine physicians in SA as the most likely experts, to describe what they thought was important knowledge, training and skills for wilderness emergency medicine practice.

Methods

A cross-sectional descriptive survey was conducted using an online survey tool. Contact details for all emergency medicine specialists registered with the Health Professions Council of South Africa were obtained in full compliance with the Protection of Personal Information Act (Act 4 of 2013). These specialists were contacted by email and invited to participate in the online survey. All respondents who completed the survey did so after providing informed consent, which was included in the online survey. This study was approved by the Biomedical Research Ethics Committee of the University of Kwa-Zulu Natal (ref. BE508/14).

The online survey tool was developed using the Survey Planet website (www.surveypplanet.com) and was divided into demographic, knowledge, training and skills components. The knowledge, training and skills components were further subdivided into general pre-hospital aspects and wilderness-specific aspects. In particular, the survey included 6 questions defining the respondent profiles, 24 questions recording expected knowledge of general and wilderness-specific pre-hospital topics, 15 questions

recording information on expected pre-hospital medicine training, as well as 44 questions recording expected skills competencies in general and wilderness-specific pre-hospital emergency care procedures.

For the expected knowledge component questions, participants were asked what topics they expected ECPs to be very knowledgeable in, to have an average working knowledge of or not essential to have any knowledge in. For the training component, participants were asked whether they expected ECPs to have undergone any of a selection of short courses in either general or wilderness emergency medicine. For the skills component, participants were asked whether they expected ECPs to have an ability and competence in performing several skills in general and wilderness emergency medicine, or not.

Data was analysed using STATISTICA Version 13 (StatSoft Inc., Tulsa, OK, USA). Demographic variables are presented as percentages of the total number of participants. Knowledge component data are presented as the percentage of knowledge component items for which respondents expected ECPs to be very knowledgeable in, to have an average knowledge of or where requisite knowledge was not necessary. In addition a knowledge score was calculated for each respondent by allocating zero (0) for “no knowledge,” one (1) for “average knowledge” or two (2) for “very knowledgeable”. The knowledge score is the sum of each knowledge component question for each respondent with a higher score indicating a higher expected level of knowledge. For training and skills components, data are presented as the percentage of training courses expected to be completed or skills competencies each respondent expected from ECPs, respectively. Summary data are presented as means and standard deviations. Differences between groups were calculated using one-way analysis of variance (ANOVA), with an alpha value of 0,05. The power of the study was calculated post-hoc using an online calculator available at <https://www.danielsoper.com/statcalc/calculator.aspx?id=49> and determined to be 0.7.

Results

There were 97 emergency medicine specialists registered with the HPCSA at the time of this study. Contact details were missing for 7 (7%) of them from the HPCSA database. Of the 90 (93%) contacted, 77 (79%) responded and participated in the survey. Table 3.1 shows the demographic details of the respondents.

Table 3.1: Profile of emergency medicine specialists in the survey

	Number, n (%)
Qualifications	
FCEM(SA) only	40 (51,9)
M.Med (Emergency Medicine) only	3 (3,9)
FCEM(SA) and M.Med (Emergency Medicine)	29 (37,7)
Other non-South African Fellowship in Emergency Medicine	5 (6,5)
Additional MSc (Emergency Medicine)	3 (3,9)
Additional M.Phil (Emergency Medicine)	8 (10,4)
Additional PhD	3 (3,9)
Age	
< 40 years old	33 (42,9)
41 - 50 years old	29 (37,7)
> 50 years old	15 (19,5)
Sex	
Male	51 (66,2)
Female	26 (33,8)
Currently working in South Africa	
Yes	68 (88,3)
No	9 (11,7)

FCEM(SA) Fellowship of the College of Emergency Medicine, M.Med (Emergency Medicine) Master of Medicine in Emergency Medicine, M.Sc. Master of Science, M.Phil. Master of Philosophy, PhD Doctor of Philosophy

Table 3.2 depicts the expectations of knowledge in wilderness emergency medicine concepts in relation to general pre-hospital medicine concepts, which may also have a bearing for wilderness medicine practice.

Table 3.2: Emergency medicine specialists expectations of knowledge for wilderness emergency medicine practice

	Very knowledgeable, n (%)	Average knowledge, n (%)	No knowledge, n (%)
Patient assessment			
Primary and secondary survey	65 (84,4)	12 (15,6)	0 (0)
Primary health care assessment	14 (18,2)	56 (72,7)	7 (9,1)
Resuscitation			
Cardiopulmonary resuscitation	73 (94,8)	4 (5,2)	0 (0)
Haemorrhage control techniques and devices	76 (98,7)	1 (0,3)	0 (0)
Vascular access techniques and devices	73 (94,8)	4 (5,2)	0 (0)
Fluid resuscitation	73 (94,8)	4 (5,2)	0 (0)
Secondary survey priorities			
Wound care	28 (36,4)	46 (59,7)	3 (3,9)
Specific diseases			
Animal bites and envenomation	57 (74)	19 (24,7)	1 (0,3)
Rabies assessment and management	17 (22,1)	58 (75,3)	2 (2,6)
Plant toxicology	56 (72,7)	21 (27,3)	0 (0)
Edible and medicinal plants	64 (83,1)	12 (15,6)	1 (0,3)
Medical emergencies	64 (83,1)	13 (16,9)	0 (0)
Altitude illness	70 (90,9)	7 (9,1)	0 (0)
Cold- and heat-related illnesses	74 (96,1)	3 (3,9)	0 (0)
Submersion / drowning and diving-related accidents	71 (92,2)	6 (7,8)	0 (0)
Avalanche-related injuries	64 (83,1)	12 (15,6)	1 (0,3)
Lightning-related injuries	71 (92,2)	6 (7,8)	0 (0)
Burn injuries	29 (37,7)	48 (62,3)	0 (0)
Trauma	73 (94,8)	4 (5,2)	0 (0)
Orthopaedic injuries	70 (90,9)	7 (9,1)	0 (0)
Tropical diseases	56 (72,7)	18 (23,4)	3 (3,9)
Dental problems	7 (9,1)	53 (68,8)	17 (22,1)
Systems			
Disaster management	69 (89,6)	8 (10,4)	0 (0)

Table 3.3 depicts what training the emergency medicine specialists expected ECPs to have undergone after graduation.

Table 3.3: Emergency medicine specialists expectations of training for wilderness emergency medicine practice

	Yes, n (%)	No, n (%)
Resuscitation		
Basic Life Support for Healthcare Providers (BLS HCP)	76 (98,7)	1 (0,3)
Advanced Cardiovascular Life Support (ACLS) or ACLS for Experienced Providers (ACLS-EP)	73 (94,8)	4 (5,2)
Paediatric Advanced Life Support (PALS) / Advanced Paediatric Life Support (APLS)	64 (83,1)	13 (16,9)
Advanced Trauma Life Support (ATLS) / Pre-Hospital Trauma Life Support (PHTLS)	75 (97,4)	2 (2,6)
International Trauma Life Support (ITLS)	33 (42,9)	44 (57,1)
Advanced Medical Life Support (AMLS)	66 (85,7)	11 (14,3)
Specialty		
Airway Interventions and Management in Emergencies (AIME)	60 (77,9)	17 (22,1)
Point of care ultrasound (POCUS)	19 (24,7)	58 (75,3)
Wilderness specific		
Wilderness First Aid (WFA) / Wilderness First Responder (WFR)	74 (96,1)	3 (3,9)
Advanced Wilderness Emergency Medicine (AWEM) or equivalent	72 (93,5)	5 (6,5)
Systems		
Major Incident Medical Management and Support (MIMMS)	68 (88,3)	9 (11,7)
Hospital Major Incident Medical Management and Support (HMIMMS)	4 (5,2)	73 (94,8)
Helicopter emergency medical operations		
Helicopter safety briefing	75 (97,4)	2 (2,6)
Aviation Health Care Provider (AHCP) or equivalent	73 (94,8)	4 (5,2)
Non-medical training		
Survival training	74 (96,1)	3 (3,9)

Table 3.4 depicts what skills the emergency medicine specialists expected ECPs to be proficient in.

Table 3.4: Emergency medicine specialists expectations of skills for wilderness emergency medicine practice

	Yes, n (%)	No, n (%)
Wilderness medicine specific skills		
Gamow bag (or equivalent) usage	72 (93,5)	5 (6,5)
Packing medical kits for the wilderness or expeditions	77 (100)	0 (0)
Primary health care skills		
Performing urinalysis	18 (23,4)	59 (76,6)
Auroscopy / otoscopy	13 (16,9)	64 (83,1)
Ophthalmoscopy	8 (10,4)	69 (89,6)
Pharyngoscopy	13 (16,9)	64 (83,1)
Dental skills	9 (11,7)	68 (88,3)
Specialty skills		
Point of care ultrasound (POCUS)	25 (32,5)	52 (67,5)
Non-medical skills		
Search and rescue	76 (98,7)	1 (0,3)
Wilderness navigation	76 (98,7)	1 (0,3)
Knots and rope work	76 (98,7)	1 (0,3)
Ski- and snow-rescue techniques	72 (93,5)	5 (6,5)
Mountain rescue operations	77 (100)	0 (0)
Outdoor camp craft	77 (100)	0 (0)
Water purification	73 (94,8)	4 (5,2)
Water collection techniques	76 (98,7)	1 (0,3)
Layering for cold weather protection	77 (100)	1 (0,3)
Swift water rescue	76 (98,7)	1 (0,3)
Radio and communications	77 (100)	1 (0,3)

	Yes, n (%)	No, n (%)
Litter systems and patient transport	77 (100)	0 (0)
Resuscitation		
Chest compressions	77 (100)	0 (0)
Manual defibrillation	76 (98,7)	1 (0,3)
Using an automated external defibrillator	76 (98,7)	1 (0,3)
Bag Valve Mask ventilation	77 (100)	0 (0)
Commercial tourniquet usage	77 (100)	0 (0)
Topical haemostatic agents	76 (98,7)	1 (0,3)
Tactical haemostats bandages	76 (98,7)	1 (0,3)
Intra-venous access	77 (100)	0 (0)
Intra-osseous access	76 (98,7)	1 (0,3)
Commercial chest seal	75 (97,4)	2 (2,6)
Improvised chest seal	77 (100)	0 (0)
Needle chest decompression	77 (100)	0 (0)
Intercostal drain insertion	72 (93,5)	5 (6,5)
Pelvic stabilisation with a sheet	77 (100)	0 (0)
Pelvic stabilisation using commercial device	76 (98,7)	1 (0,3)
Airway management	74 (96,1)	3 (3,9)
Secondary survey considerations		
Splintage using standard devices	77 (100)	0 (0)
Splintage using improvised devices	77 (100)	0 (0)
Irrigate wounds and mechanically debride them	58 (75,3)	19 (24,7)
Wound closure including suturing	58 (75,3)	19 (24,7)
Spinal immobilisation	77 (100)	0 (0)
Spinal clearance guidelines	77 (100)	0 (0)
Bandaging techniques for orthopaedic soft tissue injuries	77 (100)	0 (0)
Local and regional anaesthesia	66 (85,7)	11 (14,3)

We then grouped the questions in each section according to whether they were relevant to general pre-hospital emergency medicine practice or wilderness-specific emergency medicine practice and searched for statistical significance between the different demographic groups of emergency medicine specialists. We found no obvious statistical significance between any of the demographic groups, as depicted in table 3.5.

Table 3.5: Statistical analysis for significance among the different demographic components of emergency medicine specialists

Components assessed (n=77)	One-way ANOVA p-value			
	% Yes ± SD	Sex	Age	SA vs NonSA
Training expected				
General Training	74,24 ± 16,06	0,231	0,173	0,607
WEM Training	95,24 ± 14,01	0,871	0,89	0,811
Total Training	78,44 ± 14,22	0,265	0,203	0,609
Skills expected				
Gen Skills	96,10 ± 4,42	0,852	0,536	0,606
WEM Skills	78,52 ± 9,84	0,421	0,071	0,929
Total Skills	86,72 ± 6,78	0,497	0,108	0,93
Knowledge expected				
General Knowledge	% ± SD	Sex	Age	SA vs NonSA
Little to None	0	0	0	0
Average	14,47 ± 15,80	0,942	0,483	0,321
Very Knowledgeable	85,53 ± 15,80	0,942	0,483	0,321
WEM Knowledge	% ± SD	Sex	Age	SA vs NonSA
Little to None	3,03 ± 5,98	0,264	0,892	0,722
Average	28,74 ± 16,41	0,931	0,302	0,492
Very Knowledgeable	68,23 ± 18,22	0,657	0,305	0,616
Total Knowledge	% ± SD	Sex	Age	SA vs NonSA
Little to None	2,07 ± 4,08	0,264	0,892	0,722
Average	24,20 ± 14,59	0,967	0,363	0,385
Very Knowledgeable	73,73 ± 16,18	0,751	0,384	0,488

Discussion

There is a growing need for evidence-based training in wilderness emergency medicine.^[81] It has been identified not only in conventional emergency medicine curricula, but in other related specialties as well.^[82] Wilderness emergency medicine curricula development has been established internationally and is undergoing constant development, especially for supporting short courses.^[83]

However, even internationally, there is no industry specific standard for what should be expected of ECPs.^[84] Therefore, it can be presumed that locally in SA, there are no established standards either. When one considers the International Federation for Emergency Medicine's model curriculum for emergency medicine specialists, emergency medicine specialists are expected to spend anything between two weeks and six months in pre-hospital medicine.^[85] In 2009, the American College of Emergency Physicians established a wilderness medicine Fellowship Sub-Committee, and subsequently put out guidelines for curriculum development.^[86]

Whilst this is a welcomed initiative, in resource-limited settings where the bulk of the disease burden is not wilderness-related illnesses and injuries, the capacity and motivation to develop wilderness emergency medicine programmes may not be available. However, recent weak evidence does point to the value of certain wilderness emergency medicine skills and knowledge even for resource-limited settings.^[87]

In the light of this we sought to query our only available body of experts to determine what should be the expected levels of knowledge, skills and training for ECPs. The emergency medicine specialists we surveyed in the SA context comprise a relatively homogeneously trained group, with a few outliers qualified outside the country but registered with qualification reciprocity and recognition in SA.

This may not necessarily be the ideal group of experts, as we could not guarantee experience in wilderness emergency medicine practice, but as already explained, our specialists spend at least 3 months in the pre-hospital environment during their registrar training, and each province in SA has access to these experts for wilderness search and rescue advice.

The data we present shows consistency among all demographic sub-groups that we tested (age, sex and location of current employment), with *p*-values all greater than

0.05. Therefore, there was no disagreement of the data when one is planning to use it to further feed into a working model for a wilderness emergency medicine curriculum.

Insomuch as knowledge of wilderness emergency medicine topics are concerned, the consensus is that ECPs should be knowledgeable in general and wilderness emergency medicine topics, but not for primary health care topics which may be relevant in protracted situations of field care. This is divergent with other established programmes in countries where wilderness emergency medicine is seen as an extension of rural and remote medicine and where routine primary health care is already delivered in areas with vast expanses of geography, making it consistent with the definition for wilderness emergency medicine or wilderness medicine in general.^[88]

Our results showed that the respondents agreed that general pre-hospital emergency medicine training was required. They further agreed that wilderness-specific training as well as training that would be indirectly beneficial to the wilderness emergency medicine practitioner was necessary. However, approximately 75% did not believe that ultrasonography was of any benefit in wilderness emergency medicine practice. This is in stark contrast to the proven utility of ultrasonography in the remote and austere setting.^[89-91] Ultrasonography can certainly be used to assist in the diagnosis of wilderness specific emergencies such as high-altitude pulmonary oedema.^[92] It has been shown to withstand extreme environmental conditions and provide useful diagnostic information that assists with patient management.^[93]

From a skills perspective, there was agreement that all aspects of general and wilderness-specific emergency medicine skills were required in wilderness emergency medicine practice. Again, we see the suggestion that point of care ultrasonography and primary health care skills not be included in the required skill set. We can still argue the point here that, whilst our data show the decreased relevance that our cohort of experts placed on these skills in the wilderness setting, the evidence in the literature is to the contrary. This phenomenon is probably multi-factorial. Our expert cohort were not as

experienced as international experts in wilderness medicine practice and were not as familiar with the role of ultrasonography in remote settings or with the need for other primary health care skills in protracted field care.

Despite this discrepancy between our study and the literature, our findings are still convergent with what established curricula suggest for wilderness emergency medicine knowledge, training and skills competencies. We can therefore consider using this as the basis for geographically and resource-appropriate curricula development for wilderness emergency medicine practice, and then compare this to international guidelines before implementation.

Our study was limited in that the only professional society that offers any support in wilderness medicine practice was new, and was not established prior to the study being conducted, and we had to use the highest level of trained emergency medicine provider as an expert panel to survey. There could be biased in that this expert group were not necessarily experts in wilderness emergency medicine as such, but did provide useful information from a pre-hospital perspective. This information can then obviously be developed further.

Another limitation of this study was the lack of a sub-group analysis of why the data showed inconsistencies for ultrasonography and primary health care skills, but on review of the study design after data analysis, it would have been impossible to do, as that data was not specifically collected. This however does pave the way for more research on attitudes towards different additional skills used in the wilderness setting that would not be construed as primarily used for an emergency diagnosis or management, but for protracted field care.

We therefore conclude from our study that SA emergency medicine specialists are, for the most part, in agreement with international consensus on what should form part of

the knowledge base, skills competencies and training profile for ECPs in wilderness emergency medicine practice.

Wilderness emergency medicine is a specialised field of pre-hospital medicine that requires specific training, skills competencies and core knowledge, which does not form part of routine emergency medicine training in South Africa. As such, this exposure is not offered to ECPs who operate in this field and the care that patients in this environment receives is based on conventional urban pre-hospital training.

The surveyed cohort of emergency medicine specialists have agreed, for the most part, that wilderness emergency medicine knowledge, training and skills should form a specific standardised set of components based on the environmental situations practitioners may face. Ideally, these components should form part of a more structured approach to wilderness emergency medicine training, which is congruent with what is happening in this field internationally.

**CHAPTER 4: COMPARISON BETWEEN EMERGENCY CARE
PRACTITIONERS SELF-REPORTED LEVELS OF KNOWLEDGE, TRAINING
AND SKILLS COMPETENCIES WITH EMERGENCY MEDICINE
SPECIALISTS EXPECTATIONS FOR WILDERNESS EMERGENCY
MEDICINE PRACTICE**

This research has thus far shown that, whilst wilderness emergency medicine practice is growing in SA, the actual self-reported levels of knowledge, training and skills among ECPs in the field share some strong contrasts and comparisons with what specialist emergency physicians expect for wilderness emergency medicine practice.

There is a need for a more detailed study with comprehensive analysis of a more representative and larger sample of both pre-hospital care providers practising in the wilderness emergency medicine environment, as well as experts of wilderness emergency medicine practice with experience in the field. Unfortunately, if one knows the field of wilderness emergency medicine in SA, one would be familiar with two important limitations to this study. Firstly, there is no cohesive and representative sample of a large group of pre-hospital providers practising wilderness emergency medicine in SA. Secondly, there is no large expert body of experienced wilderness medicine specialists practising in SA.

Indeed, the highest recognised qualification for wilderness emergency medicine internationally is the Fellowship of the Academy of Wilderness Medicine (FAWM).^[94] To date, in SA, there are only two doctors who have attained this fellowship, and only towards the latter half of 2016. Other doctors and paramedics have been practising this field, but from other specialties, and without a formally recognised qualification. Therefore, to include the few that have been practising this field may have added insight into the requirements for wilderness medicine practice in SA, but these were based on experience and working knowledge, and not based on any formal qualifications. Future research will obviously need to consider their input though, as the risk of excluding

them from improving wilderness medicine education would be detrimental to practice development.

Nonetheless, using the study groups as this study has done, has shown some important patterns, which this chapter will aim to compare and contrast. When asked how important it was for ECPs to be able to conduct a full primary and secondary survey in medical, paediatric and trauma patients, 84.4% of the emergency medicine specialists regarded it as very important, whilst 15.6% regarded it as important. When the ECPs surveyed were asked if they could perform a full primary and secondary survey in medical, paediatric and trauma patients, 96.2% were confident that they could do this completely, whilst 3.8% thought that they may forget parts of the assessment, and hence not be able to conduct a full primary and secondary assessment.

Using this as a test question then, and to illustrate the comparison method used, one can see that the self-reported ability to perform this task with sufficient knowledge and clinical acumen exceeded the suggestions of the emergency medicine specialists polled.

This comparison system is understandably crude, and begs more detailed analysis, specifically for statistical significance, but it was not the researcher's intention to be detailed here, as the basis for the information itself was a self-reported representation with its potential biases and the comparator was an untested expert group.

The self-reporting of any clinical or other knowledge, skills or competencies opens the analysis up to fundamental flaws in the bias that can occur. The Dunning-Kruger effect is a major consideration here. The Dunning-Kruger effect is a form of cognitive bias where individuals with a decreased ability to perform tasks have a belief that they are superior in their ability to perform that task. Dunning and Kruger explained this as an inability of those of inferior ability to recognise their incompetencies or to assess their competencies accurately.^[95]

Nonetheless, with this factor taken into consideration, there is still useful data that can be obtained from this comparison. Table 4.1 shows representative examples from the data set of general pre-hospital and wilderness-specific data for both what the emergency medicine specialists regard as absolutely required knowledge, and for what the ECPs self-reported as extremely knowledgeable in.

Note that lower levels of importance or self-reported knowledge have been excluded from this table for ease of reviewing, but the full data set as pie charts for each question asked in the knowledge section is included in the appendix. This table is merely for comparison only, and the reader is urged to review both data sets in the appendix.

Table 4.1: Representative general pre-hospital and wilderness-specific data sets and comparisons of emergency medicine specialists expectations for and ECPs self-reporting of knowledge aspects

Representative question from data set	Emergency medicine specialists who regard this as most important, n (%)	ECPs who reported themselves as most knowledgeable, n (%)
Primary and secondary survey	65 (84,4)	126 (96,2)
Resuscitation skills	73 (94,8)	126 (96,2)
Haemorrhage control in the austere environment	76 (98,7)	104 (79,4)
Vascular access in the austere environment	73 (94,8)	116 (88,5)
Wound care in the protracted field care scenario	28 (36,4)	5 (3,8)
Animal bites and envenomation	57 (74)	7 (5,3)
Rabies	17 (22,1)	4 (3,1)
Plant toxicology	56 (72,7)	1 (0,8)
Altitude illness	70 (90,9)	27 (20,6)
Cold- and heat-related injuries	74 (96,1)	40 (30,5)
Submersion and diving-related injuries	71 (92,2)	37 (28,2)
Avalanche related injuries	64 (83,1)	7 (5,3)
Lightning related injuries	71 (92,2)	30 (22,9)
Primary health care assessment	14 (18,2)	24 (18,3)
Tropical diseases	56 (72,7)	3 (2,3)
Dental assessment and management	7 (9,1)	1 (0,8)

Clearly then one can see that there is an obvious lag between what ECPs know for wilderness medicine practice, and what emergency medicine specialists expect them to know.

Table 4.2 shows representative examples from the data set of general pre-hospital and wilderness-specific data for both what the emergency medicine specialists regard as training that was absolutely required, and for what the ECPs self-reported as training completed.

Note that the full data set as pie charts for each question asked in the training section is included in the appendix. This table is merely for comparison only, and the reader is urged to review both data sets in the appendix.

Table 4.2: Representative general pre-hospital and wilderness-specific data sets and comparisons of emergency medicine specialists expectations for and ECPs self-reporting of training completed

Representative question from data set	Emergency medicine specialists who regard this as most important, n (%)	ECPs who reported themselves as training completed, n (%)
Wilderness first aid or wilderness first responder	74 (96,1)	13 (9,9)
Advanced wilderness emergency medicine	72 (93,5)	11 (8,4)
Survival training	74 (96,1)	71 (54,2)

Again, one can see that there is an obvious lag between what wilderness-specific training ECPs have completed, and what emergency medicine specialists expect them to have completed.

Table 4.3 shows representative examples from the data set of general pre-hospital and wilderness-specific data for both what the emergency medicine specialists regard as

absolutely essential skills for wilderness emergency medicine practice, and what the ECPs self-reported as extremely competent in.

Note that lower levels of importance or self-reported competencies have been excluded from this table for ease of reviewing, but the full data set as pie charts for each question asked in the skills section is included in the appendix. This table is merely for comparison only, and the reader is urged to review both data sets in the appendix.

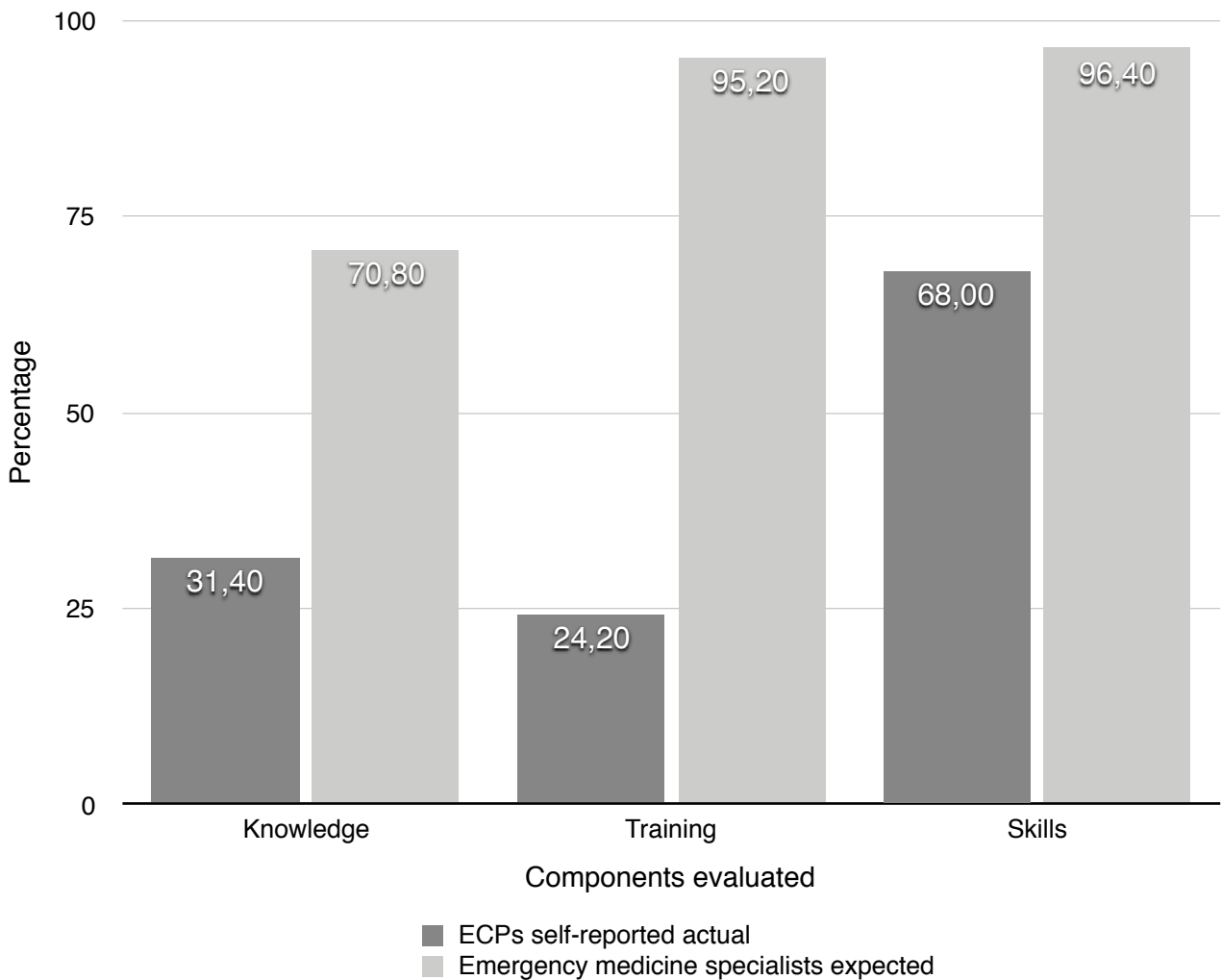
Table 4.3: Representative general pre-hospital and wilderness-specific data sets and comparisons of emergency medicine specialists expectations for and ECPs self-reporting of skills competencies.

Representative question from data set	Emergency medicine specialists who regard this as most important, n (%)	ECPs who reported themselves as most competent in skills, n (%)
Improvised splintage	77 (100)	130 (99,2)
Protracted field wound management	58 (75,3)	46 (35,1)
Gamow bag	72 (93,5)	24 (18,3)
Search and rescue	76 (98,7)	124 (94,7)
Wilderness navigation	76 (98,7)	118 (90,1)
Knots and ropework	76 (98,7)	124 (94,7)
Spinal clearance guidelines	77 (100)	72 (55)
Ski- and snow-rescue techniques	72 (93,5)	11 (8,4)
Mountain rescue	77 (100)	95 (72,5)
Camp craft	77 (100)	107 (81,7)
Swift water rescue	76 (98,7)	118 (90,1)
Improvised patient litters and carries	77 (100)	100 (76,3)

Yet again, one can see an obvious lag between what ECPs can do in wilderness medicine practice, and what emergency medicine specialists expect them to be able to do.

If one were to regard these representative questions as key knowledge, training and skills aspects for wilderness medicine practice, and then to average the percentages for both emergency medicine specialists and ECPs, a graphical display of the comparison will probably better reflect the discrepancies that is being shown, as in figure 4.1.

Figure 4.1 Graphical representation of the average percentages for key knowledge, training and skills competencies expected and actually self-reported.



This chapter reviews a specific aspect of the data collected, insomuch as actual wilderness emergency medicine practice is concerned, and clearly shows that, despite there being limitations in the sample itself, there is an obvious deficit between what emergency medicine specialists expect ECPs to know, be trained in, and to be skilled at, and what these self-reported levels actually are.

As already stated, whilst this study does have limitations, it does point out a noticeable difference between what ECPs who potentially work in the wilderness emergency medicine environment have in terms of knowledge, training and skills competencies, with what is expected for wilderness emergency medicine practice.

Why is this of relevance though in a health system with more serious health demographics and disease burdens unrelated to wilderness emergency medicine practice? Unfortunately, health systems that are overwhelmingly burdened with devastating disease patterns are invariably systems that are resource-restricted.

These are health systems that may benefit from wilderness medicine knowledge, training and skills competencies, as this cognitive approach to practising medicine is based on the premise of limited physical resources. This may then have a positive benefit for patient management, as it depends on a novel approach to patient care that is knowledge- and skill-based as opposed to equipment- and resource-oriented.

The following is an editorial published in the African Journal of Emergency Medicine explaining the potential benefits of wilderness emergency medicine for resource-limited medical practice.

CHAPTER 5: EDITORIAL



EDITORIAL

The role of wilderness medicine training in resource-limited settings



Richard III cried out “A horse, a horse! My kingdom for a horse!” in the play of the same name, undoubtedly because it was a much needed resource that he did not have, and would have to overcome his enemies by improvising during the battle [1]. Resource limitations in emergency medical care demand that we perpetually consider and reconsider ways to improve the quality of that care. Resource limitations can usually be classified similar to a surge capacity assessment, i.e. lack of essential equipment (stuff), trained professionals (staff), space restrictions (structure), and appropriate systems to manage patients (systems) [2]. Within the majority of African emergency care settings, resource limitations involving one or more of these are challenging to say the least. Clinicians navigating these health care restrictions (whether in-, or outside the hospital) have to be both smart and innovative in order to render care of a reasonable standard without compromising safety. Often these solutions are born of need, and although not ideal, necessity tends to be the mother of all invention.

Finding safe workable solutions in some of the most onerous settings during protracted times of resource limitation are key variables that define wilderness medicine [3,4]. The only difference between wilderness medicine (as it is practiced in remote areas) and emergency medicine (as it is practiced in low- and middle-income emergency centres) is the environment it is practiced in. Naturally, wilderness medicine encompasses a select group of illnesses and injuries peculiar to an extreme austere environment [5,6]. However, the basis of both fields is a system of common sense undifferentiated patient management, practiced within a less than ideal setting and with very little diagnostic and therapeutic tools to boot. If one ignores the environment, the two are practically indistinguishable. It therefore seems reasonable to suggest that wilderness medicine training can also prepare clinicians practicing in African emergency care by developing the type of on-your-feet thinking required to function effectively when resources are few.

To contextualise the potential role of wilderness medicine in African emergency care training, we might have to reconsider the classification of resource limitations, listed earlier. Wilderness medical care providers will attest to managing patients with very little resources for long periods of time using a few basic principles. Two of these principles are multi-functionality and cross-functionality [7]. Multi-functionality describes equipment that can be used for more than one element of a patient’s care, e.g. a simple intravenous giving set can also double as a rudimentary percutaneous

crico-thyroidotomy kit. In other words, a device with several different potential uses reduces the need to carry multiple devices with few uses [8]. Ketamine is an example of a drug that has many uses, from analgesia to sedation and rapid sequence induction [9]. Cross-functionality on the other hand describes the use of multiple items for similar tasks so that in the event that one item is not available, care can still be delivered using an alternate item, that was essentially carried for a different use. Simple plastic bags can be used as rudimentary gloves in the event that standard medical gloves are not available, or high-pressure wound flushing devices in lieu of syringes, over and above their other primary functions.

Working in remote wilderness settings prepares providers to work in relative isolation. This is done through exposure to and encouragement of a fair amount of self-reliance, and psychological resilience skills. Wilderness medicine providers are also trained to perform tasks alone that would usually require several other persons. For instance applying a pelvic binder can be easily applied by just one person, by first tying a knot, then placing a firm rod or a stick over the knot, and tying a second knot over that. The makeshift binder can now be tightened using the windlass technique to tighten the knot [10,11]. The need for self-reliance, and psychological resilience skills are not too different from the staff shortages African emergency care providers are exposed to on a regular basis (Fig. 1). Working in every compartment from a boat to the inside of helicopter, space is often considered a premium. Wilderness medicine providers are exposed to risk and error in an unforgiving environment. A lapse in concentration in patient management could mean harm to both the patient and the provider. Wilderness medicine providers incorporate aspects of aircraft crew resource management and tactical team based standard operating procedures to improve human resource efficiency and thereby reduce errors in wilderness rescue and patient care [12]. The result of wilderness medicine training is a unique group of systems thinkers, who are able to address clinical problems using limited inputs whilst maximising outputs for optimal patient outcome. System thinking, including practical aids such as challenge-and-response checklists, would not be out of place in a low- or middle- income emergency centre setting.

Wilderness medicine is not just a peripheral field in emergency medicine; it also includes a deeper understanding of the utility of assessment and interventions, in the face of reducing wastage of time and physical resources, within the limitations of a restricted capacity environment. It basically offers the soft skills, to support African emergency care workers in thinking outside the box. It is not meant to be viewed as a service replacement, but rather as a systems approach in limited resource settings, to improve



Fig. 1. The author with advanced wilderness medicine instructors learning improvised care in disaster settings.

efficiency with minimal quality and safety trade-offs – such as the vast majority of African emergency centres. Whilst a high-angle rescue off a cliff face may be the initial attraction for adrenaline-seeking individuals, the true value of wilderness medicine training lies in providing highly refined, system-oriented thinking for regular emergency care providers working in limited resource environments. It is for this reason that it should at least be considered for inclusion in training programmes.

Conflict of interest

The author declares no conflict of interest. The views expressed in opinion pieces do not necessarily reflect the views of the African Journal of Emergency Medicine or the African Federation for Emergency Medicine and are solely the opinion of the author.

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This editorial is an introduction to the value of wilderness emergency medicine training in the management of patients without wilderness-related problems, but within the confines of a resource-restricted health care system.

What is left then is for health educators to develop a value system of wilderness education that does not just benefit a select few wilderness participants who succumb to wilderness-related problems or other problems in the wilderness setting, but a system that trains health care workers in a cognitive approach that empowers them to operate in resource-limited environments, without compromising on patient care standards or outcomes to any significant extent, where there would be adverse effects on patients.

CHAPTER 6: SYNTHESIS: SUMMARY OF FINDINGS FROM THE RESEARCH STUDY

Anecdotal evidence has shown a discrepancy in the levels of knowledge, training and skills amongst ECPs in the wilderness emergency medicine environment. There are also not many options for training in wilderness emergency medicine in SA. Furthermore, it is believed that conventional emergency medicine and emergency care training is more than adequate to deal with emergencies in the wilderness setting.

Organisers of special events with extreme athletes in austere environmental conditions also do not place any emphasis on appropriate medical care. Their presumption is that, if basic medical care is available, then this should suffice. This inadequate preparation became obvious amongst pre-hospital, and specifically amongst members of the wilderness medicine community, during unfortunate incidents involving scholars in two different episodes on the same wilderness expedition.^[96]

This study was then developed and carried out as a pilot study to determine what would be the approach to assessing levels of knowledge, training and skills of ECPs for wilderness emergency medicine practice, and to compare this with what emergency medicine specialists in SA thought was necessary knowledge, training and skills required for wilderness emergency medicine practice.

As a pilot study there are probably few conclusions that can be drawn from this. Certainly, further research needs to be done in this field. It nonetheless does provide a very useful starting point for more detailed research.

There are also some patterns that have come out from this research despite its limitations. This research presents a current description of the self-perceived levels of knowledge, training undertaken and skills competencies among South African ECPs as relevant to wilderness emergency medicine practice.

The data presented in this study suggests that ECP's who were working in the WEM environment were more likely to report little to no knowledge, and less likely to report an average level of knowledge, in WEM specific topics than those ECPs not working in the WEM environment.

Modifications of the Dunning-Kruger effect may bias this further whereby knowledgeable and skilful individuals may actually downplay their levels of knowledge, training and skills, the so-called Imposter Syndrome.^[97] It is further noted that ECP's working in the WEM environment also completed more WEM specific training courses than those not working in the WEM environment, and the results may indicate that experience working in the WEM environment may lead to increased awareness of the required skills and self-awareness of knowledge limitations.

It is re-iterated then that observations reported here can only suggest that future research is required in the field of competency levels for wilderness emergency medicine practice as is setting standards for assessing and training towards appropriate competency levels for wilderness emergency medicine practice in SA.

It was further determined that there is no data published on the spectrum of wilderness-related medical problems in SA and this also needs to be addressed in future research. This would obviously inform any further training and competency levels assessments for wilderness emergency medicine practice in SA.

Concerning the first part of this study, the level of knowledge, training and skills competencies as self-reported by a homogenous cohort of ECPs were looked at, and it was found that those who are working outside SA are more likely to be better trained and more skilful when dealing with WEM emergencies.

In the second part of this research, a study was conducted of an available group of potential experts to determine what should be the expected levels of knowledge, training and skills necessary for wilderness emergency medicine practice.

With regard to knowledge of wilderness emergency medicine topics, the consensus was that ECPs should be knowledgeable in general and wilderness emergency medicine topics, but not for primary health care topics. This was not congruent with other established programmes in countries where WEM is seen as an extension of rural and remote medicine and where routine primary health care is already delivered in areas with vast expanses of geography, such as Australia.^[88]

The study further showed that the emergency medicine specialists surveyed agreed that general pre-hospital emergency medicine training was required. They further agreed that wilderness-specific training as well as training that would be indirectly beneficial to the ECP was necessary, such as survival training.

However, the majority did not believe that point-of-care field ultrasonography was of any benefit in wilderness emergency medicine practice, despite international literature to the contrary. There was further agreement that all aspects of general and wilderness-specific emergency medicine skills were required in wilderness emergency medicine practice. Point-of-care ultrasonography and primary health care skills were not however included in the set of requirements for skills competencies.

This part of the research then pointed out that SA emergency medicine specialists are, for the most part, in agreement with the international consensus on what should form part of the knowledge base, skills competencies and training profile for wilderness emergency medicine practice. However, a Delphi study in the future would probably provide more reliable data in this respect, as this was a single survey conducted to gain opinion. This is a limitation, in itself.

The study also attempted to compare the data sets and determined that, specifically for wilderness emergency medicine practice, there is an obvious deficit between what emergency medicine specialists expected ECPs to know, be trained in, and to be skilled at, and what the reality actually reflected.

The researcher agrees on the limitations of the study, but there are notable patterns and conclusions derived from this that cannot be ignored, and at the very least, suggest that further research is required to test the significance of these findings with a larger study.

If the reader can appreciate for the moment that these findings need to be taken into consideration, then the conclusions drawn need to be enumerated.

CONCLUSIONS

South African ECPs working in the wilderness emergency medicine environment are not as knowledgeable, skilful or appropriately trained for WEM practice, despite them being knowledgeable, skilful and appropriately trained for general pre-hospital emergency medicine practice. Unfortunately, when they are registered in SA, but work internationally, they are more inclined to be better trained for wilderness emergency medicine practice, although they report lower levels of knowledge.

There needs to be a determination of what the illness and injury profile for wilderness emergency medicine practice is before one can draw significant conclusions from this. This research has compared knowledge, training and skills based on experiences internationally. One cannot conclude that local ECPs are then adequately knowledgeable, trained or skilful if the local wilderness medicine illness demographic is significantly different from the international arena. Nonetheless, a fundamental assumption has been made that whilst there would be geographically distinct disease profiles, the core body of knowledge and skills competencies would be the same for the field of wilderness emergency medicine, irrespective of where it is practised.

One furthermore needs to also develop study protocols and conduct research that includes a larger population of pre-hospital practitioners who practice WEM, other than ECPs. When developing standards, one also needs to include experts in the field that are not emergency medicine specialists, but who have been practising WEM significantly enough to be recognised as experts in the field. Alternatively, one must include people with qualifications recognised internationally as expertise for wilderness emergency medicine practice, but which is not necessarily recognised in SA.

This study does pave the way for significant research in the field of wilderness emergency medicine in SA. One must appreciate that, at best, this serves as a pilot study, and that the study protocol itself has to be reviewed to include a more inclusive study population for both wilderness emergency medicine pre-hospital practitioners, as well as experts in the field of wilderness emergency medicine. There are further suggestions that can be derived from this research as well.

RECOMMENDATIONS

This study was the first of its kind in SA, and it opens up the avenue for further research in this field. There are a few recommendations that can be determined from this.

Firstly, more detailed research should be conducted of a larger cohort of pre-hospital providers of all levels of training and registration. This research should detail their levels of training, knowledge and skills for wilderness emergency medicine practice.

Secondly, a more specific cohort of wilderness medicine experts should be sought for a more reliable description of what should be expected for pre-hospital practice. Perhaps, as already alluded to earlier on, a Delphi study should be conducted in future research to determine more specifically what should be included in the knowledge base, training curriculum and skills set for wilderness emergency medicine practice.

Furthermore, it is logical to presume that one needs to understand the disease demographic that affects wilderness environment participants, and residents in remote, austere areas within SA. The wilderness environment itself is vast, and epidemiological research needs to span drowning mortality and morbidity data; diving related injuries; animal attacks in remote areas including snake bites, spider bites and scorpion stings; plant toxicology; wilderness search and rescue activities; alpine-related injuries and illnesses and primary health care in remote locations. Epidemiological review must also consider endurance sporting events in remote, austere environments.

Once this has been established, one can then consider this as one part of an information feeding system into a larger consensus statement for wilderness emergency medicine practice in SA. This will then obviously inform a better appreciation of what should be expected of wilderness medicine practitioners in general and ECPs specifically in SA. This will then subsequently inform training for basic and advanced wilderness emergency medicine practice.

It is then possible that two things will stem from this. Firstly, an appreciation that wilderness emergency medicine practice is recognised for what it can offer to conventional medical practice in resource-limited areas. Secondly, and more importantly, is that a formal training programme is offered in SA at the appropriate National Qualifications Framework (NQF) level, for wilderness medicine education, and that this training programme will form the benchmark for what should be the minimum level of training for both paramedical and medical practitioners in the field of wilderness emergency medicine.

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APPENDICES

1. Research proposal

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A cross-sectional descriptive study of pre-hospital care providers' training, knowledge and skills in austere environments emergency medicine in South Africa: A framework for a consensus statement for Wilderness Emergency Medicine.

Research Proposal for the Degree of Master in Medical Science

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EXECUTIVE SUMMARY

There has not been much research into the resource capabilities and capacity for austere environments emergency medicine practice in South Africa, especially in the field of wilderness emergency medicine. This is despite our country having vast expanses of populated austere geography that remains difficult to access by conventional health care systems, as well as our country increasingly becoming an attractive ecotourist destination.

With increasing needs for skilled health care human resources to deal with medical emergencies in this environment, it is our first challenge to determine what our capacity and capabilities are.

This research will provide a reflection of the human resources potential to deal with medical emergencies in the wilderness emergency medical environment in South Africa. A survey will be conducted of all practising pre-hospital care providers, both registered with the Professional Board for Emergency Care Practitioners and the Medical and Dental Board of the Health Professions Council of South Africa. This survey will seek to determine the extent of training (including experience), knowledge and skills that capacitates our health care providers when operating in the wilderness environment in dealing with medical emergencies.

Another survey will gain opinion from experts as to what should constitute competence in knowledge, training and skills in the field.

The project will culminate in the quantification of our collaborative training,

knowledge and skills into a database and to draw relevant conclusions regarding any potential shortcomings to address to improve our level of care to patients in this austere environment. This should form a framework for a consensus statement for future reference when developing training programmes for this field.

Keywords:

Wilderness medicine training, wilderness medicine skills, wilderness medicine education, wilderness medicine competencies

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1. DEFINING THE RESEARCH PROBLEM

Traditional evidence-based emergency medicine training and practice focuses on select resource-appropriate environments. However, human endeavours mandate an understanding of health care needs and priorities in environments far removed from these conventional areas of health care service delivery. This is especially true when we find ourselves providing care in austere environments for which we are not trained, such as the wilderness and remote environments. Our skill set and knowledge base does not routinely and necessarily prepare us for these extreme environments.

Practice in the austere wilderness environment demands a unique and flexible skill set and cognitive framework to deal with medical emergencies. With vast expanses of populated South Africa still remotely accessible to health care providers, and with the further increase in recreational activities in South Africa taking place in remote austere environments, there is a need for our own health care providers to be suitably trained and skilled with adequate cognitive and technical abilities to appreciate and deal with the risks for patient care in these environments.

Several skills and core knowledge taught under the umbrella of Wilderness Emergency Medicine training, can be easily cross-applied in any realm of medicine where there are limited resources. The difficulty then is that with no single database of human resource capabilities, we cannot be sure of our capacity to deal with any medical emergency in the wilderness field.

There are a few wilderness first aid courses offered in the private sector, and universities that train pre-hospital health care practitioners do usually include a component on field medical care in austere environments, but there is no consistent reference point to determine what the basic skill set, medical knowledge and overall training is available to practitioners and the patients who rely on them, in South Africa.

2. LITERATURE REVIEW AND MOTIVATION

Historically, human activity in austere wilderness environmental settings that resulted in medical and rescue emergencies, resulted in a primary response of non-medically trained rescue volunteers and professionals, or other service professionals such as law enforcement officers whose main concern was the search for and rescue of the victims.¹

Once this was done, the patient was then extracted to field first aiders who did what they could to stabilise their injuries or medical afflictions before further transfer to appropriate emergent care. Definitive care was far removed from all of this with victims having to wait days for definitive care in wilderness environments. These unique challenges of both distance and time were further compounded by lack of resources, adverse weather conditions and natural hazards that both the rescuer and patient were exposed to.²

As the field of pre-hospital care practice was introduced and developed, more medical care was taught and offered to patients in the wilderness setting. However, this was always seen as an extension of urban pre-hospital care, and the primary goal of this care was the rapid stabilisation and transfer of patients to medical facilities that offered better emergency and definitive care.^{2,3}

However, this did not mitigate the fact that definitive care was still delayed, and adapted field care cannot be the answer when facilities are still very far away.^{4,5}

This is compounded by the fact that the burden of disease facing most emergency care providers in South Africa has been described as and still remains the quadruple burden of pre-transitional diseases, the emerging chronic diseases, injuries and HIV / AIDS.⁶ This necessitates that training for emergency care and emergency medicine providers focus more on these burden of disease demographics. With less, if any, emphasis placed on the austere environment, practitioners facing these are at an obvious disadvantage.

Wilderness Emergency Medicine (WEM) then developed internationally as a field of emergency medicine that offered more than just field first aid and pre-hospital driven medical care. Practitioners of WEM could offer more to their patients that was closer to Emergency Department (ED) level of care, in view of the fact that the ED itself was still a fair time away for the patient.^{2,3,7,8}

In-hospital Emergency Medicine (EM) principles and techniques were now expanded into the field where definitive care was most likely to be delayed for WEM. Based on these hospital-based levels of care, training programmes were then developed within organisations first as wilderness medicine short courses, and then into post-graduate diploma and Masters based programmes done through formal university training.^{3,9} Organisations then began to start and grow throughout the developed world, offering more evidence-based guidance to care in the field.^{2,3,9,10,11}

South Africa is a fast growing developing country, often seen as a playground for ecotourists. Added to this is the vast expanse of areas that are populated but considered far removed from urban and peri-urban centres making accessibility a paramount concern. When you consider our limited and under-developed emergency care system, one can appreciate that even in urban centres, emergent care and transport to definitive care could be delayed.¹²

From a wilderness emergency medicine perspective, several organisations internationally have already identified the poor access to these areas, and despite best efforts from all parties concerned, getting patients from these areas to definitive medical care still poses a challenge.^{2,9,11} One possible solution then is to improve the level of care offered to these patients whilst waiting for long periods for extraction.

Patients in remote and austere wilderness environments present with a multitude of medical illnesses and injuries that, even in urban centres with short transit times, can pose challenges for care. In controlled situations such as on

wilderness courses, injury rates were 1.18 per 1000 programme days and illness rates were 1.08 per 1000 programme days. Whilst no fatalities were recorded on wilderness courses, orthopaedic injuries, gastrointestinal illnesses, and to a lesser extent hypothermia, heat stroke and seizures occurred.¹³ Problems requiring evacuation on these courses were fractures, dental emergencies, tick bite fever and serious other orthopaedic injuries.¹³

In relatively controlled wilderness sporting and mass gathering events, injury and illness rates are 1-10 per 1000 person days of exposure.¹¹ If these events last many days or are in extreme environments or are very competitive, then the rates approximate 10-100 per 1000 person days of exposure.

Where professional adventure racers are involved, then presentations for illness or injury are in the region of 1000 encounters per 1000 racer days.¹¹

In uncontrolled situations, injuries and illnesses have been more severe, with higher recorded mortalities. In a case series of 100 fatalities, 59% were unintentional trauma and 12% were medical-related mortalities, with 27% being a combination of suicides and homicides.¹⁴ Sadly, whilst 55% of these deaths were witnessed, 80% of these happened before Search and Rescue teams could reach the victims.¹⁴ There are no published statistics for South Africa, but it is possible that, with the problem of under-reporting of our incidents, we would have much higher figures than these.

In international remote site and wilderness settings, responders are trained to at least a minimum level for wilderness care, that of the Wilderness First Aid certification.^{9,15} However, we do not know what the levels of training or care offered to these patients are as most of this information is anecdotal. Certainly in South Africa, nothing has been published regarding levels of skills, knowledge and training among practitioners providing search, safety, rescue and medical care to patients in wilderness settings.

Rescues in the wilderness setting in South Africa are usually conducted by a

team of varied professionals, most times non-medically trained. This includes fireman, police, military and mountain climbing volunteers. Among the medically trained and qualified rescuers, this is usually first aiders to advanced level life support paramedics, and sometimes medical practitioners.^{16,17,18}

There still remains no formalised training for this in South Africa. Short courses do exist for wilderness first aid and wilderness emergency medicine.¹⁹ At university level, pre-hospital practitioners are trained in search and rescue in this setting, but the wilderness medicine component is not emphasised. Practice so far is based on preparing all practitioners for urban and peri-urban care.

International research has already established the need for specialised training for this unique and high-risk environment.^{20,21} In fact, WEM has been established as an accepted extension of rural medicine in Canada, with relevance not just for medical rescue and rural practice, but for expedition medicine, disaster relief and military medicine in remote environments.²²

The foundations of WEM may have been from military exploration indeed, with the military long ago identifying the need to provide the best possible care with limited resources in hostile environments far removed from any and all definitive means of care for soldiers in the frontline.²³ However, even though these beginnings were of a militaristic note, WEM now finds its place within humanitarian response in global crises.^{24,25} In fact global health clinical skills in low resource settings share similar competencies with wilderness medicine competencies.

Therefore, in order to proceed with any development of the pedagogic aspects of Wilderness Emergency Medicine in South Africa, one needs to have a starting point as to what constitutes our academic framework. This study will then seek to establish what the training backgrounds, experience levels, knowledge base and skills and competencies are of South African trained practitioners who work in the pre-hospital environment and who may be

exposed to the wilderness or austere remote setting.

3. AIMS AND OBJECTIVES OF STUDY

Aims:

The aim of the study is to develop a framework for a consensus statement for WEM training by quantifying the level of training, knowledge and skills among pre-hospital providers in Wilderness Emergency Medicine in South Africa, and by further surveying experts in emergency medicine in South Africa as to what should constitute competencies in knowledge, training and skills in this field.

Objectives:

1. Conduct a literature review of what constitutes an appropriate level of training and what are the cognitive components and physical competencies required when dealing with patients in the wilderness emergency setting.
2. Conduct a cross-sectional analysis by survey among operational pre-hospital providers in South Africa and determine how many practitioners:
 - a. Have done a formal WEM course
 - b. Have done a mountain rescue course
 - c. Have done a wilderness survival course
 - d. Have sufficient knowledge on practice in the wilderness medicine environment using established criteria developed in (1) and (2) above for wilderness medicine care
 - e. Have sufficient skills for the safe and effective practice of wilderness medicine as developed in (1) and (2) above

3. Conduct a Delphi study among South African Emergency Medicine Practitioners and Physicians to determine what would be regarded as the minimum requirements for practice in the wilderness emergency medicine field based on the criteria determined in objective (1).

4. METHODS

4.1. STUDY DESIGN

The first part of this study will be to conduct a cross-sectional survey among pre-hospital providers that practice in the wilderness setting to determine their demographics and distribution as well as their levels of knowledge, training and skills in the field.

The second part of this study will be a cross-sectional Delphi survey of South African Emergency Medicine Practitioners and Physicians using a convenience and snow-balling sampling technique to determine what the criteria are for safe wilderness emergency medicine practice, based on core knowledge, training and skills.

4.2. SETTING

There is no fixed setting for this study as the surveys will be conducted per electronic mail.

4.3. SUBJECT RECRUITMENT

For the first part of the study, electronic mails will be sent to Health Professions Council of South Africa registered pre-hospital and medical practitioners who are known to also operate in the wilderness environment. These practitioners identified for study will be asked to forward the survey to any other practitioner

who fulfils this criteria as well. Verification of their wilderness practice will be done by the investigator. Practitioners who do not practice in the wilderness environment will be excluded from the study. This electronic mail survey will then gather details about the actual knowledge, training and skills that these practitioners possess, along with demographic and distribution data.

For the second part of the study, electronic mails will be sent to South African Emergency Medicine Practitioners and Physicians (DipPEC, HDipEM, FCEM, MMed (Emergency Medicine), MSc (Emergency Medicine), MPhil (Emergency Medicine)) with a criteria list developed by the investigator detailing the knowledge, training and skills required for wilderness emergency medicine practice. These medical practitioners will also be asked to forward the same to any other doctor who fulfils the recruitment criteria. Practitioners who do not possess any of the above qualifications will be excluded from the Delphi round.

4.4. MEASUREMENTS

For the first part of this study, a survey will be conducted where a list of criteria without weightings will be submitted to the identified participants who practice in the wilderness field. Percentages (for each criteria) will be calculated of practitioners who have the identified knowledge components, training courses or modules and skill sets or competencies.

For the second part of the study, a set of criteria (one criterion representing either one knowledge topic, one training course or one skill set) developed by the investigator will be forwarded to the Delphi participants and a final list of knowledge, training and skills will be developed. The weighting of each criteria will be assessed.

The final list will measure what weightings were eventually agreed upon for each criteria and what percentage of participants regard each criteria

according to certain weightings. A final analysis will review the practitioners scores for each criteria against the Delphi weightings for the criteria to determine if we are appropriately competent to deal with wilderness emergencies in South Africa.

4.5. DATA ANALYSIS

All data will be captured into a Numbers for Apple Mac spreadsheet (Apple Corporation, USA). Descriptive statistics will be used to calculate the percentage of Delphi respondents who agreed to the various criteria weightings. The same will be done for the criteria themselves that fell into different weighting categories.

Descriptive statistics will also be used to describe the proportion of practitioners who met the various criteria components for wilderness emergency care.

EPI Info from the Centers for Disease Control and Prevention will be used for data analysis post capturing into the spreadsheet.

4.6. SAMPLE SIZE

As this is a purely descriptive study and no correlation for significance will be attempted, sample size is not a concern. However, the number of respondents expected for the Delphi analysis is thirty (30) minimum and the number of respondents expected for the initial practitioner survey is fifty (50).

5. ETHICAL CONSIDERATIONS

The main ethical problem in the study is the confidentiality of the respondents. For the Delphi round, consent will be obtained from the respondents for participating in the Delphi round. They will be aware that other respondents will be also weighting the criteria but will not be aware of who these respondents are. When the weighting is done, this will be resubmitted to each respondent again for comment. When no further comments are received after the final round of re-submissions, then the Delphi round will be considered complete. At each stage of the re-submissions, respondents will be blinded as to who the other contributors / respondents are.

All returned submissions will be password protected at all times, with a main spreadsheet of the various passwords kept by the investigator on his private hard drive under lock and key. Once the final criteria list has been developed and approved by all respondents, all other submissions and re-submissions will be destroyed.

The same problem of confidentiality arises with the respondents for the initial practitioner survey part of this study. Consent will be obtained from the expected respondents. Again, the returned survey forms will be password protected, again with a main spreadsheet of the various passwords kept by the investigator on his private hard drive under lock and key. Once all surveys have been collated onto the master spreadsheet, these surveys will be destroyed. The main collated spreadsheet will de-identify the respondents, and this master spreadsheet will also be password protected. Once the final spreadsheets have been collated, all other documents will be destroyed, as they will not be further required. The final de-identified spreadsheets will be used to enter data into Epi Info.

Consent forms are attached in the appendices. Ethical approval will be applied for from the University of Kwa-Zulu Natal's Biomedical Research Ethics

Committee.

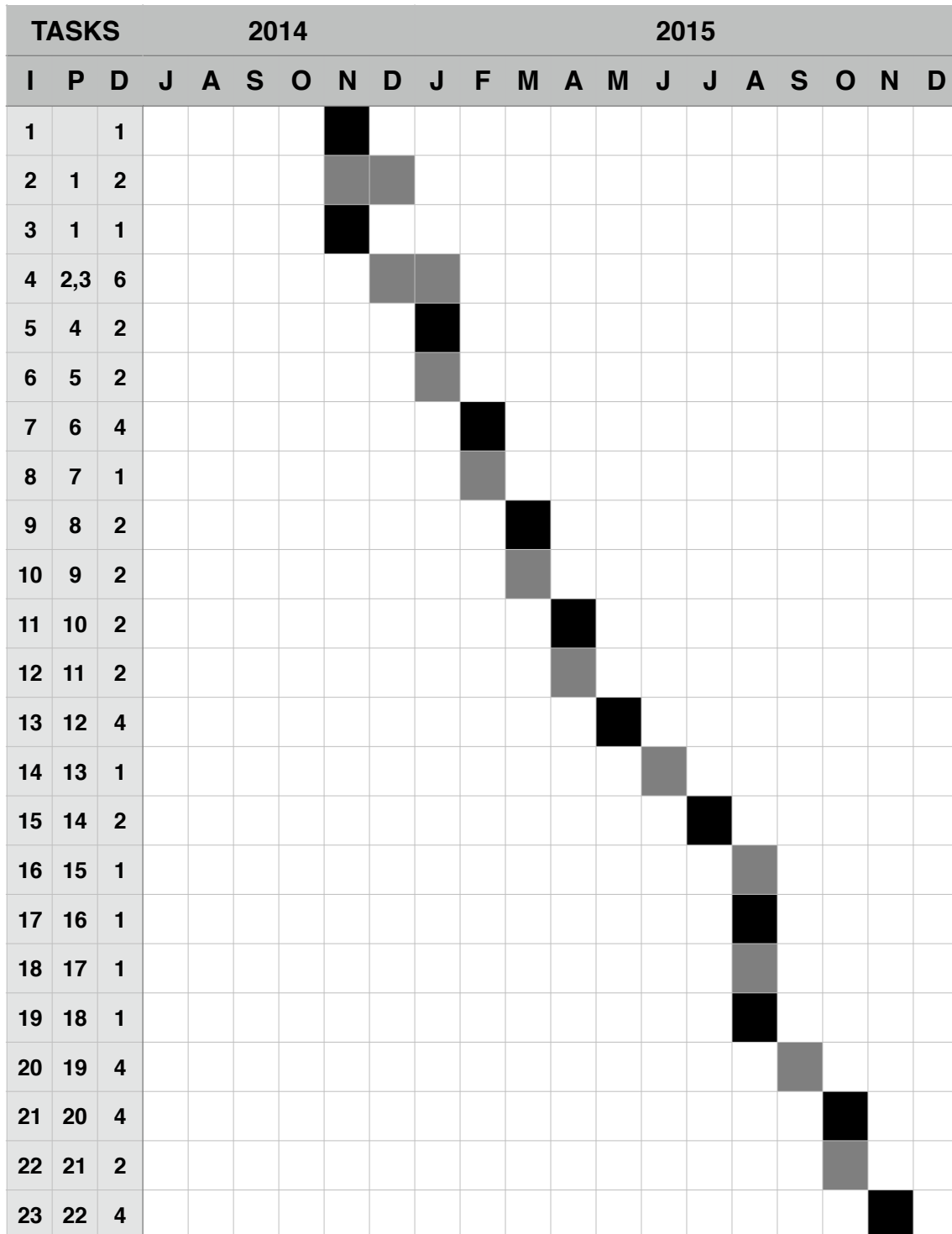
6. BUDGET AND FUNDING

Expenditure		
Item description	Unit cost (R)	Cost (R)
Internet costs (unit cost per month)	750.00	13500.00
Epi Info	0.00	0.00
Total project cost		13500.00

Funding		
Item description	Unit cost (R)	Cost (R)
Dr JA Matthew towards internet costs	750.00	13500.00
Epi Info	0.00	0.00
Total funding		13500.00

7. TIME LINES AND PROJECT MANAGEMENT

Gantt chart showing project timelines



TASKS			2014												2015											
I	P	D	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D						
24	23	2																								
25	24	2																								
26	25	2																								

Key to table:

- I (Identity of task):* *Task to be performed*
- 1 *Completion of proposal*
 - 2 *Submission and approval by supervisors*
 - 3 *BREC application completed*
 - 4 *Submission and approval from BREC*
 - 5 *Consent obtained from prospective initial practitioner survey respondents*
 - 6 *Submission of survey to initial practitioner survey respondents*
 - 7 *Return of surveys from initial practitioner respondents*
 - 8 *Analysis of surveys and collation of results*
 - 9 *Submission to supervisors*
 - 10 *Consent obtained from prospective Delphi respondents*
 - 11 *Survey submitted to Delphi respondents*
 - 12 *Return of initial surveys from Delphi respondents*
 - 13 *Re-submission and return rounds with Delphi respondents*
 - 14 *Final criteria list generated*
 - 15 *Final submission of criteria list to Delphi respondents*
 - 16 *Submission to supervisors*
 - 17 *Collation of all survey results*
 - 18 *Analysis of results*
 - 19 *Submission to supervisors*
 - 20 *Write-up of manuscripts for publication and submit to supervisors*
 - 21 *Submission of manuscripts to journals*
 - 22 *Completion of final academic tasks whilst awaiting journal publication*
 - 23 *Draft Masters thesis manuscript write-up*
 - 24 *Submission of draft manuscript to supervisors*
 - 25 *Final Masters thesis manuscript write-up*
 - 26 *Submission of final Masters thesis manuscript to UKZN*
- P (Pre-requisite):* *Requirements for task commencing*
- D (Duration):* *Expected duration of task / activity (in weeks)*

8. CONTRIBUTORS AND AUTHORSHIP

Name	Department	Contribution	Author or acknowledgement
Dr J.A. Matthew	Emergency Medicine	Investigator	Author
Dr R. Maharaj	Emergency Medicine	Supervisor	Author
Dr D.L. Clarke	Trauma Surgery	Supervisor	Author

9. DISSEMINATION OF RESEARCH

It is the intention of the researcher to submit two manuscripts for publication to the African Journal of Emergency Medicine. The first manuscript paper will outline the findings of the practitioner survey, showing the summation and breakdown of wilderness emergency medicine knowledge, training and skills that are available among pre-hospital practitioners.

The second manuscript paper will outline the results of the Delphi survey that developed the criteria of components for practitioners that work in wilderness emergency medicine in South Africa.

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11. APPENDICES

11.1 Consent to participate in Delphi component of study

Consent to participate in research towards a Master in Medical Science

Study Title: A cross-sectional descriptive study of pre-hospital care providers' training, knowledge and skills in austere environments emergency medicine in South Africa: A framework for a consensus statement for Wilderness Emergency Medicine.

Principal Investigator: Dr Jay Matthew

Supervisors: Dr Roshen Maharaj / Dr Damian Clarke

Department: Emergency Medicine

University: University of Kwa-Zulu Natal

Funding Source: Self-funded

Invitation to Participate and Description of Project

You are invited to take part in a research study designed to look at the key components of care available to patients in wilderness settings. These components are knowledge, training and skills / competencies.

We are all aware that care in emergency departments and in the urban pre-hospital environment is usually resourced appropriately, for the particular environment and scenario. However, studies have already shown that the wilderness environment is unique and practitioners in this environment cannot merely rely on conventional training in both the in-hospital and pre-hospital environment.

Of note, there are more risks that both the patient and the practitioner can be faced with. Furthermore, the practitioner is usually caring for the patient over a

longer period of time due to delays in extraction and transport to definitive care. Finally, it is not easy for the wilderness emergency patient to be self-evacuated or rescued from the field, and practitioners have to deal with many more field problems, that can be beyond their scope of training, and that may be non-life-threatening to warrant evacuation.

I have devised a list of competencies or skills as well as training and core knowledge components that I would like you to look at. Please rate these individual items or criteria according to the associated scale, as per the instruction that is associated with the criterion. Where necessary, there is also a line after each criterion for you to make a brief individual comment.

Once I have collated these, I will re-submit them with the comments considered, if possible, and with the overall weightings applied. Kindly review these criteria with the weightings, and if necessary, make any additional comments and adjust the weighting as you consider appropriate. Bear in mind that, the weightings are an average of what all other respondents thought.

After continuous rounds of submission and re-submission with adjustments of the weightings based on the comments received, I will create a final list of what we have concluded as the final set of criteria to consider with respect to core knowledge, training, and skills and competencies.

You have been asked to take part because of your knowledge in emergency medicine in general and your exposure and / or experience in the pre-hospital environment.

In order to decide whether or not you wish to be a part of this research study you should know enough about its risks and benefits to make an informed decision. This consent form gives you detailed information about the study, which the researcher can discuss with you further, if you require. All data collected about you that identifies you will be de-identified.

Once you understand the study, kindly complete the consent form below and submit to me per email at rapid.sequence@yahoo.com. If you decide to withdraw from the study, you may do so at any time up to the data collection process. You will then not be included in the study.

Risks of data collection and maintenance

There is a risk that your information could be misused if stolen from the database. The database will be password protected and personal information regarding the practitioners will be de-identified.

Declaration

I agree to participate in this study. I have no further questions or concerns at this time. If I have any questions or concerns, I will address this with the researcher. I have no entitlements to the data collected or to any rights to access the data prior to publication. I will keep a duplicate copy of this consent. If I choose to withdraw my consent and participation in this research, I will immediately inform the researcher per email to rapid.sequence@yahoo.com and follow up by completing the second part of this form (*Withdrawing consent*), which will be sent to the researcher as soon as possible. This can also be sent per email to rapid.sequence@yahoo.com or posted to:

Postnet Suite 34
Private Bag X05
Malvern
4055

I, (your full name and surname),
hereby consent to my participation in this study.

Signed at(place) on this (date) day of
..... (month)(year).

.....
Participant

.....
Witness

Withdrawing consent

I, the undersigned, hereby withdraw my consent and participation in this study. The reason for my withdrawing consent is as follows (please complete this section if you want to, although it is not compulsory):

I have no further questions or concerns at this time. If I have any questions or concerns later, I will address this with the researcher. I have no entitlements to the data collected or to any rights to access the data prior to publication. I will keep a duplicate copy of this withdrawal of consent. As I choose to withdraw my consent and participation in this research, I will immediately inform the researcher per email to rapid.sequence@yahoo.com of my intentions and submit this document to the researcher as soon as possible. This can also be sent per email to rapid.sequence@yahoo.com or posted to:

Postnet Suite 34
Private Bag X05
Malvern
4055

I, (your full name and surname),
hereby withdraw my consent to my participation in this study.

Signed at(place) on this (date) day of
..... (month)(year).

.....
Participant

.....
Witness

11.2 Criteria for Delphi analysis

Dear respondent,

Kindly review the following criteria that constitutes suggested components to ensure competency in the practice of wilderness emergency medicine in South Africa. Please rate each criterion as 1=low importance, 2=intermediate importance, and 3=high importance. The criteria are grouped into the following categories of core knowledge, training, and skill sets for ease of analysis. After each criteria is a line for free text comments. Kindly provide me with any additional thoughts regarding each of the criteria.

Once completed, please submit to **rapid.sequence@yahoo.com**. Once all the surveys have been received, I will collate and revise, and then re-submit for your review. Once no further comments are received after as many rounds as it is necessary to result in no final comments, I will submit a final criteria list to you for approval. Thank you again for your assistance.

Criteria	1	2	3
Knowledge			
EMS systems including EMS modes of transport			
Primary and secondary survey			
Cardio-pulmonary resuscitation			
Haemorrhage control techniques			
Vascular access and fluid resuscitation			
Wound management			
Animal bites			
Rabies			
Envenomation syndromes			
Botanical toxinology			
Medical emergencies in austere environments			
Altitude illness and its complications of HAPE and HACE			
Hypothermia and hyperthermia			
Submersion injuries and diving related accidents			

Criteria	1	2	3
Avalanche-related injuries			
Lightning strikes (Keraunomedicine)			
Burns			
Trauma			
Orthopaedic injuries			
Primary health care			
Tropical medicine			
Disaster medicine			
Ethnobotany (including identification of edible and medicinal plants)			
Dental injuries and illnesses			
<u>Training</u>			
CAT-138			
Aviation Healthcare Provider			
BLS-HCP			
ACLS			

Criteria	1	2	3
PALS			
ATLS / PHTLS			
Wilderness First Responder / Wilderness First Aid Provider			
Wilderness Emergency Medicine			
Advanced medical life support			
<u>Skill sets</u>			
Survival			
Chest compressions			
AED use			
Bag-valve mask ventilation			
Tourniquet use			
Topical haemostatic agents			
Tactical bandage application			
Intra-venous access			
Intra-osseous access			

Criteria	1	2	3
Splintage of limbs with wounds			
Wound irrigation and debridement			
Wound closure techniques including suturing			
Gamow bag usage			
Search and rescue techniques			
Navigation			
Rope rescue			
Chest seal application			
Needle decompression			
Chest drain insertion			
Pelvic stabilisation using sheet, T-Pod, SAM pelvic sling, PelviGrip			
Spinal immobilisation			
Spinal clearance			
Basic and advanced airway management			
Field ultra-sonography (eFAST and RUSH protocols)			

Criteria	1	2	3
Splintage of limbs			
Orthopaedic soft tissue bandaging			
Ski and snow rescue techniques			
Mountaineering			
Outdoor camp craft			
Primary health care diagnostics (Dipstix, auroscopy, ophthalmoscopy)			
Water purification techniques			
Water collection techniques			
Layering of clothing			
Swift water rescue			
Local and regional anaesthesia techniques (blocks)			
Packing medical kits			
Radio usage			
Temporary fillings and extractions			

Criteria	1	2	3
Litter fabrications and patient transport by litter systems			

11.3 Consent to participate in survey

Consent to participate in research towards a Master in Medical Science

Study Title: A cross-sectional descriptive study of pre-hospital care providers' training, knowledge and skills in austere environments emergency medicine in South Africa: A framework for a consensus statement for Wilderness Emergency Medicine.

Principal Investigator: Dr Jay Matthew

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We are all aware that care in emergency departments and in the urban pre-hospital environment is usually resourced appropriately, for the particular environment and scenario. However, studies have already shown that the wilderness environment is unique and practitioners in this environment cannot merely rely on conventional training in both the in-hospital and pre-hospital environment.

Of note, there are more risks that both the patient and the practitioner can be faced with. Furthermore, the practitioner is usually caring for the patient over a longer period of time due to delays in extraction and transport to definitive care. Finally, it is not easy for the wilderness emergency patient to be self-evacuated or rescued from the field, and practitioners have to deal with many more field problems, that can be beyond their scope of training, and that may be non-life-threatening to warrant evacuation.

I have devised a list of competencies or skills as well as training and core knowledge components that I would like you to look at. Please identify those that you feel you have either sufficient core knowledge of, have been appropriately trained in or are appropriately skilled in. Please be as honest as you can, as the answers will help us in determining if our system is adequately prepared to deal with wilderness emergencies or there are areas that we need to focus on to develop. Please rate these individual items or criteria according to the associated scale, as per the instruction that is associated with the criterion. Where necessary, there is also a line after each criterion for you to make a brief individual comment.

You have been asked to take part because of your knowledge in emergency medicine in general and your exposure and / or experience in the pre-hospital environment, especially in the austere wilderness or remote medical field.

In order to decide whether or not you wish to be a part of this research study you should know enough about its risks and benefits to make an informed decision. This consent form gives you detailed information about the study, which the researcher can discuss with you further, if you require. All data collected about you that identifies you will be de-identified.

Once you understand the study, kindly complete the consent form below and submit to me per email at rapid.sequence@yahoo.com. If you decide to withdraw from the study, you may do so at any time up to the data collection process. You will then not be included in the study.

Risks of data collection and maintenance

There is a risk that your information could be misused if stolen from the database. The database will be password protected and personal information regarding the practitioners will be de-identified.

Declaration

I agree to participate in this study. I have no further questions or concerns at this time. If I have any questions or concerns, I will address this with the researcher. I have no entitlements to the data collected or to any rights to access the data prior to publication. I will keep a duplicate copy of this consent. If I choose to withdraw my consent and participation in this research, I will immediately inform the researcher per email to rapid.sequence@yahoo.com and follow up by completing the second part of this form (*Withdrawing consent*), which will be sent to the researcher as soon as possible. This can also be sent per email to rapid.sequence@yahoo.com or posted to:

Postnet Suite 34
Private Bag X05
Malvern
4055

I, (your full name and surname),
hereby consent to my participation in this study.

Signed at(place) on this (date) day of
..... (month)(year).

.....
Participant

.....
Witness

Withdrawing consent

I, the undersigned, hereby withdraw my consent and participation in this study. The reason for my withdrawing consent is as follows (please complete this section if you want to, although it is not compulsory):

I have no further questions or concerns at this time. If I have any questions or concerns later, I will address this with the researcher. I have no entitlements to the data collected or to any rights to access the data prior to publication. I will keep a duplicate copy of this withdrawal of consent. As I choose to withdraw my consent and participation in this research, I will immediately inform the researcher per email to rapid.sequence@yahoo.com of my intentions and submit this document to the researcher as soon as possible. This can also be sent per email to rapid.sequence@yahoo.com or posted to:

Postnet Suite 34
Private Bag X05
Malvern
4055

I, (your full name and surname),
hereby withdraw my consent to my participation in this study.

Signed at(place) on this (date) day of
..... (month)(year).

.....
Participant

.....

Witness

11.4 Survey of pre-hospital practitioners

Dear respondent,

Kindly review the following criteria that assesses components of your core knowledge of, training in, and skills and competencies when dealing with medical emergencies in the wilderness setting. Please rate each criterion as 1=little to no knowledge, training or skills, 2=average knowledge, some training and some ability, and 3=very knowledgeable, accredited training completed or very experienced or skilled. The criteria are grouped into the following categories of core knowledge, training, and skill sets for ease of analysis. After each criteria is a line for free text comments. Kindly provide me with any additional thoughts regarding each of the criteria.

Once completed, please submit to **rapid.sequence@yahoo.com**. Please feel free to submit this to anyone else whom you feel are able to complete it, along with the consent form. Thank you again for your assistance.

Name and surname	
HPCSA registration number	
Qualifications (separated by commas)	
Current age	
Gender	

Relevant qualifications in wilderness emergency medicine	
Other appropriate training for wilderness emergency medicine	
Where did you train in emergency medicine / care and wilderness emergency care	
Where do you currently work	
In which country do you currently work	

Criteria	1	2	3
<u>Knowledge</u>			
I am knowledgeable about EMS systems including EMS modes of transport			
I am able to complete a full primary and secondary survey (medical, paediatric and trauma)			
I am knowledgeable about all aspects of cardio-pulmonary resuscitation			
I am well aware of all aspects of haemorrhage control techniques and devices			
I am knowledgeable about all aspects of vascular access and emergency access techniques and am further knowledgeable about fluid resuscitation			

Criteria	1	2	3
I am knowledgeable about all aspects of wound care including antibiotic usage and wound closure			
I am able to deal with all types of animal bites			
I am aware of rabies and know how to manage potential exposure			
I am aware of all types of envenomation syndromes			
I am aware of all aspects of plant and fungi poisoning			
I am able to deal with all types of medical emergencies in austere environments			
I know how to recognise and manage altitude illness and its complications of HAPE and HACE			
I know how to recognise and manage all types of cold-related injuries including hypothermia and heat-related injuries including hyperthermia			
I know how to manage submersion injuries and diving related accidents			
I know what to expect in avalanche-related injuries, how to identify them and how to manage them			
I know what to expect in lightning strikes, how to recognise these injuries, know what Lichtenberg figures are, and how to manage the complications of these injuries			
I know how to assess, categorise, and manage burns			

Criteria	1	2	3
I know how to deal with all types of major and minor trauma as may be expected in the wilderness environment			
I know how to deal with most types of orthopaedic injuries in the field			
I can conduct a full primary health care assessment, including take a history, conduct a clinical examination, develop a problem list, develop a list of differential diagnoses, request simple primary health care investigations and develop a management plan			
I am familiar with all aspects of tropical medicine to be comfortable with dealing with the common types			
I am knowledgeable at managing a disaster in the pre-hospital urban and wilderness environment such as a plane crash			
I am knowledgeable about ethnobotany including identification of edible and medicinal plants			
I can fully assess for and manage common dental problems in the field			
<u>Training</u>			
I have completed a helicopter safety briefing in the last year			
I have attended a aviation medicine course which is up to date			
I have a valid BLS card			
I have a valid ACLS card			
I have a valid PALS / APLS card			

Criteria	1	2	3
I have a valid ATLS / PHTLS card			
I have done a basic wilderness first aid course that is valid			
I have done an advanced wilderness emergency medicine course which is valid			
I have a valid AMLS / AME card			
<u>Skill sets</u>			
I have done survival training and am fairly comfortable with survival in the wilderness setting			
I can perform chest compressions			
I can defibrillate using an AED			
I can comfortably perform bag-valve mask ventilation			
I can safely and appropriately apply and use a tourniquet			
I can safely and appropriately use topical haemostatic agents			
I can safely and appropriately use a tactical bandage			
I can obtain intra-venous access			
I can obtain intra-osseous access			
I am comfortable with splintage of limbs using standard splintage devices			

Criteria	1	2	3
I am comfortable with splint age of limbs using improvised splintage devices			
I can irrigate a wound and deride it mechanically			
I can close wounds using various techniques including suturing			
I am familiar with the use of a Gamow bag for altitude dysbarism			
I am competent in search and rescue techniques			
I am competent with navigation techniques and can navigate by compass or GPS			
I am comfortable with knots and rope work used in rope rescue			
I can apply a HALO or Asherman's chest seal			
I can apply an improvised chest seal			
I can insert a needle for decompression of a tension pneumothorax			
I can insert a chest drain			
I am competent with pelvic stabilisation using the sheet method			
I am competent with pelvic stabilisation using the T-Pod, SAM pelvic sling, and PelviGrip			
I am comfortable with spinal immobilisation			

Criteria	1	2	3
I am comfortable with spinal clearance protocols			
I am able to manage a patient's airway using basic and advanced airway management techniques			
I can perform field ultra-sonography (eFAST and RUSH protocols)			
I can apply orthopaedic soft tissue bandaging			
I am familiar with ski and snow rescue techniques			
I am trained or experienced enough in mountaineering to conduct mountain rescue operations			
I am familiar with outdoor camp craft			
I am able to perform a urine dipstix			
I am able to perform auroscopy			
I am able to perform ophthalmoscopy			
I am able to perform pharyngoscopy			
I am aware of water purification techniques			
I am aware of water collection techniques			
I am aware of layering of clothing for survival in cold weather			

Criteria	1	2	3
I can conduct swift water rescue techniques			
I can perform local and regional anaesthesia techniques (blocks)			
I am able to pack wilderness and expedition medical kits			
I am familiar with radio techniques			
I can perform temporary fillings and extractions			
I can create litter fabrications and conduct patient transport by litter systems			

2. Post-graduate approval



28 November 2014

Dr R Maharaj
Dept of Internal Medicine
School of Clinical Medicine

Dear Dr Maharaj

MMDSC PROTOCOL: "A cross-sectional descriptive study of pre-hospital care providers' training, knowledge and skills in austere environments emergency medicine in South Africa: A framework for a consensus statement for Wilderness Emergency Medicine"

Student: Dr J A Matthew, student number: 931484733 (Emergency Medicine)

I am pleased to inform you that the abovementioned study has been approved.

Please note:

- The Academic Leader: Research must review any changes made to this study.
- The study may not begin without the approval of the Biomedical Research Ethics Committee.

May I take this opportunity to wish the student every success with the study.

Yours sincerely

for Dr VS Singaram
Academic Leader School Research (Acting)
School of Clinical Medicine

cc Dr D Clarke
Dr J A Matthew

Biomedical Research Ethics Committee
Westville Campus

Postgraduate, Higher Degrees & Research
School of Clinical Medicine, NRMSM Campus
Postal Address: P/Bag X3, Congella, Durban, 4013, South Africa
Telephone: +27 (0) 31 260 4745 Facsimile: +27 (0) 31 260 4723 Email: jantjies@ukzn.ac.za Website: www.ukzn.ac.za

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Founding Campuses: ■ Edgewood ■ Howard College ■ Medical School ■ Pietermaritzburg ■ Westville

3. Ethics approval



27 May 2015

Dr Jaybalan Matthew
Postnet Suite 34
Private Bag X05
Malvern, 4055
rapid.sequence@yahoo.com

PROTOCOL: A cross-sectional descriptive study of pre-hospital care providers' training, knowledge and skills in austere environments emergency medicine in South Africa: A framework for a consensus statement for Wilderness Emergency Medicine: Degree Purposes (MMedSc) - School of Clinical Medicine (Internal Medicine) Student Number: 931484733. BREC REF: BE508/14.

EXPEDITED APPLICATION

A sub-committee of the Biomedical Research Ethics Committee has considered and noted your application received on 02 December 2014.

The study was provisionally approved pending appropriate responses to queries raised. Your responses received on 17 May 2015 to queries raised on 30 January 2015 have been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given full ethics approval.

This approval is valid for one year from **27 May 2015**. To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2015), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at <http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx>.

BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

The sub-committee's decision will be **RATIFIED** by a full Committee at its meeting taking place on **09 June 2015**.

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely

Professor J Tsoka-Gwegweni
Chair: Biomedical Research Ethics Committee

Biomedical Research Ethics Committee
Professor J Tsoka-Gwegweni (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000

Telephone: +27 (0) 31 260 2486 Facsimile: +27 (0) 31 260 4609 Email: brec@ukzn.ac.za
Website: <http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx>

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4. Ethics approval extension



RESEARCH OFFICE
BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 260-4609
Email: BREC@ukzn.ac.za
Website: <http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx>

09 June 2016

Dr Jaybalan Matthew
Postnet Suite 34
Private Bag X05
Malvern, 4055
rapid.sequence@yahoo.com

Dear Dr Matthew

PROTOCOL: A cross-sectional descriptive study of pre-hospital care providers' training, knowledge and skills in austere environments emergency medicine in South Africa: A framework for a consensus statement for Wilderness Emergency Medicine: Degree Purposes (MMedSc) - School of Clinical Medicine (Internal Medicine) Student Number: 931484733. BREC REF: BE508/14.

RECERTIFICATION APPLICATION APPROVAL NOTICE

Approved: 27 May 2016
Expiration of Ethical Approval: 26 May 2017

I wish to advise you that your application for Recertification received 31 May 2016 for the above protocol has been noted and approved by a sub-committee of the Biomedical Research Ethics Committee (BREC) for another approval period. The start and end dates of this period are indicated above.

If any modifications or adverse events occur in the project before your next scheduled review, you must submit them to BREC for review. Except in emergency situations, no change to the protocol may be implemented until you have received written BREC approval for the change.

This approval will be ratified by a full Committee at its next meeting taking place on 12 July 2016.

Yours sincerely

Mrs A Marimuthu
Senior Administrator: Biomedical Research Ethics

5. Survey questionnaire for manuscript I (Chapter 2)

Survey questions used to determine levels of knowledge, skills and competencies in Wilderness Emergency Medicine among Emergency Care Practitioners in South Africa

Demographic questions:

Q1 What is your highest Advanced Life Support Qualification?

Q2 What is your current age?

Q3 What is your gender?

Q4 Which country do you currently work in?

Q5 Are you currently actively involved in the pre-hospital environment?

Q6 Do you work in the wilderness / mountain rescue environment?

Emergency medicine knowledge component: General

Q7 How knowledgeable are you about Emergency Medical Service (EMS) systems currently?

Q8 Are you able to complete a full primary and secondary survey in medical, paediatric and trauma patients?

Q9 How knowledgeable are you about cardio-pulmonary resuscitation with reference to the latest guidelines?

Q10 How well do you know haemorrhage control techniques and devices used in the austere environment?

Q11 How knowledgeable are you about all aspects of vascular access and emergency vascular access techniques?

Q12 How knowledgeable are you about fluid resuscitation?

Q17 How knowledgeable are you to manage all types of medical (non-trauma) emergencies in the austere environment?

Q23 How well do you know how to assess, categorise, determine depth and affected surface area, and manage burn injuries?

Q24 How knowledgeable are you to deal with all types of major and minor trauma in the austere environment?

Emergency medicine knowledge component: Wilderness

Q13 How knowledgeable are you about wound care including antibiotic usage and wound closure techniques in protracted field care?

Q14 How knowledgeable are you about animal bites including envenomation syndromes?

Q15 How good is your knowledge and understanding of rabies and assessing risk / exposure as well as the management of this problem?

Q16 How knowledgeable are you in plant toxicology and the management of herbal toxicities in humans?

Q18 How knowledgeable are you to recognise and manage altitude related illnesses?

Q19 How knowledgeable are you to manage cold- and heat-related injuries and illnesses?

Q20 How well do you know how to deal with submersion injuries / drowning injuries and diving-related accidents?

Q21 How well do you know avalanche-related injuries, how to identify them, and how to manage them?

Q22 How well do you know lightning-related injuries, how to recognise these injuries and their complications, and how to manage them?

Q25 How knowledgeable are you to assess and manage orthopaedic injuries in the wilderness environment when protracted field care may be required?

Q26 How knowledgeable are you to conduct a primary health care assessment (history taking, clinical examination, develop a problem list, develop a list of differential diagnoses, request and conduct simple primary health care investigations) and develop a management plan?

Q27 How knowledgeable are you in the presentation, assessment and management of tropical diseases?

Q28 How knowledgeable are you to manage a disaster / major incident in the

wilderness / austere environment?

Q29 Are you able to recognise edible and medicinal plants in the area you work?

Q30 How knowledgeable are you to assess and manage dental problems in the field?

Emergency medicine training component: General

Q31 Did you complete any helicopter safety briefing in the last year?

Q32 Do you have an updated Aviation Health Care Provider course (or equivalent) certification?

Q33 Do you have a valid Basic Life Support for Healthcare Providers certificate?

Q34 Do you have a valid Advanced Cardiovascular Life Support (ACLS) or ACLS-Experienced Provider (ACLS-EP) certification?

Q35 Do you have a valid Paediatric Advanced Life Support (PALS) or Advanced Paediatric Life Support (APLS) certification?

Q36 Do you have a valid Advanced Trauma Life Support (ATLS) or Prehospital Trauma Life Support (PHTLS) certification?

Q37 Do you have a valid International Trauma Life Support (ITLS) certification?

Q40 Have you done an Advanced Medical Life Support (AMLS) course or equivalent which is current and valid?

Q41 Have you done a Major Incident Medical Management and Support (MIMMS) course which is current and valid?

Q42 Have you done a Hospital Major Incident Medical Management and Support (HMIMMS) course which is current and valid?

Q43 Have you done an Airway Interventions and Management in Emergencies (AIME) course which is current and valid?

Q44 Have you done a basic point-of-care ultrasound course?

Emergency medicine training component: Wilderness

Q38 Have you done a basic wilderness first aid or first responder course that is current and valid?

Q39 Have you done an Advanced Wilderness Emergency Medicine course or equivalent

that is current and valid?

Q45 Have you done any formal survival training?

Emergency medicine skills component: General

Q46 Can you effectively perform chest compressions?

Q47 Can you defibrillate using a manual defibrillator?

Q48 Can you defibrillate using an automated external defibrillator?

Q49 Can you comfortably perform bag-valve-mask ventilation?

Q50 Can you use a commercial tourniquet?

Q51 Can you safely use topical haemostatic agents?

Q52 Can you use a tactical haemostatic bandage?

Q53 Can you obtain intra-venous access?

Q54 Can you obtain intra-osseous access with both commercial and fabricated devices such as a bone marrow needle?

Q55 Are you comfortable with splintage using standard splintage devices?

Q64 Can you apply an improvised chest seal?

Q65 Can you insert a needle correctly and safely for decompression of a tension pneumothorax?

Q67 Are you competent with pelvic stabilisation using the sheet method?

Q69 Are you comfortable with spinal immobilisation?

Q71 Are you able to manage the patient's airway using basic and advanced airway management techniques, including rescue devices, and performing a cricothyroidotomy for a failed airway?

Q72 Can you perform field ultrasonography (eFAST protocol), if equipment is available?

Q73 Can you apply soft tissue bandaging techniques for minor orthopaedic injuries?

Q87 Are you competent in radio and other communication techniques?

Emergency medicine skills component: Wilderness

- Q56 Are you comfortable with splintage using improvised devices?
- Q57 Can you irrigate a wound and mechanically debride it?
- Q58 Can you close wounds using various techniques including suturing?
- Q59 Are you familiar with the use of a Gamow Bag or equivalent?
- Q60 Are you competent in search and rescue techniques?
- Q61 Are you competent with wilderness navigation techniques?
- Q62 Are you competent at using knots and ropework in rope rescue?
- Q63 Can you apply a HALO, Asherman's or other commercial chest seal?
- Q66 Can you insert a formal chest drain?
- Q68 Are you competent with commercial pelvic binders viz T-Pod, SAM Pelvic Sling II and PelviGrip?
- Q70 Are you comfortable with spinal clearance guidelines?
- Q74 Are you familiar with ski- and snow-rescue techniques?
- Q75 Are you competent enough in the mountain environment to conduct mountain rescue operations?
- Q76 Are you familiar with outdoor camp craft?
- Q77 Are you able to perform and interpret a urine dipstix test?
- Q78 Are you able to perform and interpret auroscopy (otoscopy or instrumented ear examination)?
- Q79 Are you able to perform and interpret ophthalmoscopy (fundoscopy or instrumented eye examination)?
- Q80 Are you able to perform and interpret pharyngoscopy?
- Q81 Are you able to use various commercial or improvised water purification techniques?
- Q82 Are you able to use improvised water collection techniques?
- Q83 Are you able to use layering strategies to survive cold weather?
- Q84 Can you conduct swift water rescue techniques?
- Q85 Can you perform local and regional anaesthesia techniques?
- Q86 Are you able to pack wilderness and expedition medical kits?

Q88 Can you perform temporary fillings and teeth extractions, under dental anaesthesia?

Q89 Can you create litter fabrications and conduct patient transport by litter systems?

6. Survey questionnaire for manuscript II (Chapter 3)

Survey questions used to determine levels of knowledge, skills and competencies required for Wilderness Emergency Medicine as determined by Emergency Medicine Specialists in South Africa

Demographic questions:

Q1 What is your highest qualification in Emergency Medicine?

Q2 What is your current age?

Q3 What is your gender?

Q4 Which country do you currently work in?

Q5 Are you currently actively involved in the pre-hospital environment?

Q6 Do you work in the wilderness / mountain rescue environment?

Emergency medicine knowledge component: General

Q7 How knowledgeable are you about Emergency Medical Service (EMS) systems currently?

Q8 How important is it for the Wilderness Emergency Medicine (WEM) prehospital provider to be able to conduct a full primary and secondary survey in medical, paediatric and trauma patients?

Q9 How knowledgeable should the WEM prehospital provider be with respect to cardio-pulmonary resuscitation with reference to the latest guidelines?

Q10 How well should the WEM prehospital provider know haemorrhage control techniques and devices used in the austere environment?

Q11 How knowledgeable should the WEM prehospital provider be with respect to all aspects of vascular access and emergency vascular access techniques?

Q12 How knowledgeable should the WEM prehospital provider be with respect fluid resuscitation?

Q17 How knowledgeable should the WEM prehospital provider be with respect to the management of all types of medical (non-trauma) emergencies in the austere environment?

Q23 How knowledgeable should the WEM prehospital provider be with respect to the assessment, categorisation, determination of depth and affected surface area, and the management of burn injuries?

Q24 How knowledgeable should the WEM prehospital provider be with respect to dealing with all types of major and minor trauma in the austere environment?

Emergency medicine knowledge component: Wilderness

Q13 How knowledgeable should the WEM prehospital provider be with respect to wound care including antibiotic usage and wound closure techniques in protracted field care?

Q14 How knowledgeable should the WEM prehospital provider be with respect to animal bites including envenomation syndromes?

Q15 How knowledgeable should the WEM prehospital provider be with respect to the understanding of rabies and assessing risk / exposure as well as the management of this problem?

Q16 How knowledgeable should the WEM prehospital provider be with respect plant toxicology and the management of herbal toxicities in humans?

Q18 How knowledgeable should the WEM prehospital provider be with respect to the recognition and management of altitude related illnesses?

Q19 How knowledgeable should the WEM prehospital provider be with respect to the management of cold- and heat-related injuries and illnesses?

Q20 How knowledgeable should the WEM prehospital provider be with respect to submersion injuries / drowning injuries and diving-related accidents?

Q21 How knowledgeable should the WEM prehospital provider be with respect to avalanche-related injuries, their identification and assessment, and their management?

Q22 How knowledgeable should the WEM prehospital provider be with respect to lightning-related injuries, how to recognise these injuries and their complications, and how to manage them?

Q25 How knowledgeable should the WEM prehospital provider be with respect to the assessment and management of orthopaedic injuries in the wilderness environment when protracted field care may be required?

Q26 How knowledgeable should the WEM prehospital provider be with respect to conducting a primary health care assessment (history taking, clinical examination, develop a problem list, develop a list of differential diagnoses, request and conduct simple primary health care investigations) and the development of a management plan?

Q27 How knowledgeable should the WEM prehospital provider be with respect to the presentation, assessment and management of tropical diseases?

Q28 How knowledgeable should the WEM prehospital provider be with respect to the management of a disaster / major incident in the wilderness / austere environment?

Q29 How knowledgeable should the WEM prehospital provider be with respect to the recognition of edible and medicinal plants in the geographic area they work in?

Q30 How knowledgeable should the WEM prehospital provider be with respect to the assessment and management of dental problems in the field?

Emergency medicine training component: General

Q31 Should the WEM prehospital provider complete an annual helicopter safety briefing?

Q32 Should the WEM prehospital provider have an updated Aviation Health Care Provider course (or equivalent) certification?

Q33 Should the WEM prehospital provider have a valid Basic Life Support for Healthcare Providers (BLS) certificate?

Q34 Should the WEM prehospital provider have a valid Advanced Cardiovascular Life Support (ACLS) or ACLS- Experienced Provider (ACLS-EP) certification?

Q35 Should the WEM prehospital provider have a valid Paediatric Advanced Life Support (PALS) or Advanced Paediatric Life Support (APLS) certification?

Q36 Should the WEM prehospital provider have a valid Advanced Trauma Life Support (ATLS) or Prehospital Trauma Life Support (PHTLS) certification?

Q37 Should the WEM prehospital provider have a valid International Trauma Life Support (ITLS) certification?

Q40 Should the WEM prehospital provider have done an Advanced Medical Life Support (AMLS) course or equivalent which is current and valid?

Q41 Should the WEM prehospital provider have done a Major Incident Medical Management and Support (MIMMS) course which is current and valid?

Q42 Should the WEM prehospital provider have done a Hospital Major Incident Medical Management and Support (HMIMMS) course which is current and valid?

Q43 Should the WEM prehospital provider have done an Airway Interventions and Management in Emergencies (AIME) course which is current and valid?

Q44 Should the WEM prehospital provider have done a basic point-of-care ultrasound course?

Emergency medicine training component: Wilderness

Q38 Should the WEM prehospital provider have done a basic wilderness first aid or first responder course that is current and valid?

Q39 Should the WEM prehospital provider have done an Advanced Wilderness Emergency Medicine course or equivalent that is current and valid?

Q45 Should the WEM prehospital provider have done any formal survival training?

Emergency medicine skills component: General

Q46 Should the WEM prehospital provider be able to effectively perform chest compressions?

Q47 Should the WEM prehospital provider be able to defibrillate using a manual defibrillator?

Q48 Should the WEM prehospital provider be able to defibrillate using an automated external defibrillator?

Q49 Should the WEM prehospital provider be able to effectively and comfortably perform bag-valve-mask ventilation?

Q50 Should the WEM prehospital provider be able to use a commercial tourniquet?

Q51 Should the WEM prehospital provider be able to safely use topical haemostatic agents?

Q52 Should the WEM prehospital provider be able to use a tactical haemostatic bandage?

Q53 Should the WEM prehospital provider be able to obtain intra-venous access?

Q54 Should the WEM prehospital provider be able to obtain intra-osseous access with both commercial and fabricated devices such as a bone marrow needle?

Q55 Should the WEM prehospital provider be able to comfortably perform splintage using standard splintage devices?

Q64 Should the WEM prehospital provider be able to apply an improvised chest seal?

Q65 Should the WEM prehospital provider be able to insert a needle correctly and safely for decompression of a tension pneumothorax?

Q67 Should the WEM prehospital provider be competent with pelvic stabilisation using the sheet method?

Q69 Should the WEM prehospital provider be competent with spinal immobilisation?

Q71 Should the WEM prehospital provider be able to manage the patient's airway using basic and advanced airway management techniques, including rescue devices, and performing a cricothyroidotomy for a failed airway?

Q72 Should the WEM prehospital provider be able to perform field ultrasonography (eFAST protocol), if equipment is available?

Q73 Should the WEM prehospital provider be able to apply soft tissue bandaging techniques for minor orthopaedic injuries?

Q87 Should the WEM prehospital provider be competent in radio and other communication techniques?

Emergency medicine skills component: Wilderness

Q56 Should the WEM prehospital provider be able to comfortably perform splintage using improvised devices?

Q57 Should the WEM prehospital provider be able to irrigate a wound and mechanically debride it?

Q58 Should the WEM prehospital provider be able to close wounds using various techniques including suturing?

Q59 Should the WEM prehospital provider be able to use a Gamow Bag or equivalent?

Q60 Should the WEM prehospital provider be competent in search and rescue techniques?

Q61 Should the WEM prehospital provider be competent with wilderness navigation techniques?

Q62 Should the WEM prehospital provider be competent at using knots and ropework in rope rescue?

Q63 Should the WEM prehospital provider be able to apply a HALO, Asherman's or other commercial chest seal?

Q66 Should the WEM prehospital provider be able to insert a formal chest drain in a protracted field care situation?

Q68 Should the WEM prehospital provider be competent with commercial pelvic binders viz T-Pod, SAM Pelvic Sling II and PelviGrip?

Q70 Should the WEM prehospital provider be competent with spinal clearance guidelines?

Q74 Should the WEM prehospital provider be familiar with ski- and snow-rescue techniques?

Q75 Should the WEM prehospital provider be competent enough in the mountain environment to conduct mountain rescue operations?

Q76 Should the WEM prehospital provider be familiar with outdoor camp craft?

Q77 Should the WEM prehospital provider be able to perform and interpret a urine dipstix test?

Q78 Should the WEM prehospital provider be able to perform and interpret auroscopy (otoscopy or instrumented ear examination)?

Q79 Should the WEM prehospital provider be able to perform and interpret ophthalmoscopy (fundoscopy or instrumented eye examination)?

Q80 Should the WEM prehospital provider be able to perform and interpret pharyngoscopy?

Q81 Should the WEM prehospital provider be able to use various commercial or improvised water purification techniques?

Q82 Should the WEM prehospital provider be able to use improvised water collection techniques?

Q83 Should the WEM prehospital provider be able to use layering strategies to survive cold weather?

Q84 Should the WEM prehospital provider be able to conduct swift water rescue techniques?

Q85 Should the WEM prehospital provider be able to perform local and regional anaesthesia techniques?

Q86 Should the WEM prehospital provider be able to pack wilderness and expedition medical kits?

Q88 Should the WEM prehospital provider be able to perform temporary fillings and teeth extractions, under dental anaesthesia?

Q89 Should the WEM prehospital provider be able to create litter fabrications and conduct patient transport by litter systems?

7. Data sets

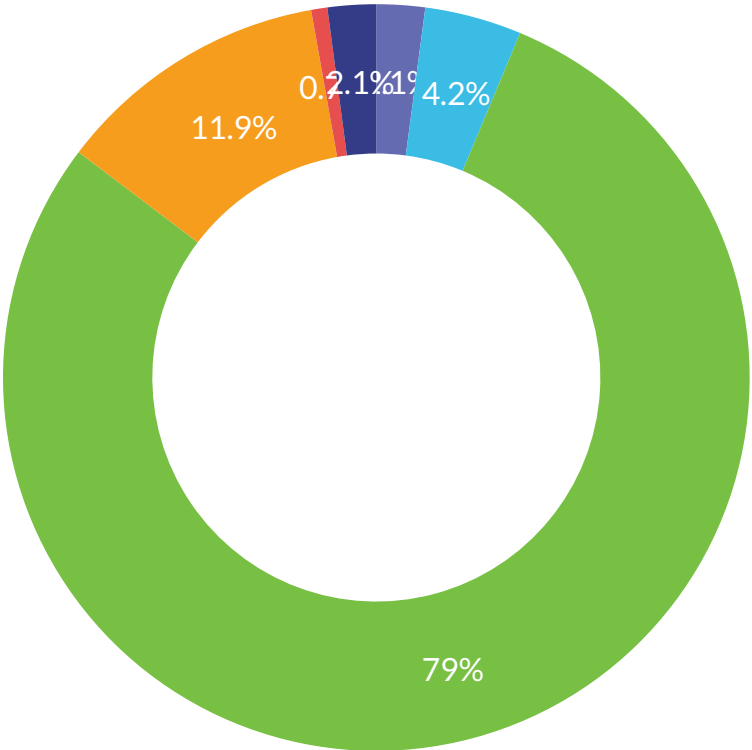
Pre-hospital practitioners



What is your highest Advanced Life Support Qualification?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**



Choice	Total
CCA or equivalent	3
N.Dip(EMC) or equivalent	6
B.Tech(EMC) or equivalent	113
B.H.Sc.(EMC) or equivalent	0
M.Tech(EMC) or equivalent	17
PhD	1

● Other (Please specify)

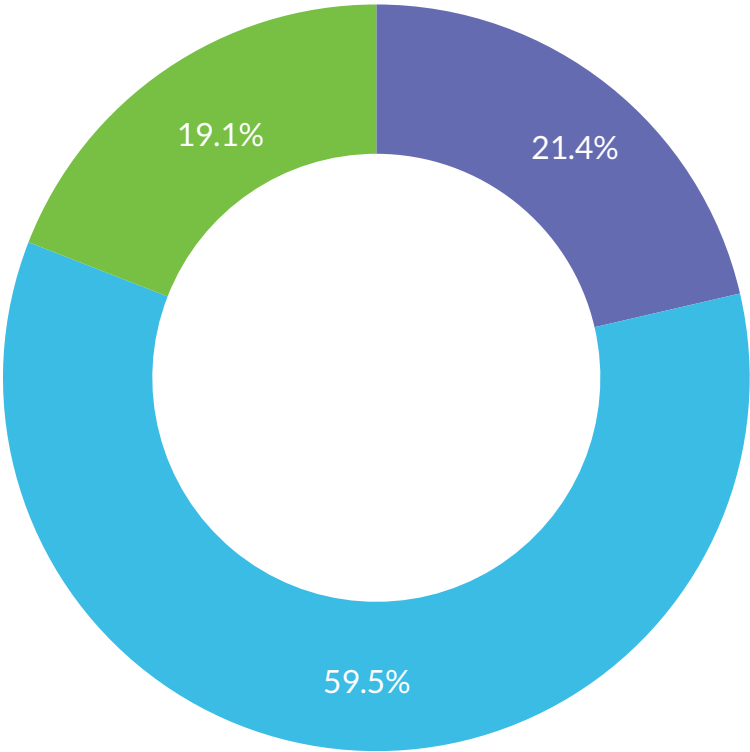
3

Q2

What is your current age?*

MULTIPLE CHOICE

Answered
131
Unanswered
0

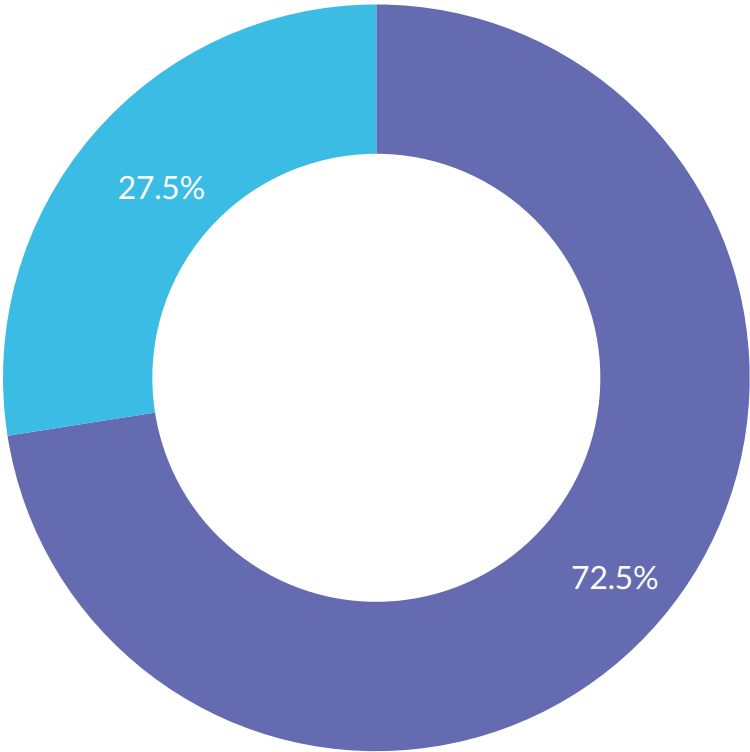


Choice	Total
● <30 years	28
● 31-40 years	78
● 41-50 years	25
● > 50 years	0

Q3

What is your gender?*

MULTIPLE CHOICE



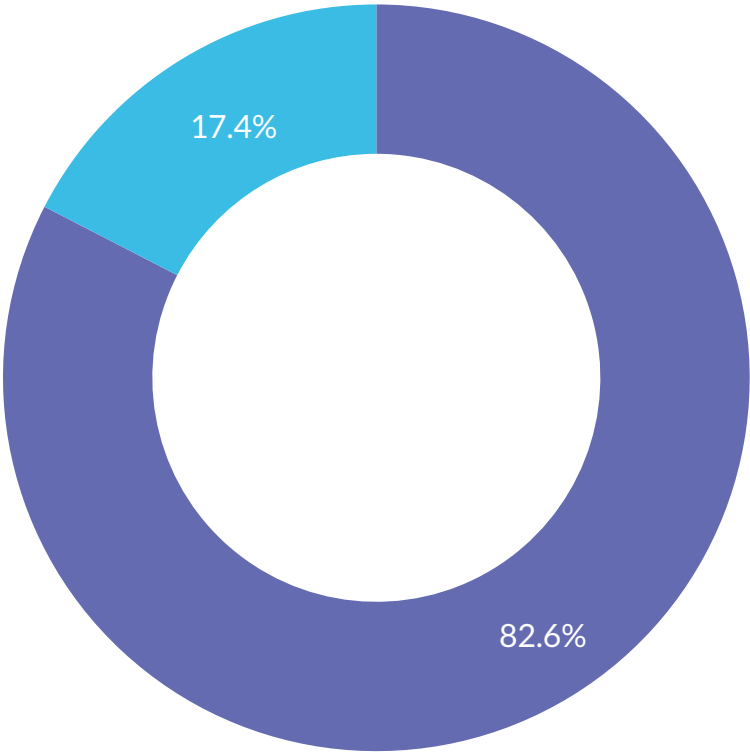
Answered
131
Unanswered
0

Choice	Total
● Male	95
● Female	36

Q4

Which country do you currently work in?*

MULTIPLE CHOICE



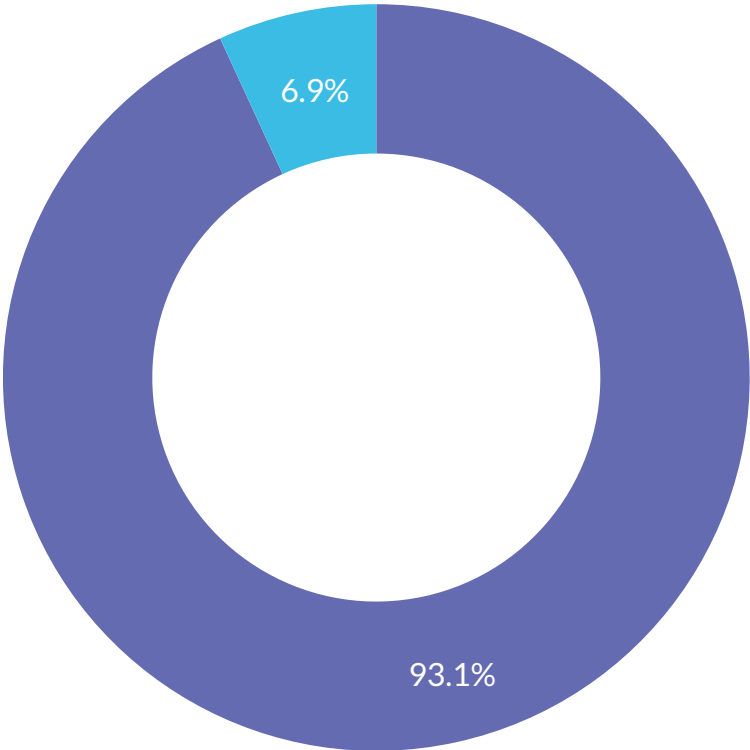
Answered
131
Unanswered
0

Choice	Total
● South Africa	109
● Outside South Africa	23

Q5

Are you currently actively involved in the pre-hospital environment?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

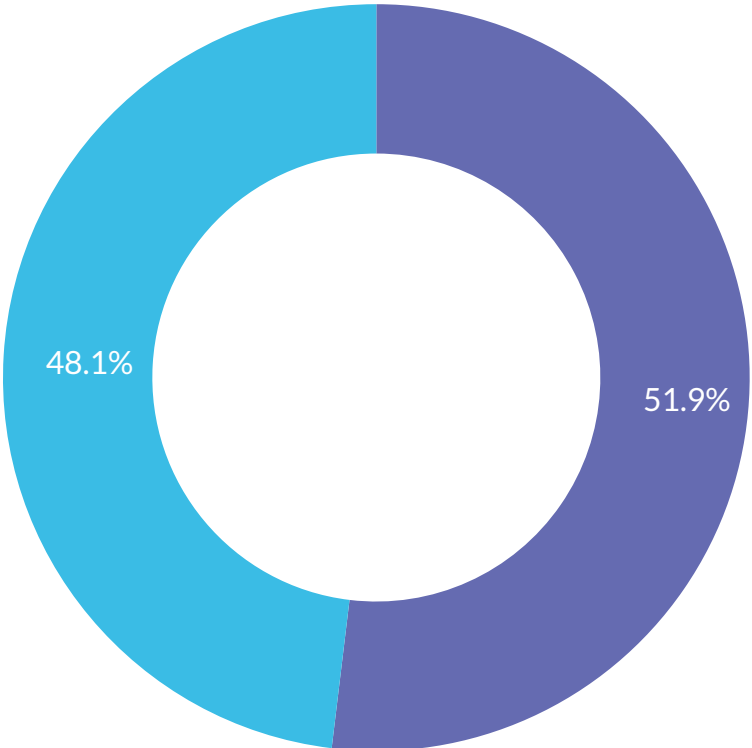
Choice	Total
● Yes	122
● No	9



Do you work in the wilderness / mountain rescue environment?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**



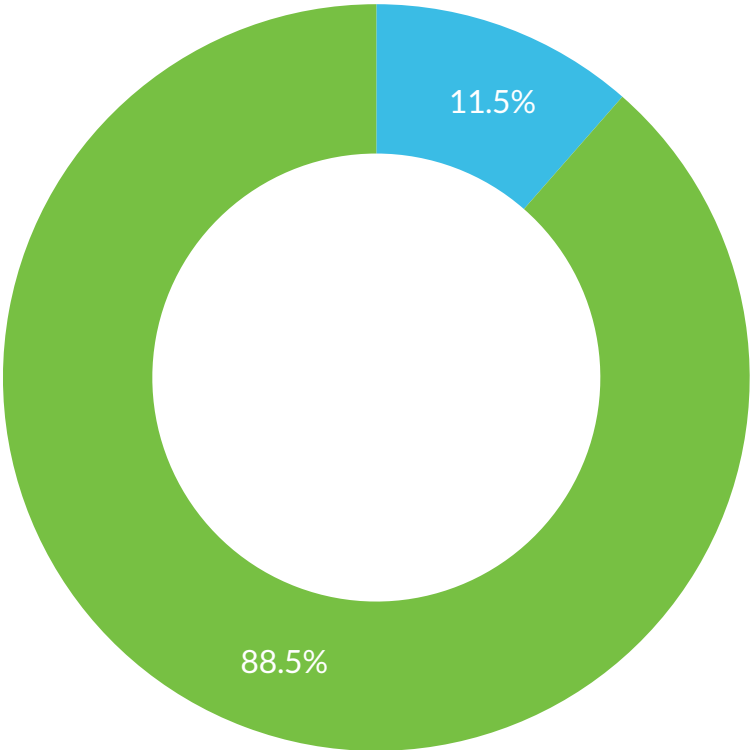
Choice	Total
● Yes	68
● No	63



How knowledgeable are you about Emergency Medical Service (EMS) systems currently?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**

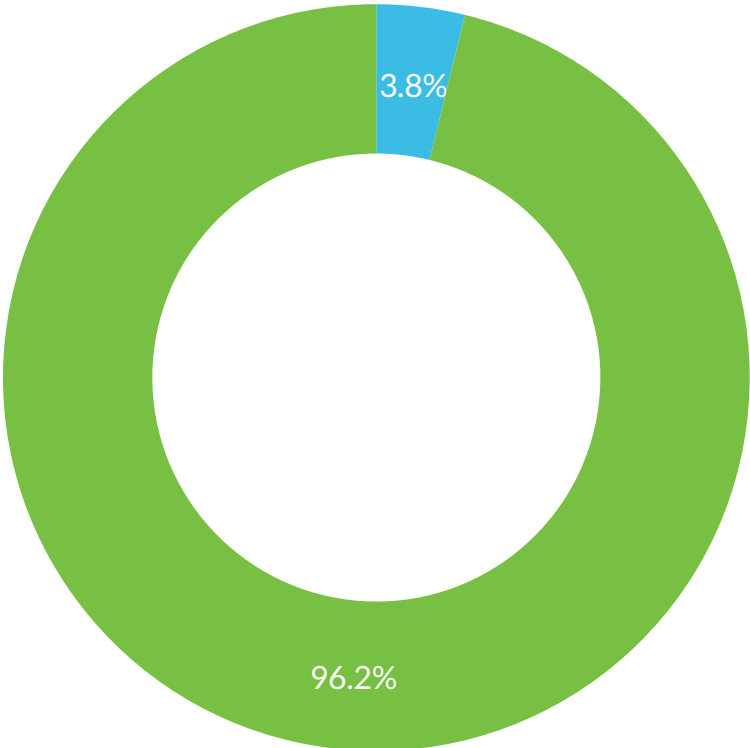


Choice	Total
● Little to no knowledge	0
● Average knowledge	15
● Very knowledgeable	116

Q8

Are you able to complete a full primary and secondary survey in medical, paediatric and trauma patients?*

MULTIPLE CHOICE



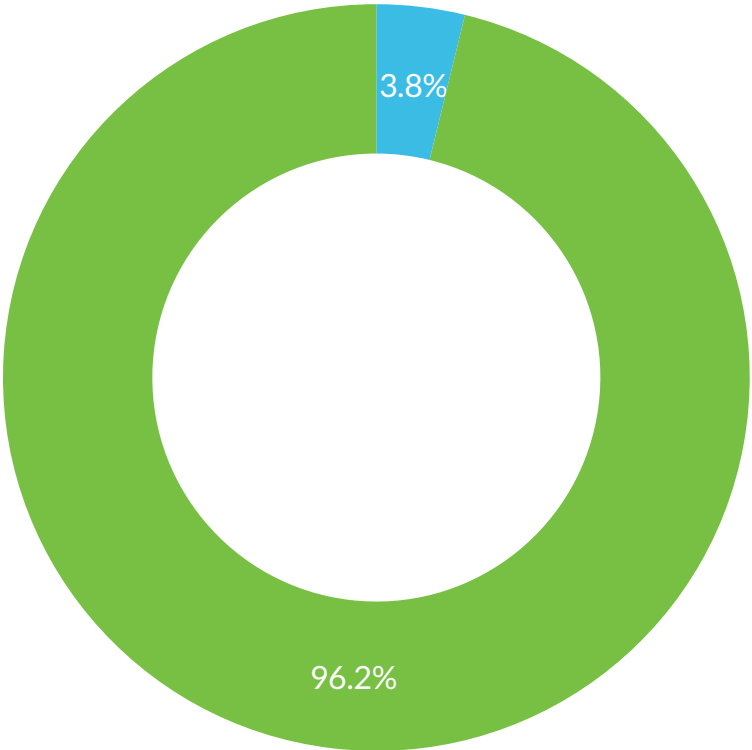
Answered **131**
Unanswered **0**

Choice	Total
<input type="radio"/> I do not know how to do this	0
<input type="radio"/> I may be able to do this, but may not complete a full proper examination	5
<input type="radio"/> I can conduct a full primary and secondary survey for all patient profiles	126



How knowledgeable are you about cardio-pulmonary resuscitation with reference to the latest guidelines?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

Choice	Total
● Little to no knowledge	0
● Average knowledge	5
● Very knowledgeable	126

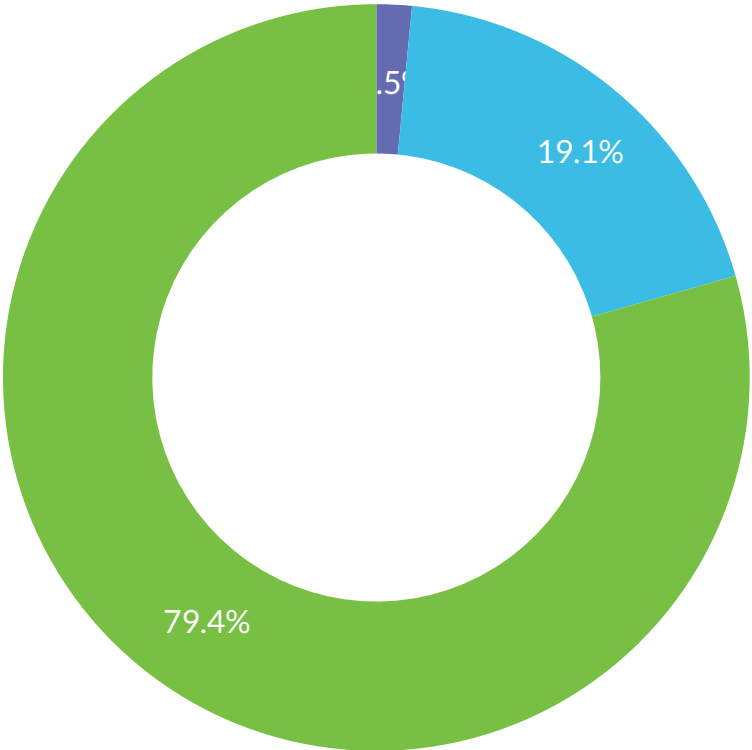
Q10

How well do you know haemorrhage control techniques and devices used in the austere environment?*

MULTIPLE CHOICE

Answered **131**

Unanswered **0**

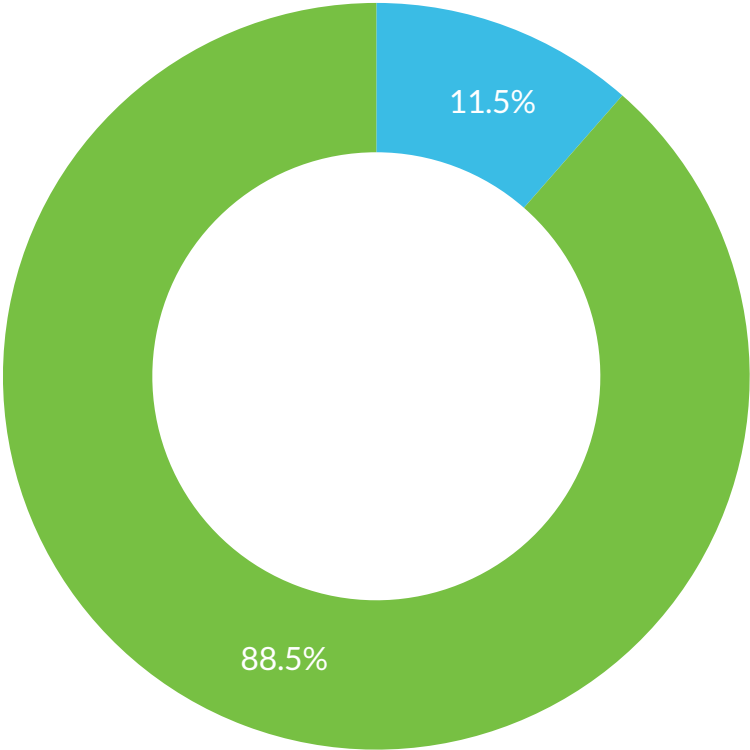


Choice	Total
● Little to no knowledge	2
● Average knowledge	25
● Very knowledgeable	104

Q11

How knowledgeable are you about all aspects of vascular access and emergency vascular access techniques?*

MULTIPLE CHOICE



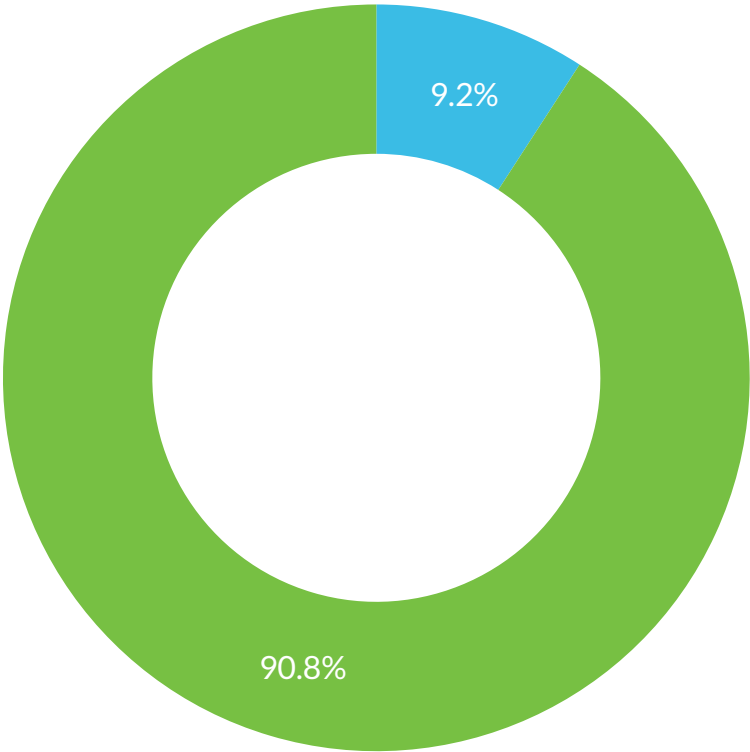
Answered **131**
Unanswered **0**

Choice	Total
● Little to no knowledge	0
● Average knowledge	15
● Very knowledgeable	116

Q12

How knowledgeable are you about fluid resuscitation?*

MULTIPLE CHOICE



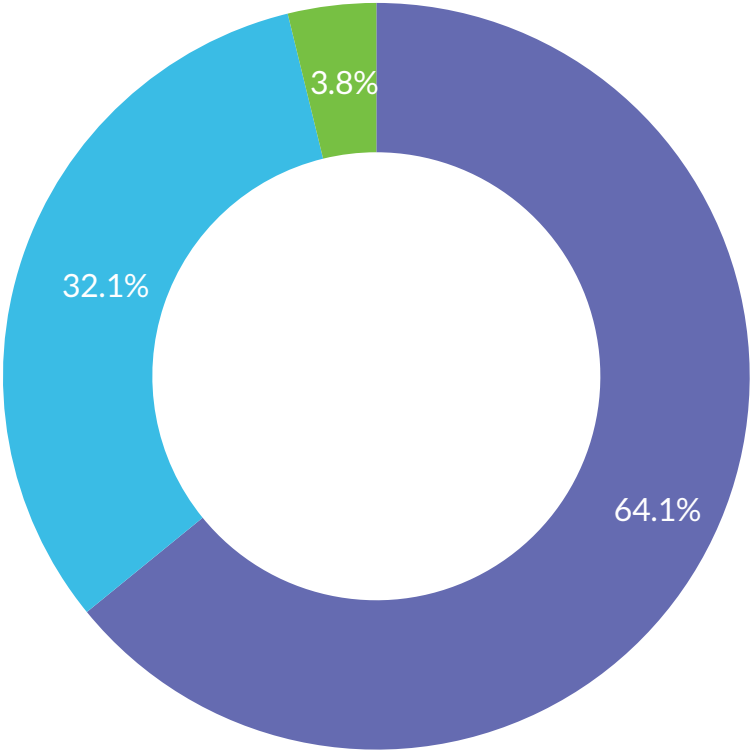
Answered
131
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	12
● Very knowledgeable	119

Q13

How knowledgeable are you about wound care including antibiotic usage and wound closure techniques in protracted field care?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

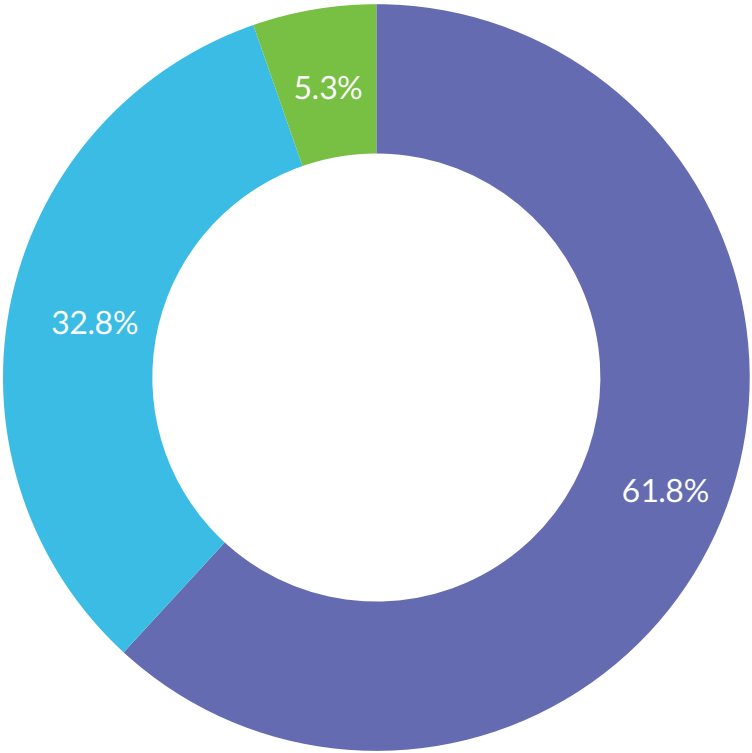
Choice	Total
● Little to no knowledge	84
● Average knowledge	42
● Very knowledgeable	5

Q14

How knowledgeable are you about animal bites including envenomation syndromes?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**

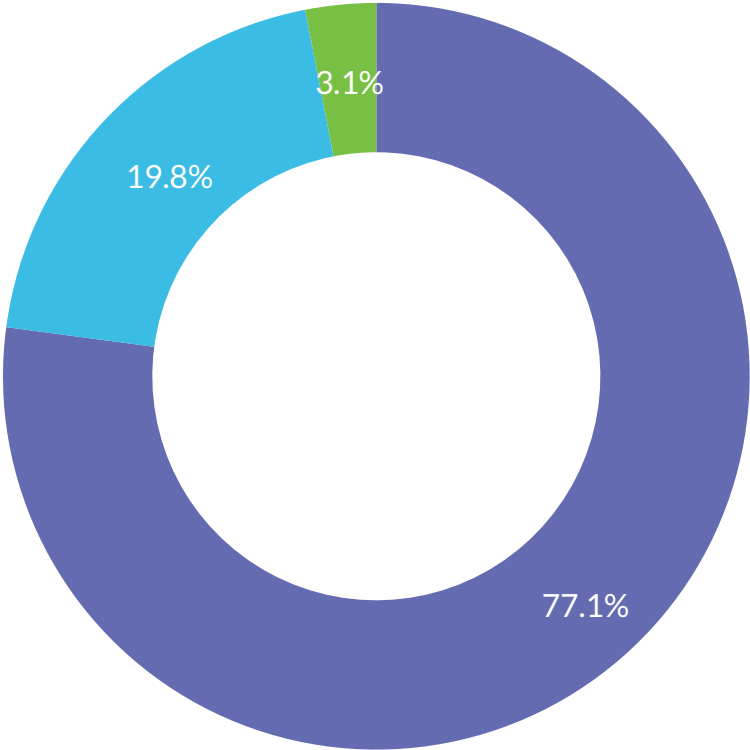


Choice	Total
● Little to no knowledge	81
● Average knowledge	43
● Very knowledgeable	7

Q15

How good is your knowledge and understanding of rabies and assessing risk / exposure as well as the management of this problem?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

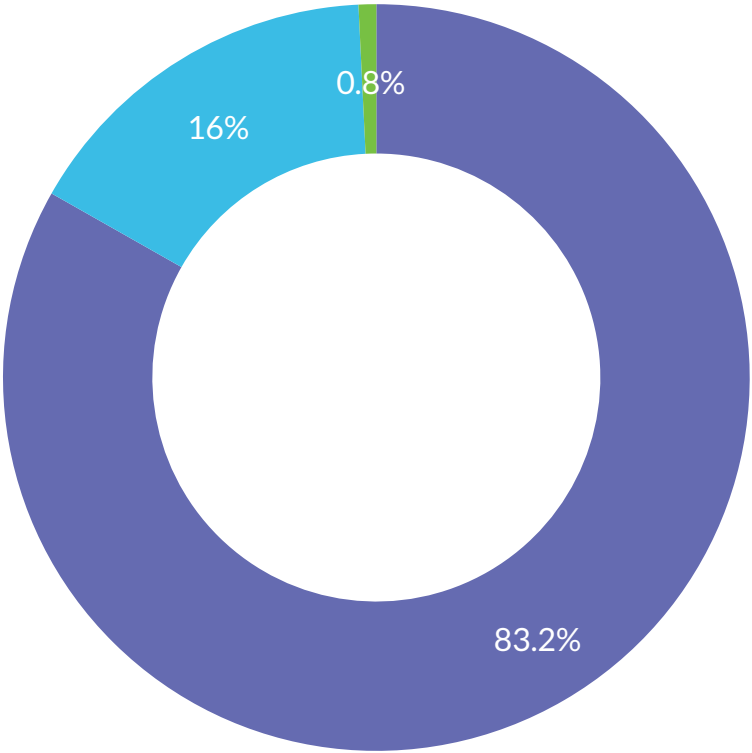
Choice	Total
● Little to no knowledge	101
● Average knowledge	26
● Very knowledgeable	4

Q16

How knowledgeable are you in plant toxicology and the management of herbal toxicities in humans?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**

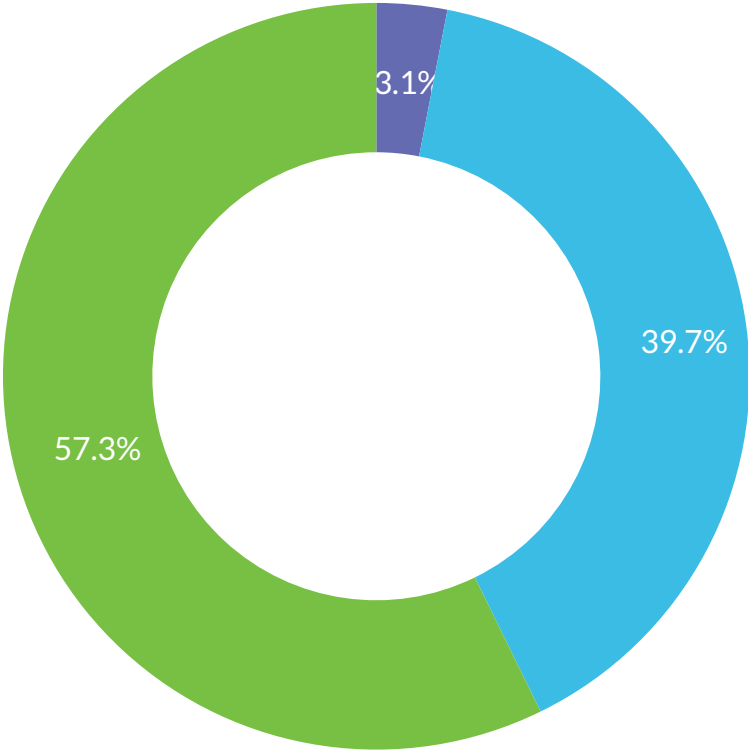


Choice	Total
● Little to no knowledge	109
● Average knowledge	21
● Very knowledgeable	1

Q17

How knowledgeable are you to manage all types of medical (non-trauma) emergencies in the austere environment?*

MULTIPLE CHOICE



Answered
131
Unanswered
0

Choice	Total
● Little to no knowledge	4
● Average knowledge	52
● Very knowledgeable	75

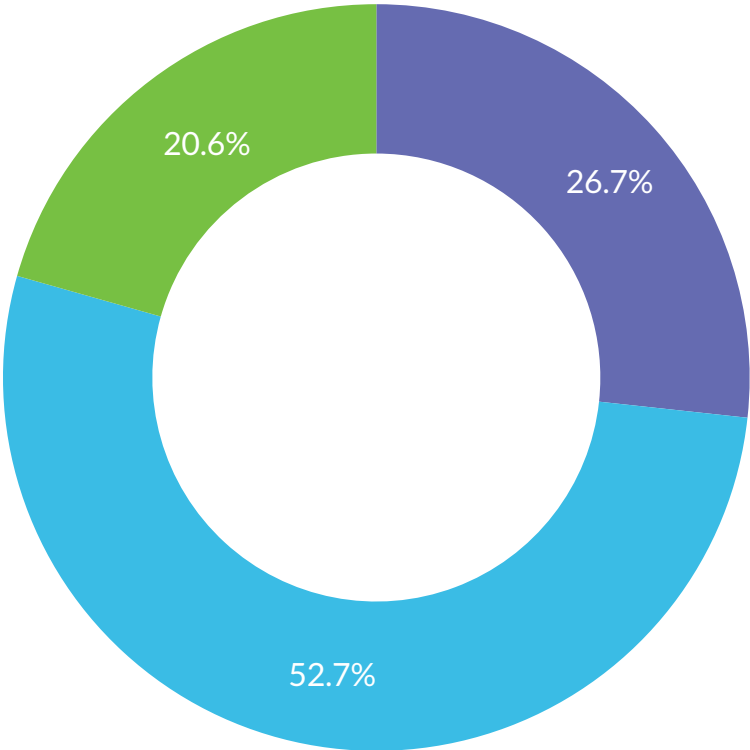
Q18

How knowledgeable are you to recognise and manage altitude related illnesses?*

MULTIPLE CHOICE

Answered **131**

Unanswered **0**



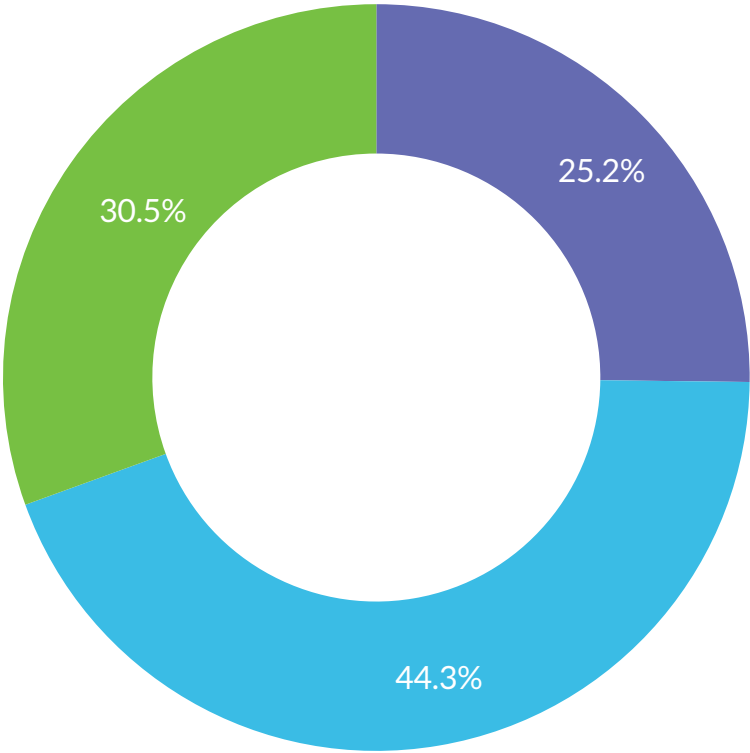
Choice	Total
● Little to no knowledge	35
● Average knowledge	69
● Very knowledgeable	27

Q19

How knowledgeable are you to manage cold- and heat-related injuries and illnesses?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**



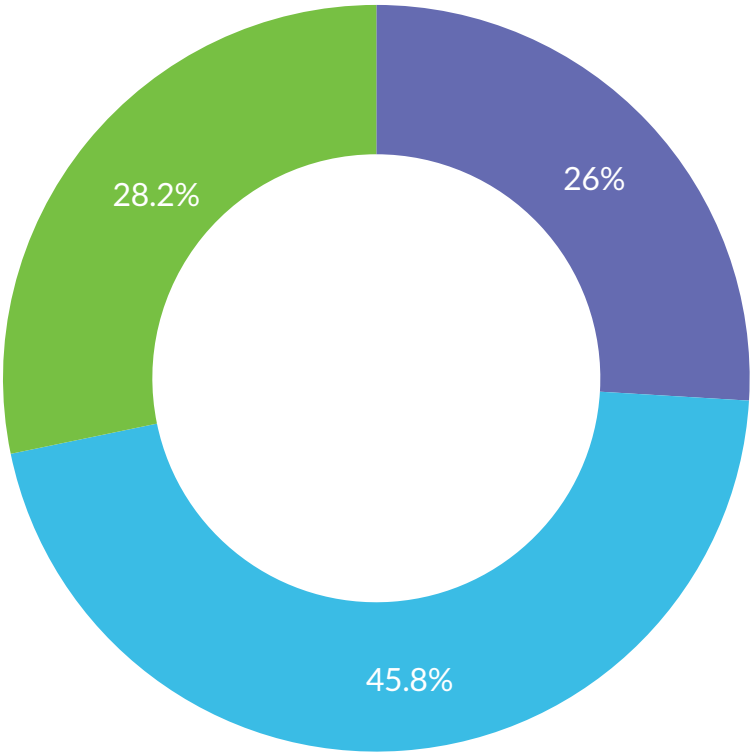
Choice	Total
● Little to no knowledge	33
● Average knowledge	58
● Very knowledgeable	40

Q20

How well do you know how to deal with submersion injuries / drowning injuries and diving-related accidents?

*

MULTIPLE CHOICE



Answered
131

Unanswered
0

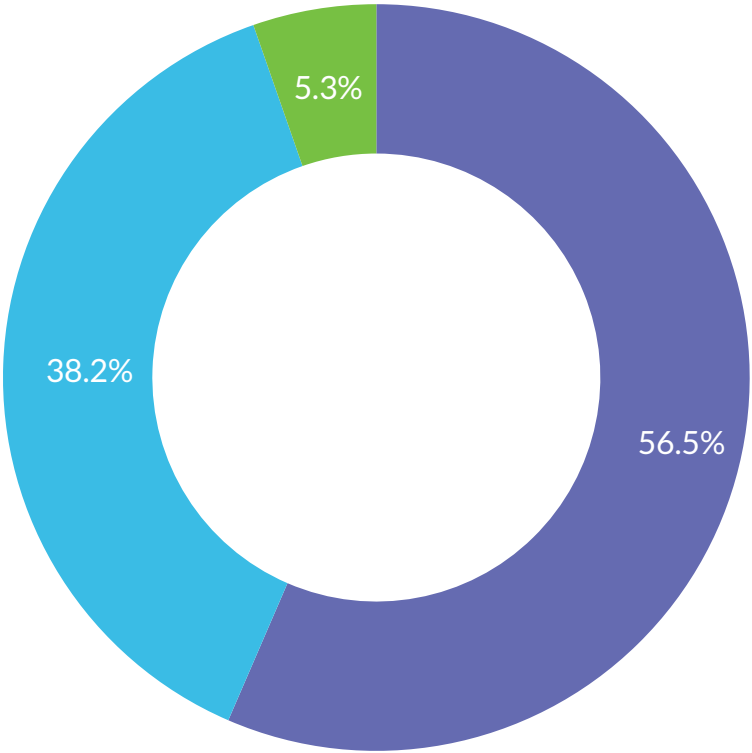
Choice	Total
● Little to no knowledge	34
● Average knowledge	60
● Very knowledgeable	37

Q21

How well do you know avalanche-related injuries, how to identify them, and how to manage them?*

MULTIPLE CHOICE

Answered
131
Unanswered
0



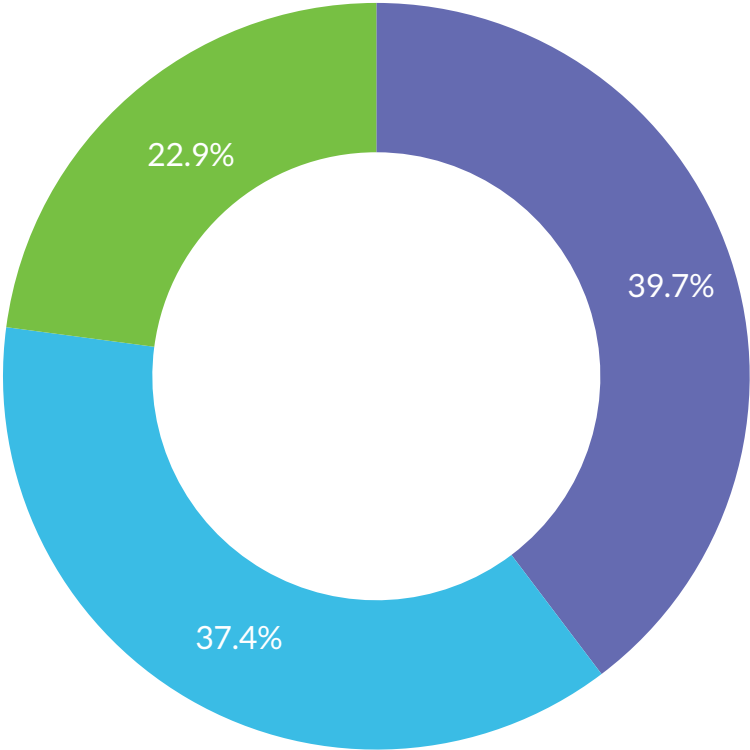
Choice	Total
● Little to no knowledge	74
● Average knowledge	50
● Very knowledgeable	7

Q22

How well do you know lightning-related injuries, how to recognise these injuries and their complications, and how to manage them?*

MULTIPLE CHOICE

Answered
131
Unanswered
0

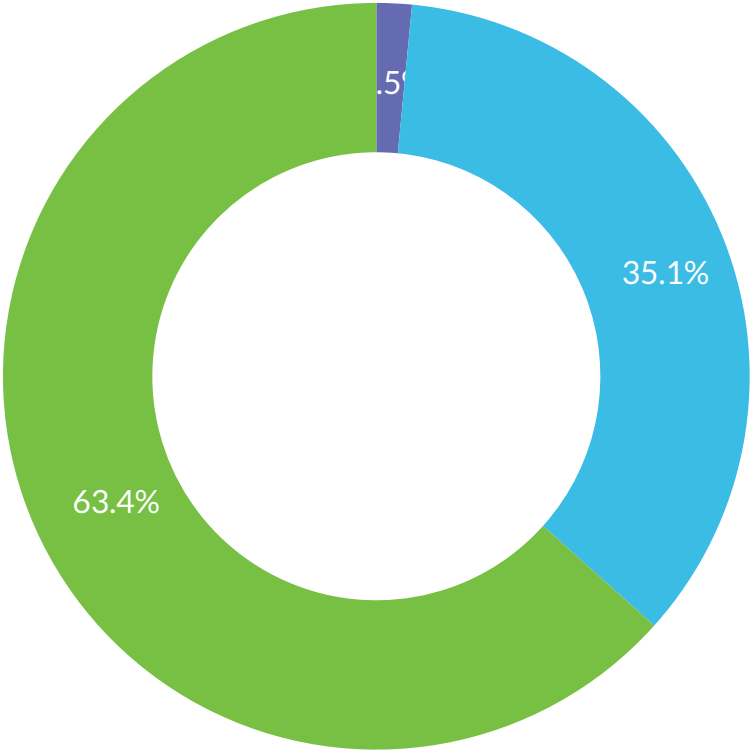


Choice	Total
● Little to no knowledge	52
● Average knowledge	49
● Very knowledgeable	30

Q23

How well do you know how to assess, categorise, determine depth and affected surface area, and manage burn injuries?*

MULTIPLE CHOICE



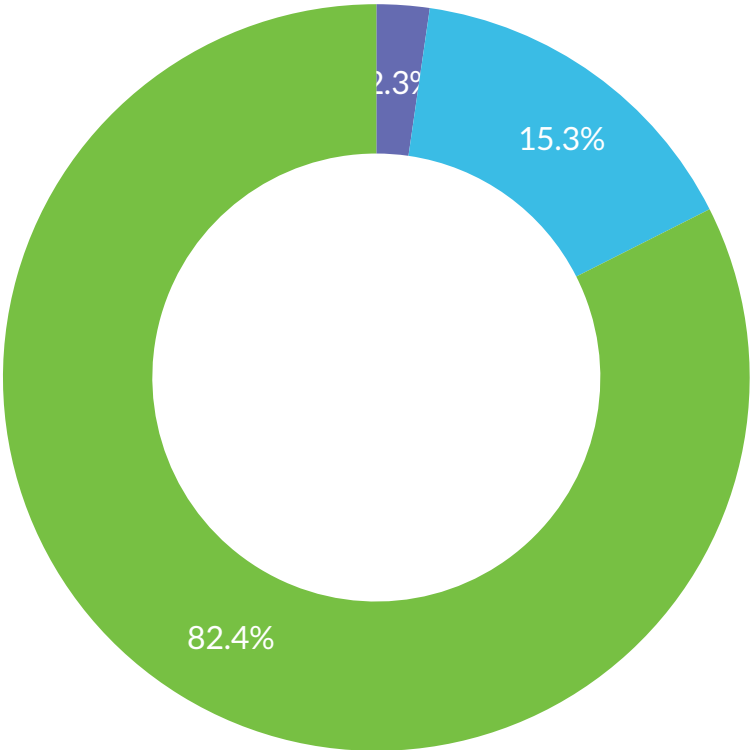
Answered
131
Unanswered
0

Choice	Total
● Little to no knowledge	2
● Average knowledge	46
● Very knowledgeable	83

Q24

How knowledgeable are you to deal with all types of major and minor trauma in the austere environment?*

MULTIPLE CHOICE



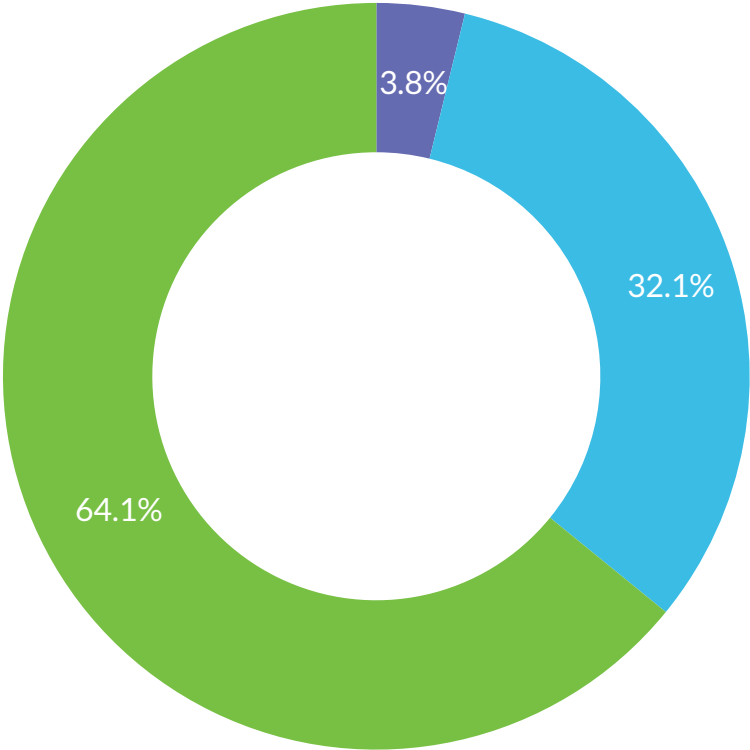
Answered **131**
Unanswered **0**

Choice	Total
● Little to no knowledge	3
● Average knowledge	20
● Very knowledgeable	108

Q25

How knowledgeable are you to assess and manage orthopaedic injuries in the wilderness environment when protracted field care may be required?*

MULTIPLE CHOICE



Answered
131

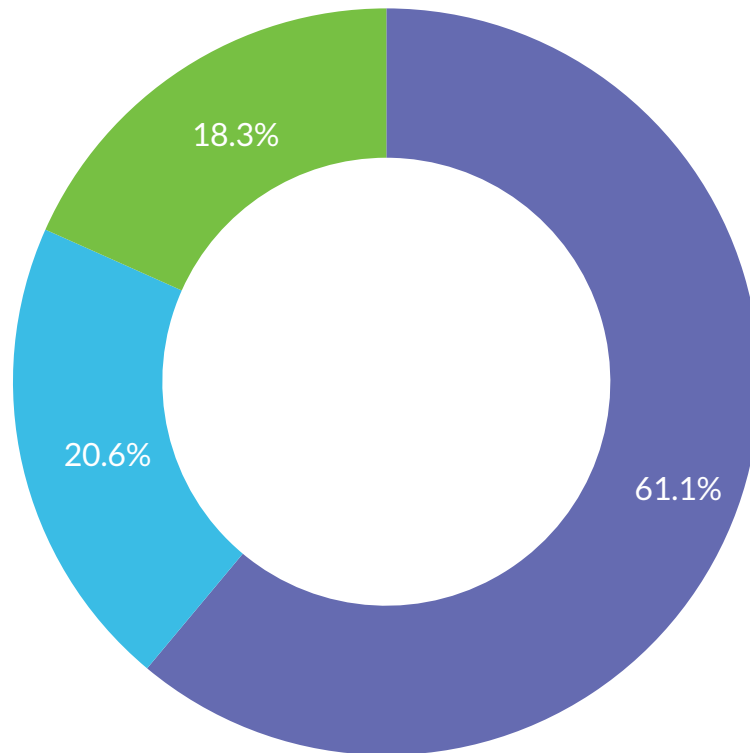
Unanswered
0

Choice	Total
● Little to no knowledge	5
● Average knowledge	42
● Very knowledgeable	84

Q26

MULTIPLE CHOICE

How knowledgeable are you to conduct a primary health care assessment (history taking, clinical examination, develop a problem list, develop a list of differential diagnoses, request and conduct simple primary health care investigations) and develop a management plan?*



Answered
131
Unanswered
0

Choice	Total
● Little to no knowledge	80
● Average knowledge	27
● Very knowledgeable	24

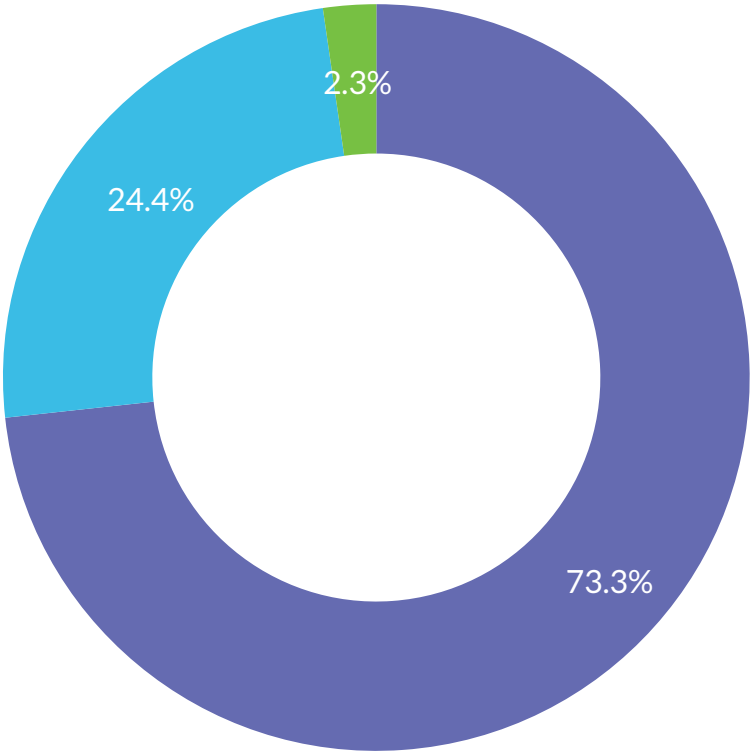
Q27

How knowledgeable are you in the presentation, assessment and management of tropical diseases?*

MULTIPLE CHOICE

Answered
131

Unanswered
0



Choice	Total
● Little to no knowledge	96
● Average knowledge	32
● Very knowledgeable	3

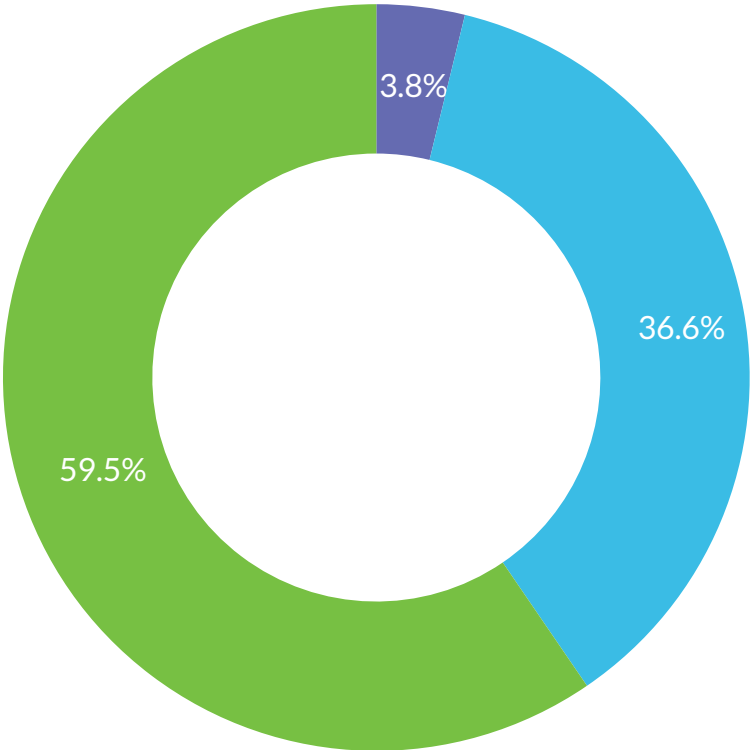
Q28

How knowledgeable are you to manage a disaster / major incident in the wilderness / austere environment?*

MULTIPLE CHOICE

Answered
131

Unanswered
0

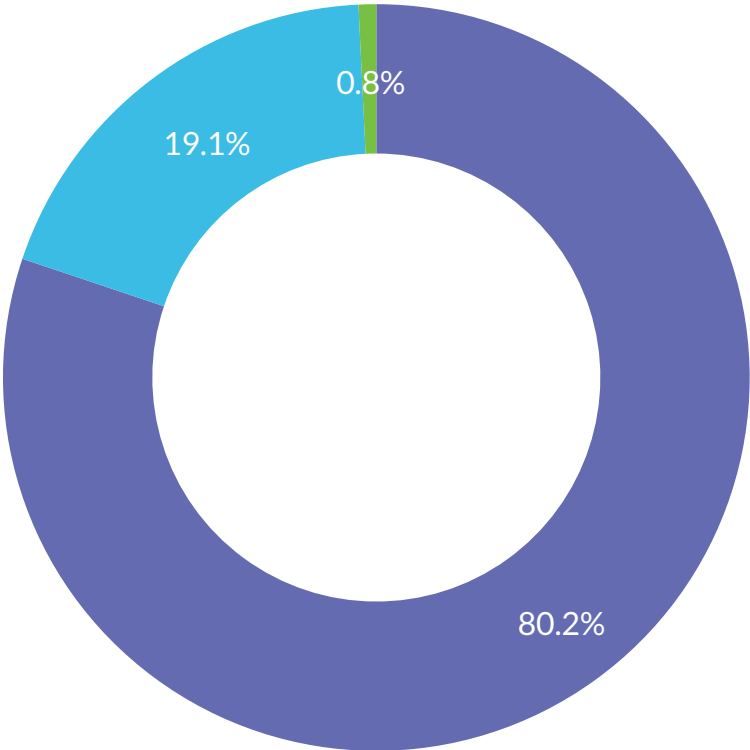


Choice	Total
● Little to no knowledge	5
● Average knowledge	48
● Very knowledgeable	78

Q29

Are you able to recognise edible and medicinal plants in the area you work?*

MULTIPLE CHOICE



Answered
131

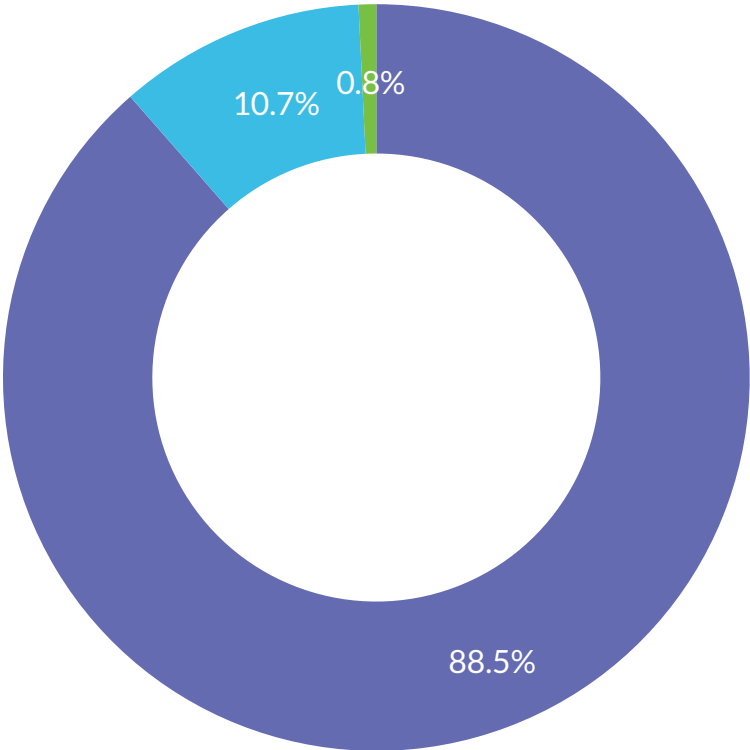
Unanswered
0

Choice	Total
No	105
Some plants only	25
Very knowledgeable	1

Q30

How knowledgeable are you to assess and manage dental problems in the field?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

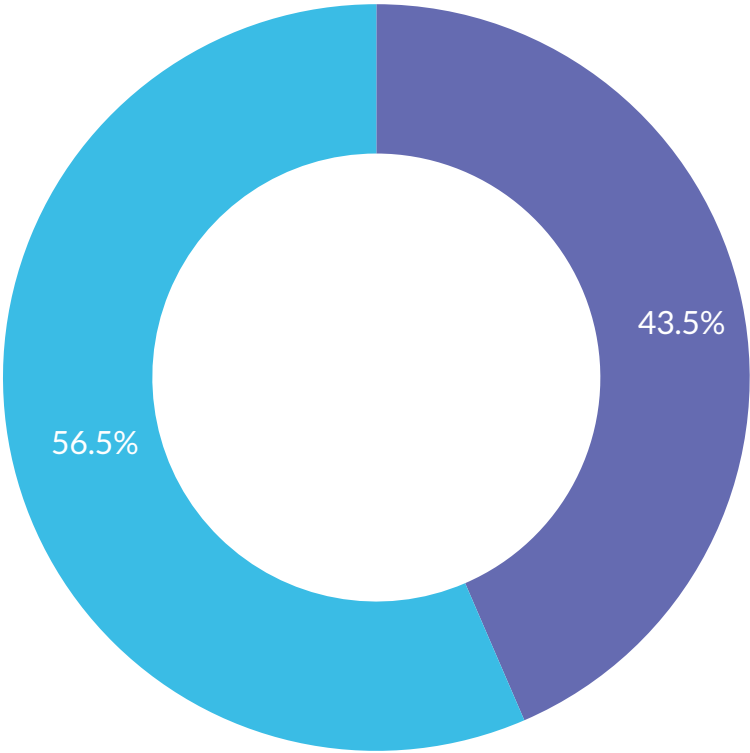
Choice	Total
● Little to no knowledge	116
● Average knowledge	14
● Very knowledgeable	1

Q31

Did you complete any helicopter safety briefing in the last year?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**



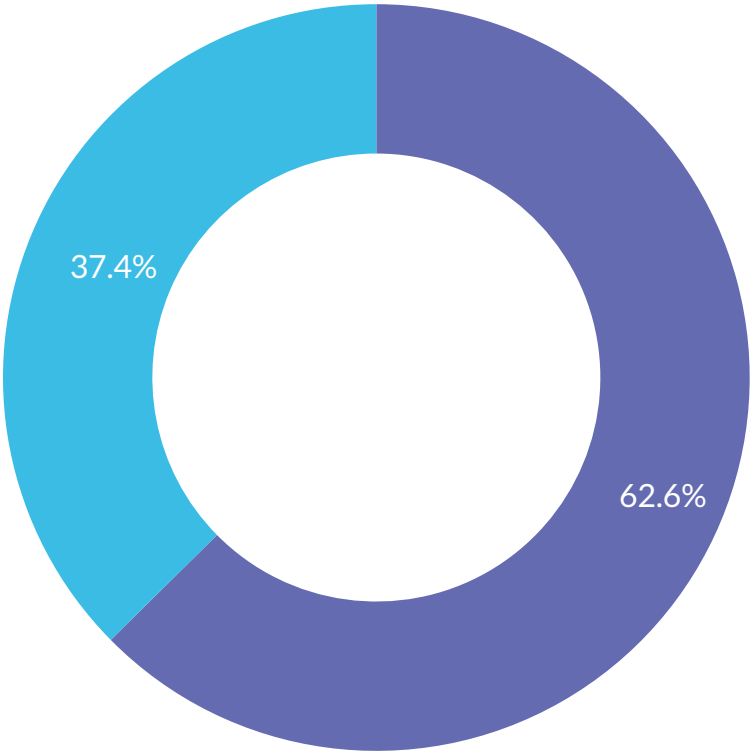
Choice	Total
No	57
Yes	74

Q32

Do you have an updated Aviation Health Care Provider course (or equivalent) certification?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**

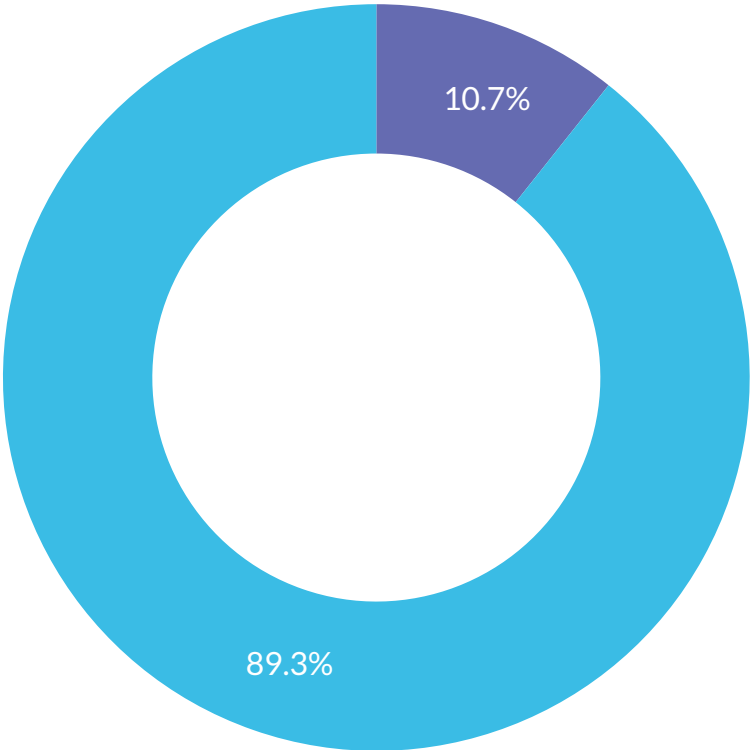


Choice	Total
● No	82
● Yes	49

Q33

Do you have a valid Basic Life Support for Healthcare Providers certificate?*

MULTIPLE CHOICE



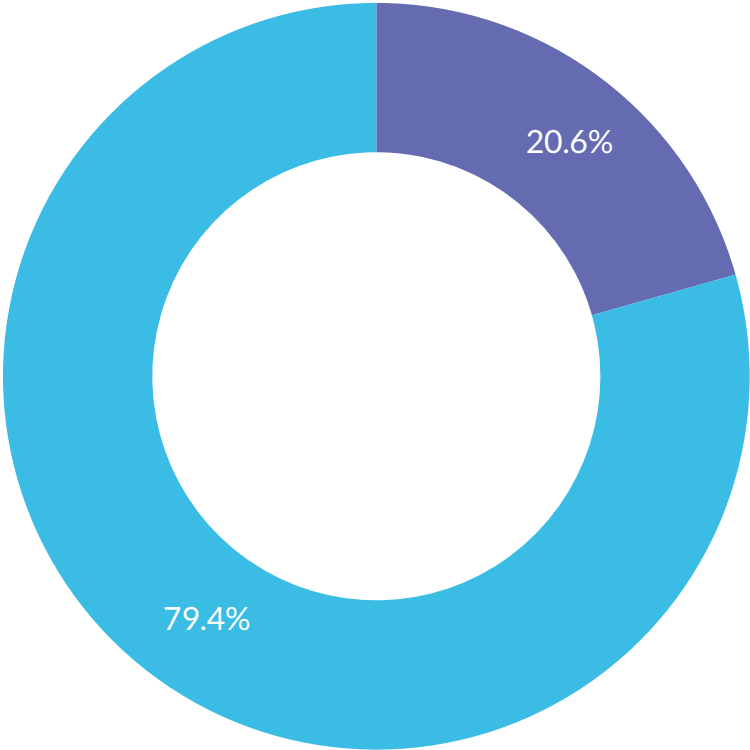
Answered **131**
Unanswered **0**

Choice	Total
No	14
Yes	117

Q34

Do you have a valid Advanced Cardiovascular Life Support (ACLS) or ACLS-Experienced Provider (ACLS-EP) certification?*

MULTIPLE CHOICE



Answered
131

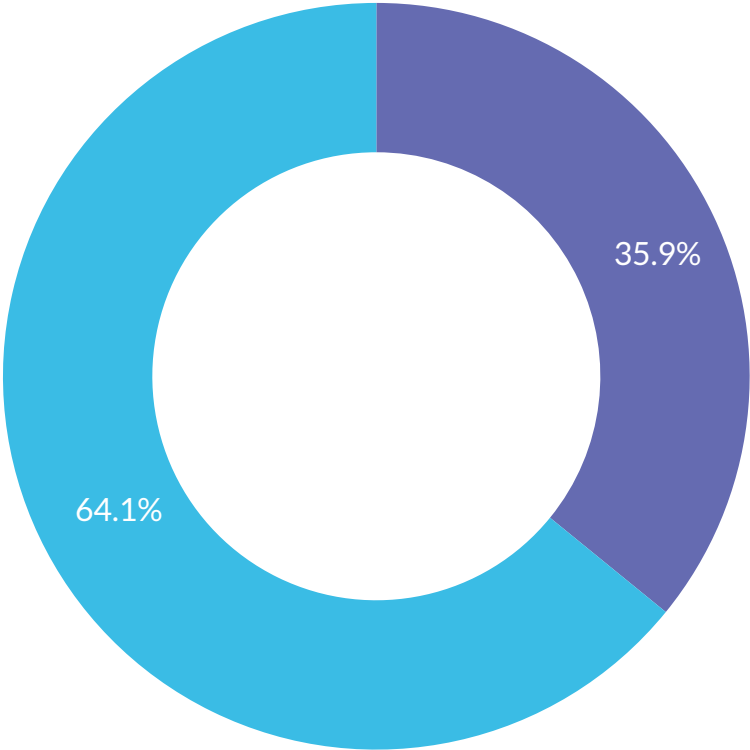
Unanswered
0

Choice	Total
● No	27
● Yes	104

Q35

Do you have a valid Paediatric Advanced Life Support (PALS) or Advanced Paediatric Life Support (APLS) certification?*

MULTIPLE CHOICE



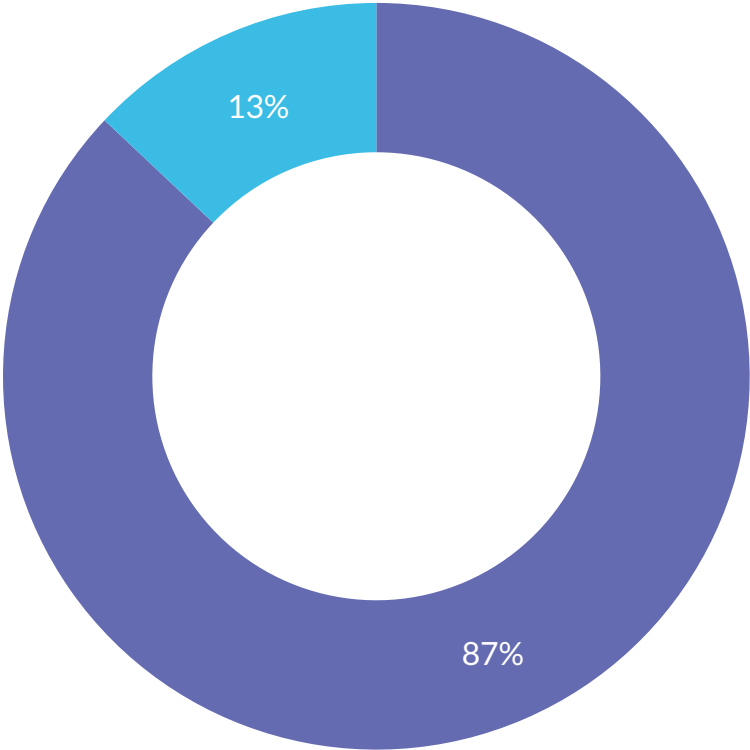
Answered
131
Unanswered
0

Choice	Total
● No	47
● Yes	84

Q36

Do you have a valid Advanced Trauma Life Support (ATLS) or Prehospital Trauma Life Support (PHTLS) certification?*

MULTIPLE CHOICE



Answered
131
Unanswered
0

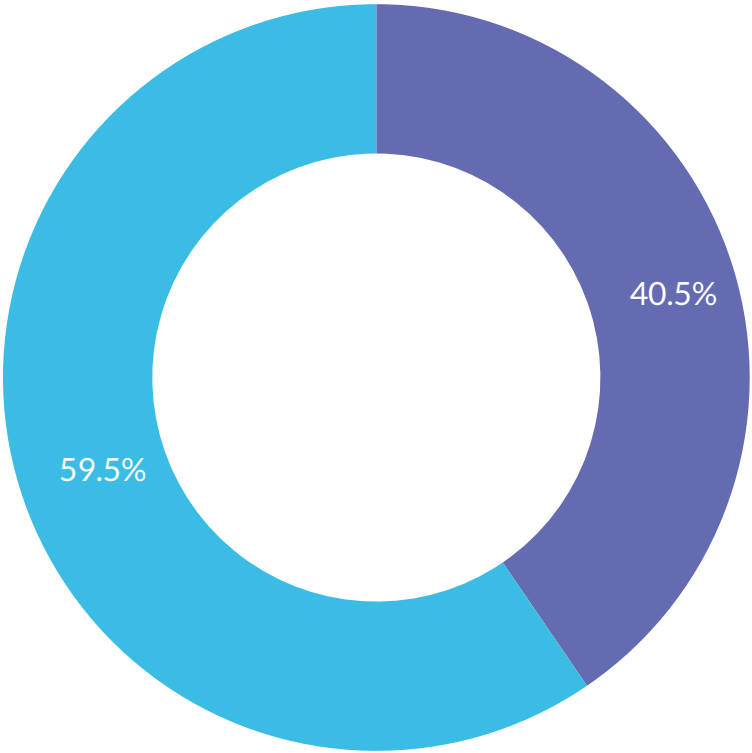
Choice	Total
● No	114
● Yes	17

Q37

Do you have a valid International Trauma Life Support (ITLS) certification?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**



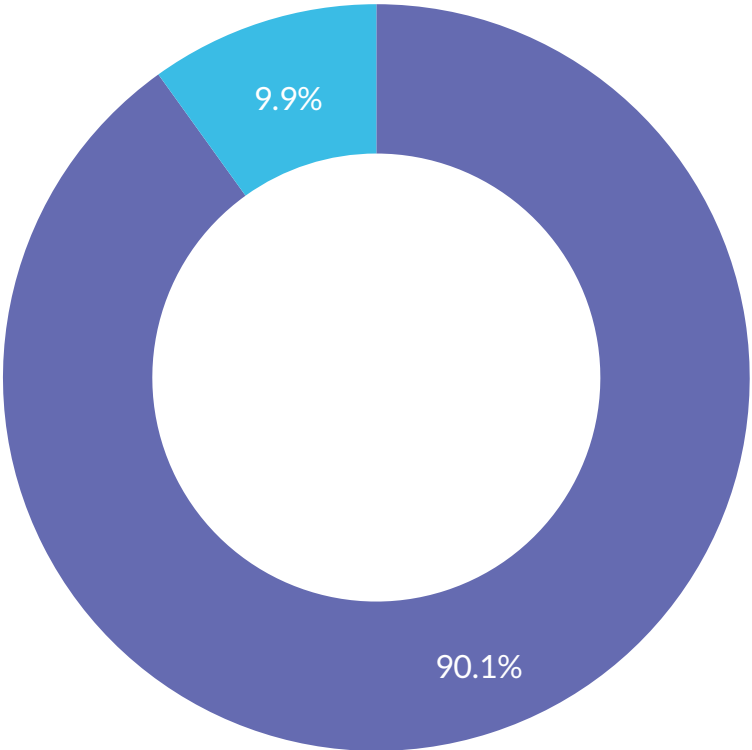
Choice	Total
No	53
Yes	78

Q38

Have you done a basic wilderness first aid or first responder course that is current and valid?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**

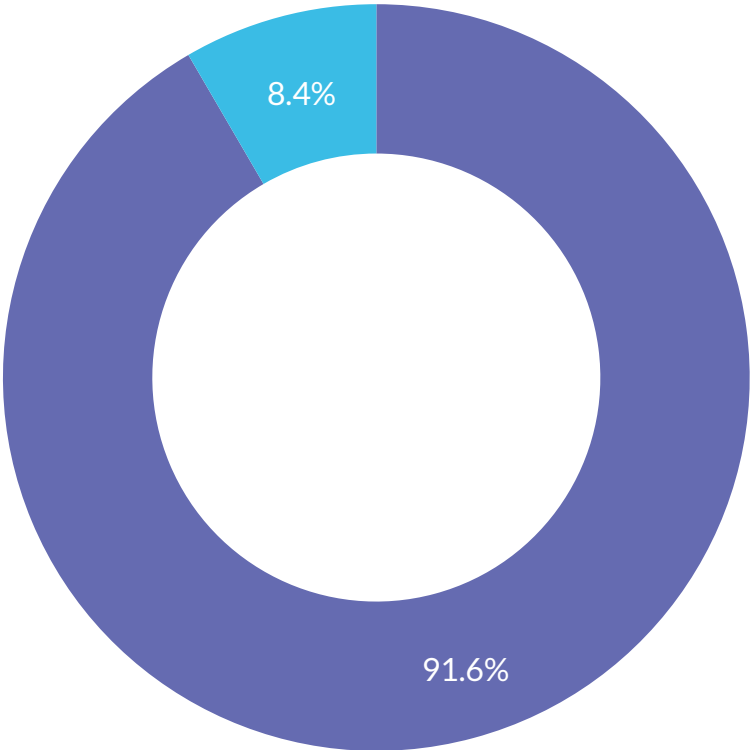


Choice	Total
● No	118
● Yes	13

Q39

Have you done an Advanced Wilderness Emergency Medicine course or equivalent that is current and valid?*

MULTIPLE CHOICE



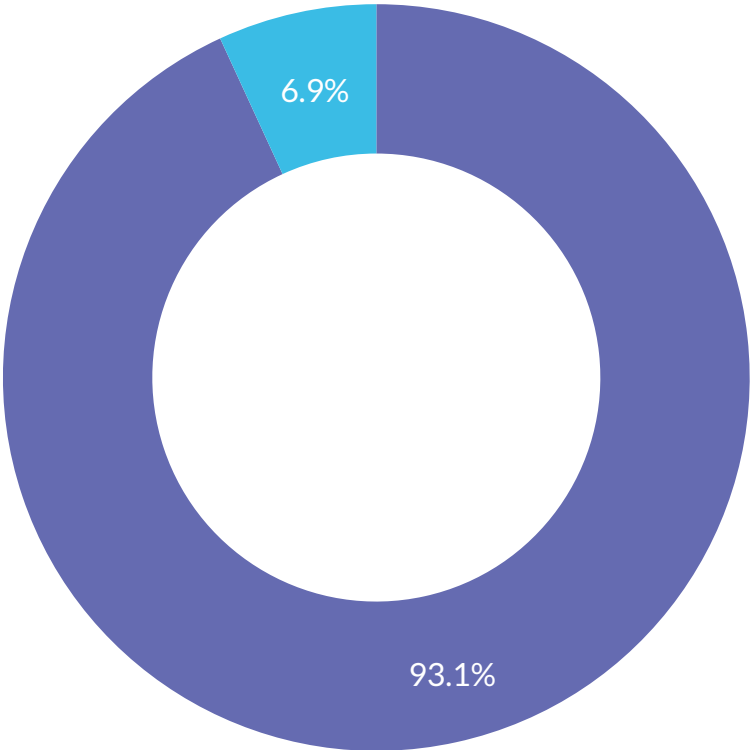
Answered
131
Unanswered
0

Choice	Total
● No	120
● Yes	11

Q40

Have you done an Advanced Medical Life Support (AMLS) course or equivalent which is current and valid?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

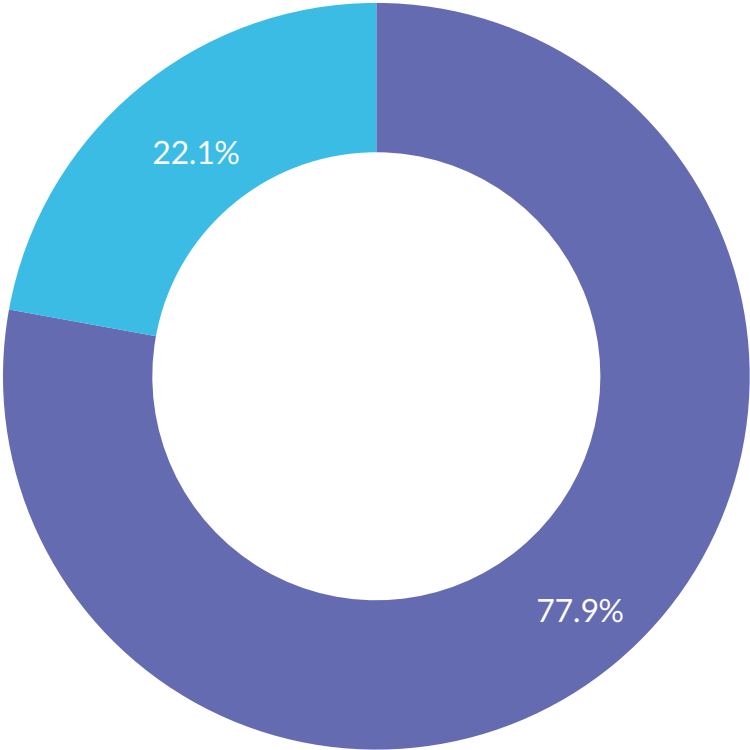
Choice	Total
No	122
Yes	9

Q41

Have you done a Major Incident Medical Management and Support (MIMMS) course which is current and valid?

*

MULTIPLE CHOICE



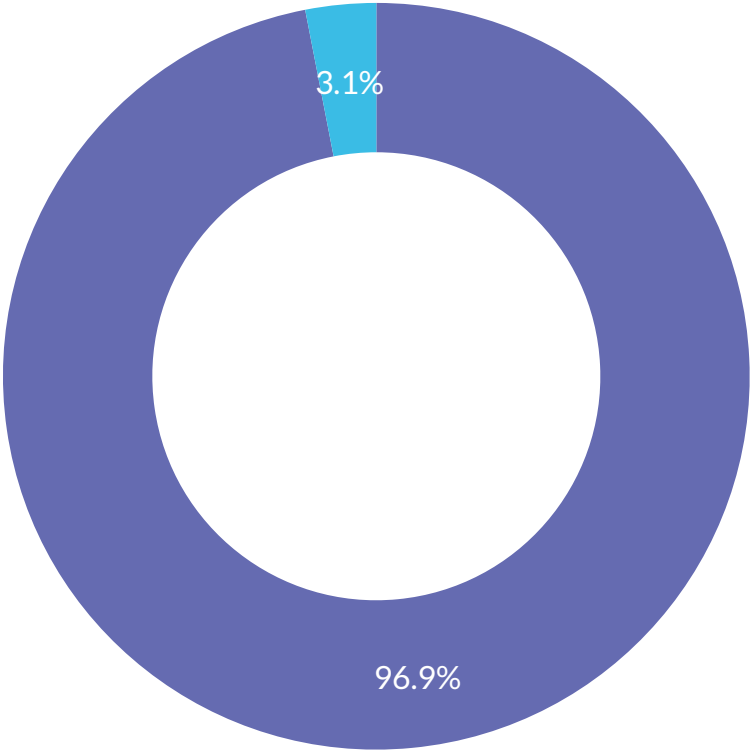
Answered
131
Unanswered
0

Choice	Total
● No	102
● Yes	29

Q42

Have you done a Hospital Major Incident Medical Management and Support (HMIMMS) course which is current and valid?*

MULTIPLE CHOICE



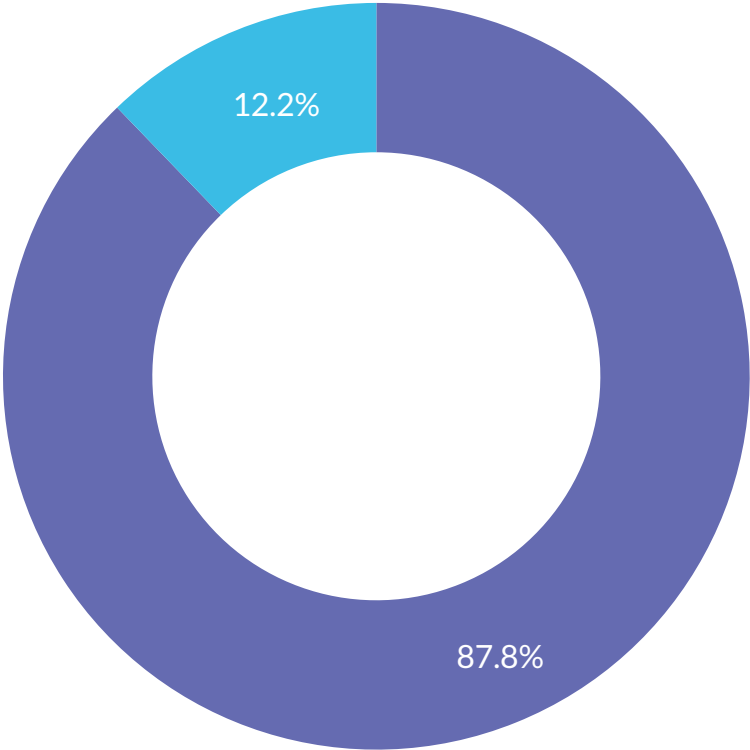
Answered
131
Unanswered
0

Choice	Total
● No	127
● Yes	4

Q43

Have you done an Airway Interventions and Management in Emergencies (AIME) course which is current and valid?*

MULTIPLE CHOICE



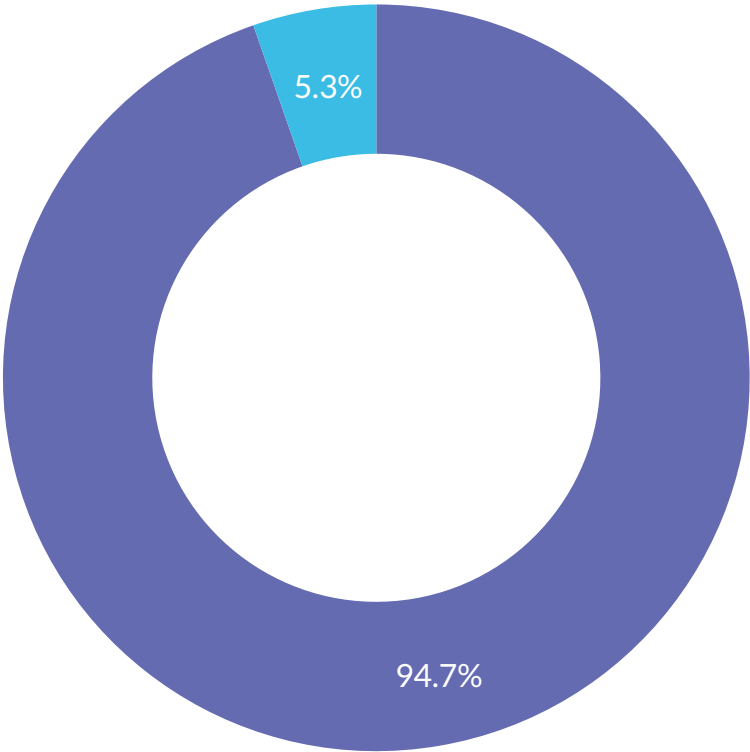
Answered
131
Unanswered
0

Choice	Total
● No	115
● Yes	16

Q44

Have you done a basic point-of-care ultrasound course?*

MULTIPLE CHOICE



Answered
131
Unanswered
0

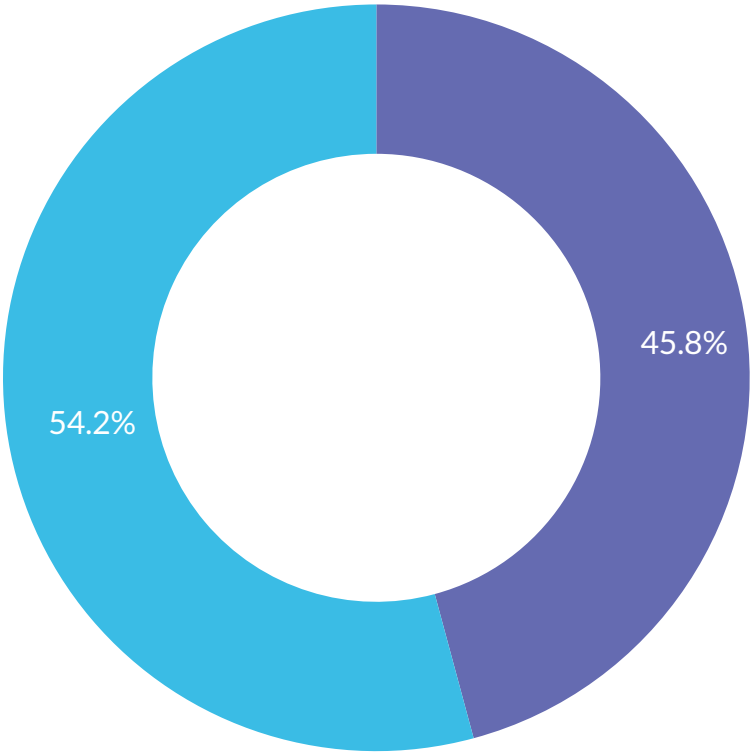
Choice	Total
● No	124
● Yes	7

Q45

Have you done any formal survival training?*

MULTIPLE CHOICE

Answered
131
Unanswered
0



Choice	Total
No	60
Yes	71

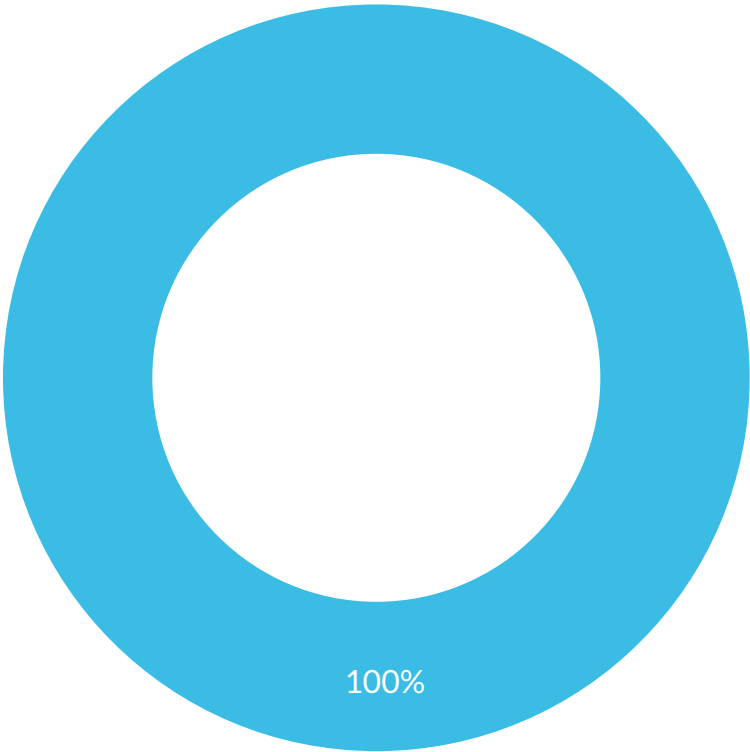
Q46

Can you effectively perform chest compressions?*

MULTIPLE CHOICE

Answered
131

Unanswered
0



Choice	Total
● No	0
● Yes	131

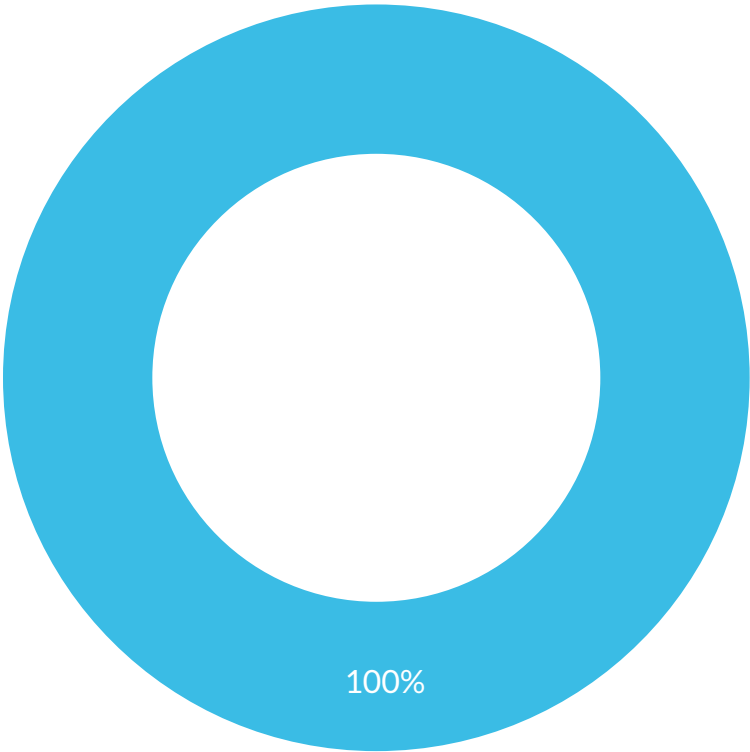
Q47

Can you defibrillate using a manual defibrillator?*

MULTIPLE CHOICE

Answered
131

Unanswered
0



Choice	Total
● No	0
● Yes	131

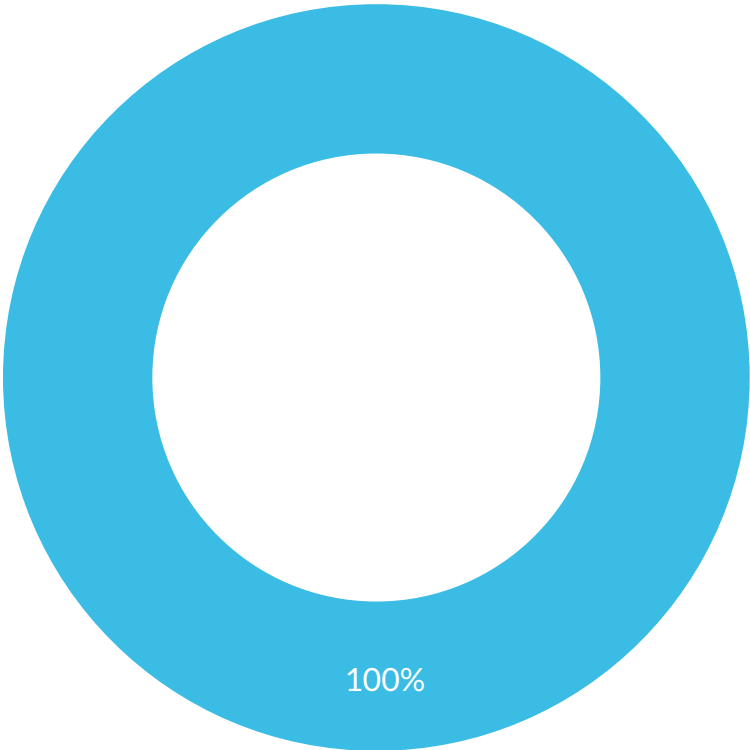
Q48

Can you defibrillate using an automated external defibrillator?*

MULTIPLE CHOICE

Answered **131**

Unanswered **0**

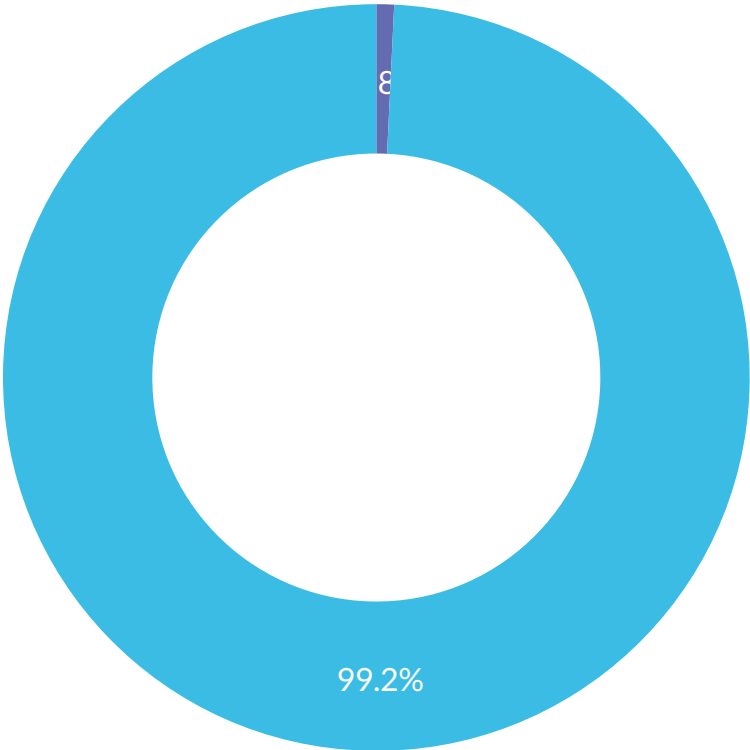


Choice	Total
● No	0
● Yes	131

Q49

Can you comfortably perform bag-valve-mask ventilation?*

MULTIPLE CHOICE



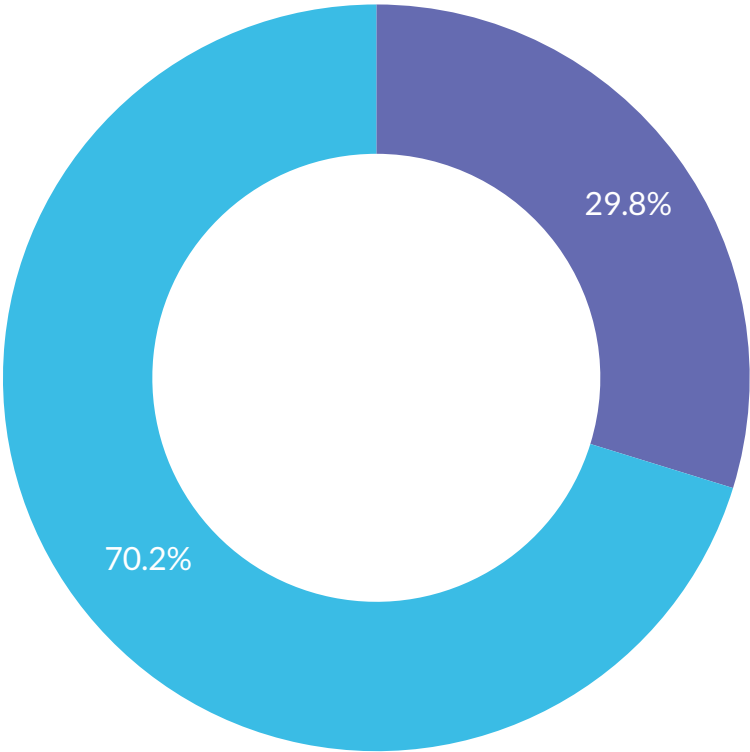
Answered **131**
Unanswered **0**

Choice	Total
No	1
Yes	130

Q50

Can you use a commercial tourniquet?*

MULTIPLE CHOICE



Answered
131
Unanswered
0

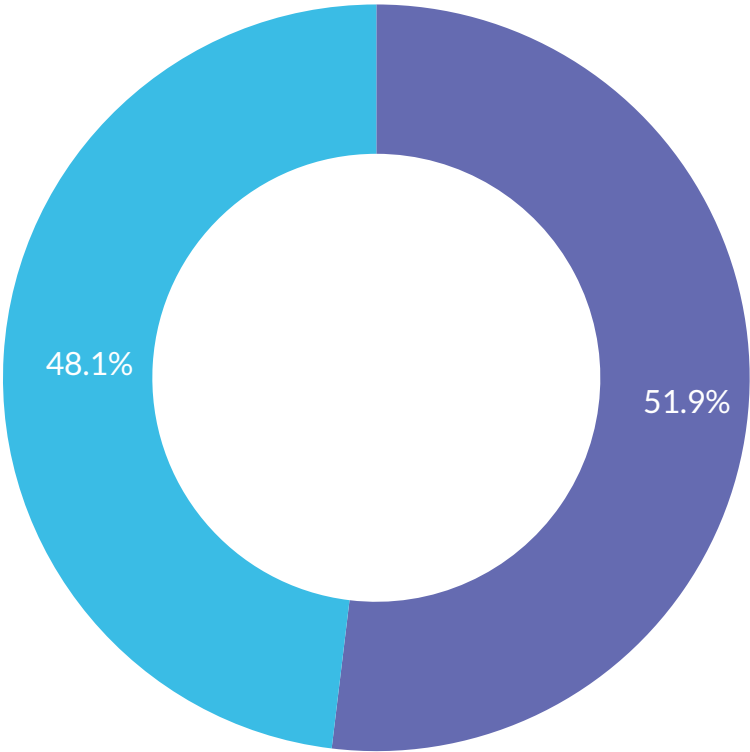
Choice	Total
No	39
Yes	92

Q51

Can you safely use topical haemostatic agents?*

MULTIPLE CHOICE

Answered
131
Unanswered
0



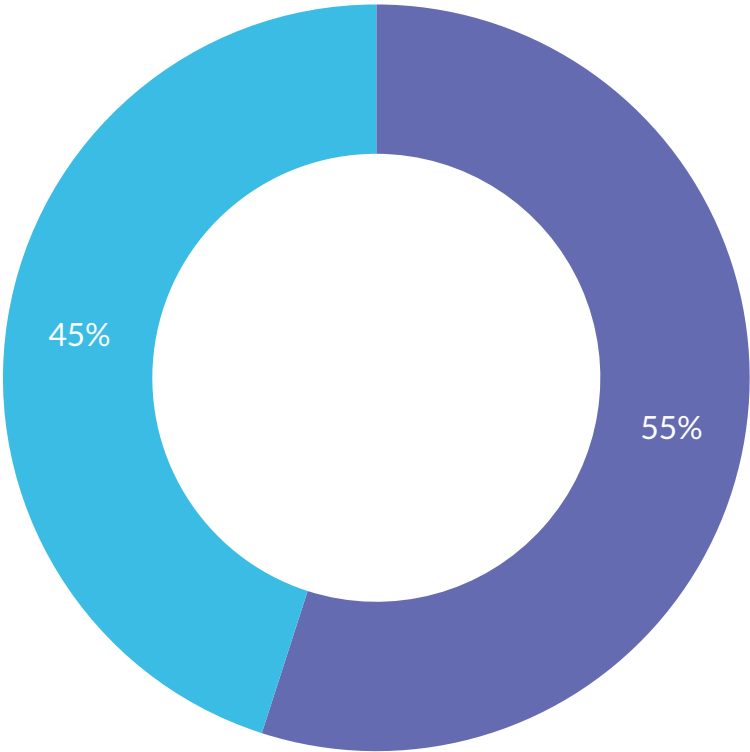
Choice	Total
No	68
Yes	63

Q52

Can you use a tactical haemostatic bandage?*

MULTIPLE CHOICE

Answered
131
Unanswered
0

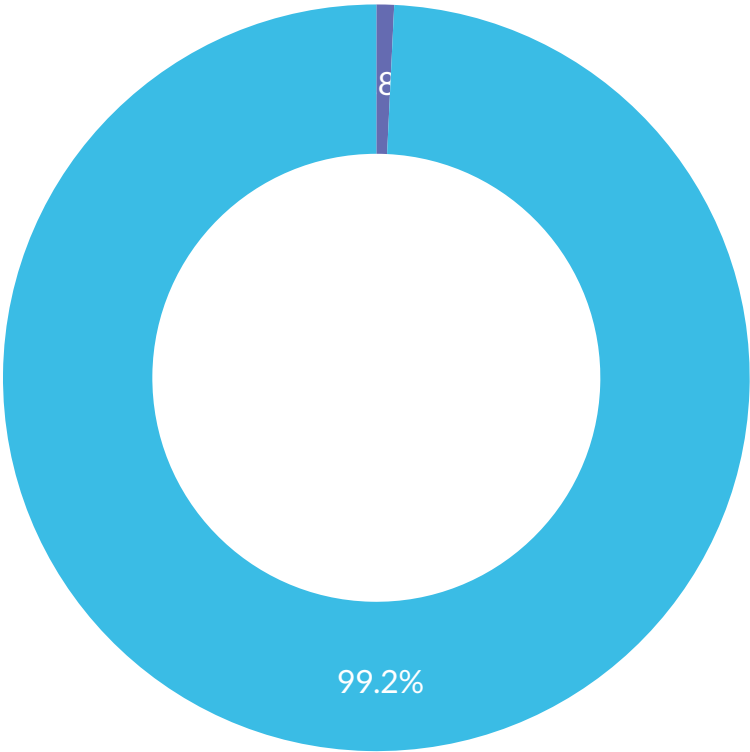


Choice	Total
● No	72
● Yes	59

Q53

Can you obtain intra-venous access?*

MULTIPLE CHOICE



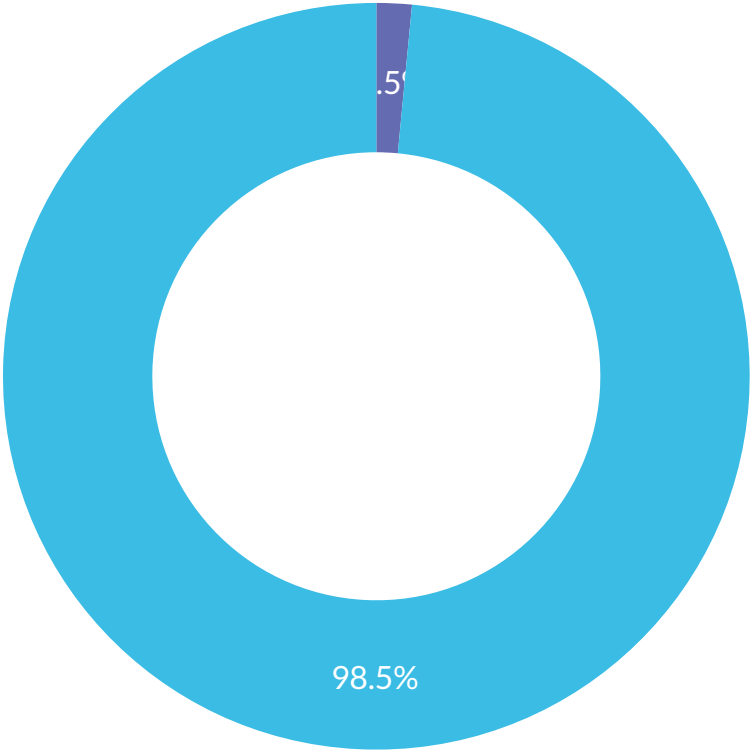
Answered
131
Unanswered
0

Choice	Total
No	1
Yes	130

Q54

Can you obtain intra-osseous access with both commercial and fabricated devices such as a bone marrow needle?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

Choice	Total
No	2
Yes	129

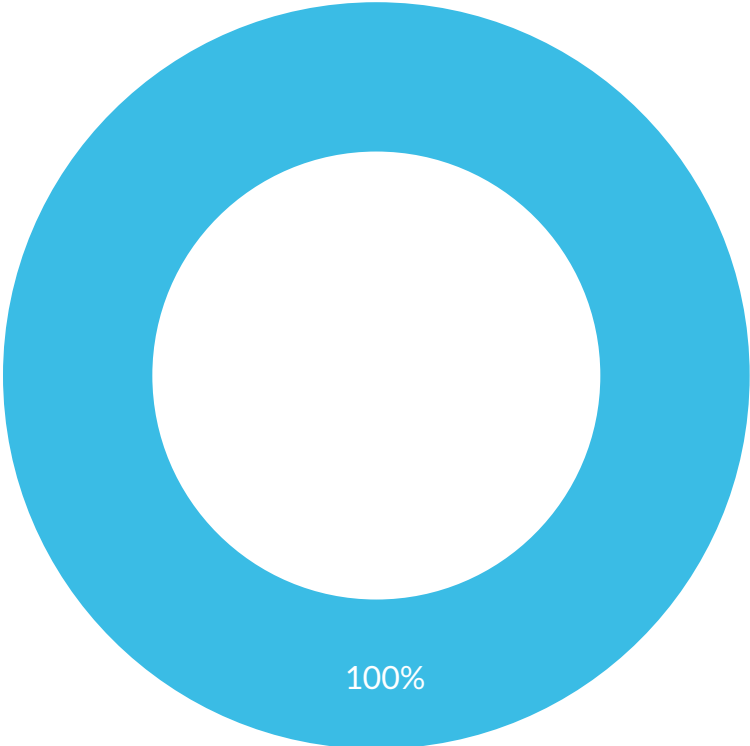
Q55

Are you comfortable with splintage using standard splintage devices?*

MULTIPLE CHOICE

Answered **131**

Unanswered **0**

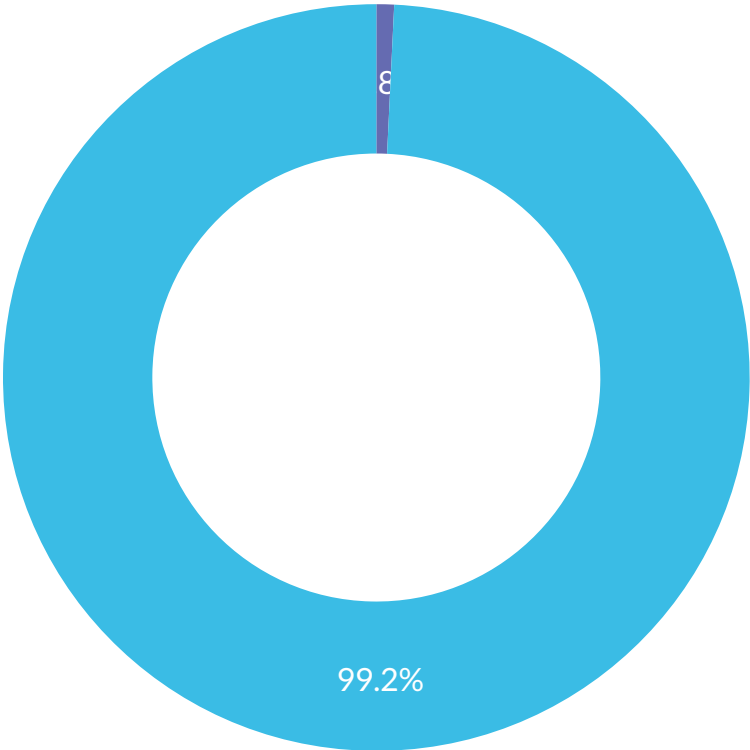


Choice	Total
● No	0
● Yes	131

Q56

Are you comfortable with splintage using improvised devices?*

MULTIPLE CHOICE



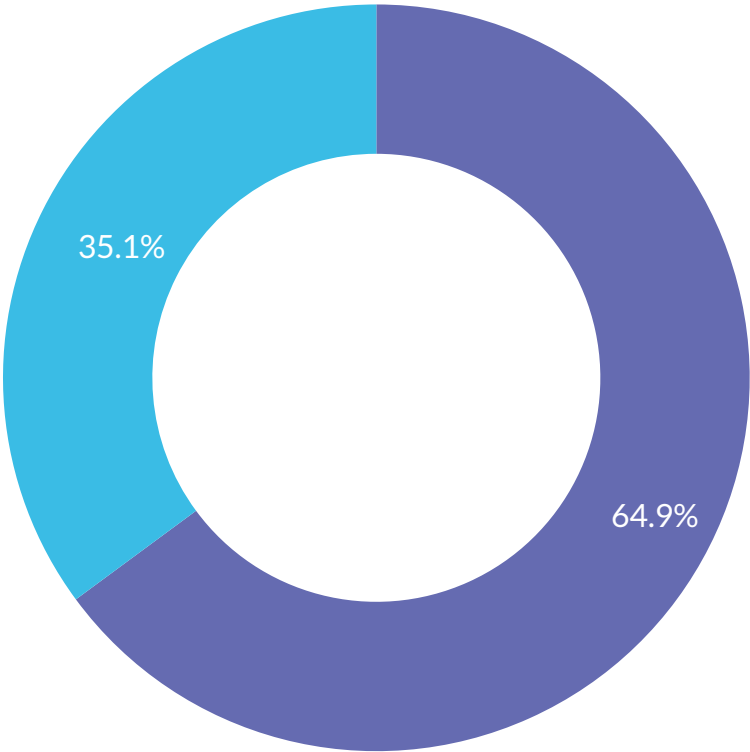
Answered **131**
Unanswered **0**

Choice	Total
No	1
Yes	130

Q57

Can you irrigate a wound and mechanically debride it?*

MULTIPLE CHOICE



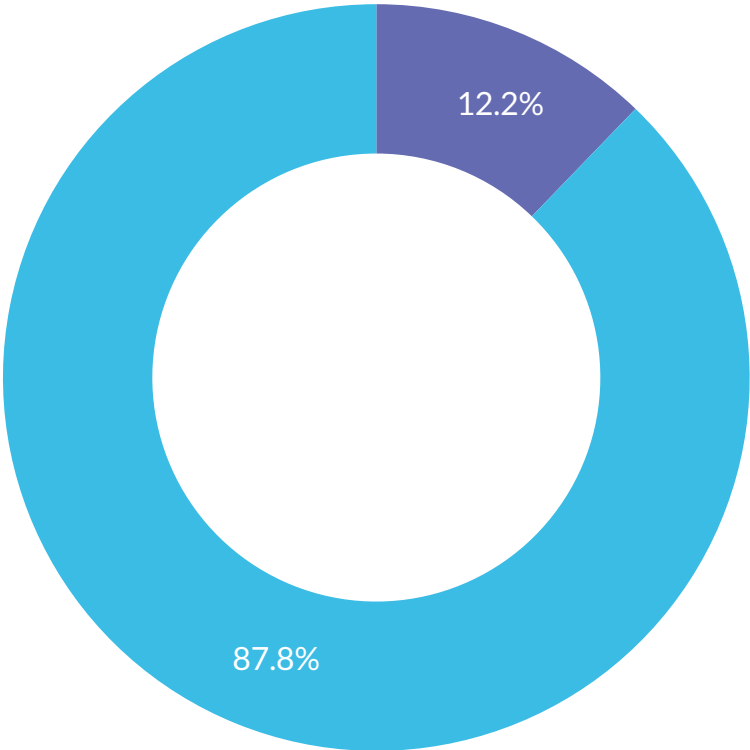
Answered
131
Unanswered
0

Choice	Total
● No	85
● Yes	46

Q58

Can you close wounds using various techniques including suturing?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

Choice	Total
No	16
Yes	115

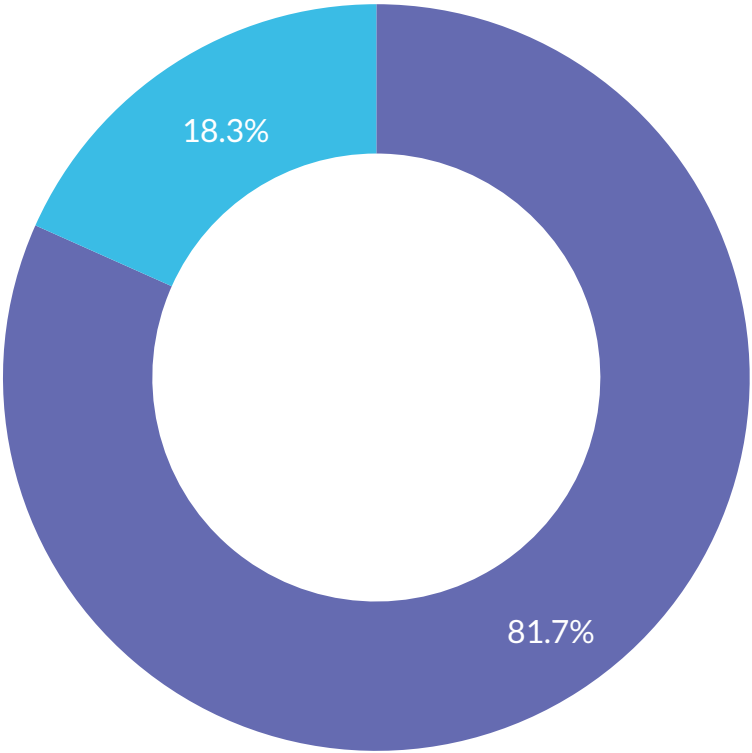
Q59

Are you familiar with the use of a Gamow Bag or equivalent?*

MULTIPLE CHOICE

Answered
131

Unanswered
0

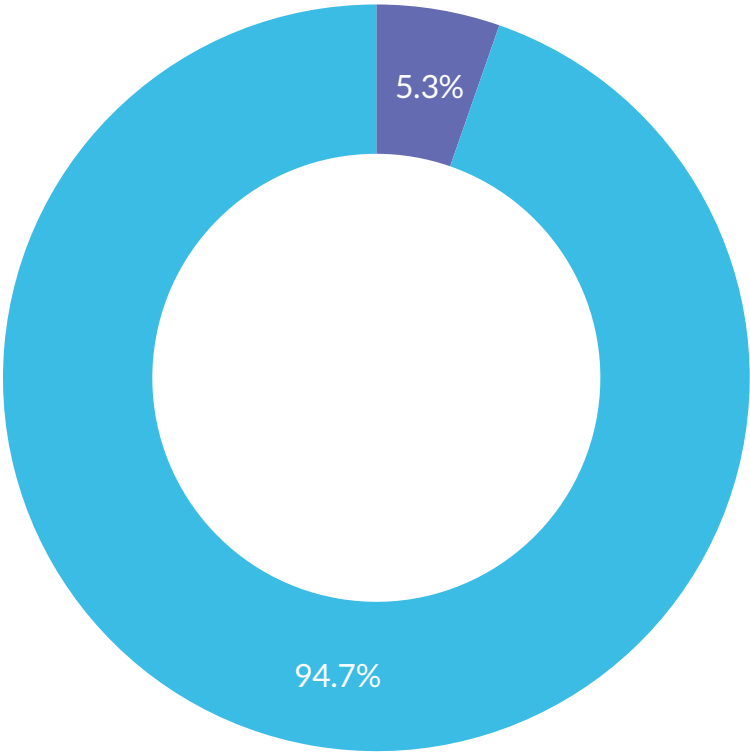


Choice	Total
No	107
Yes	24

Q60

Are you competent in search and rescue techniques?*

MULTIPLE CHOICE



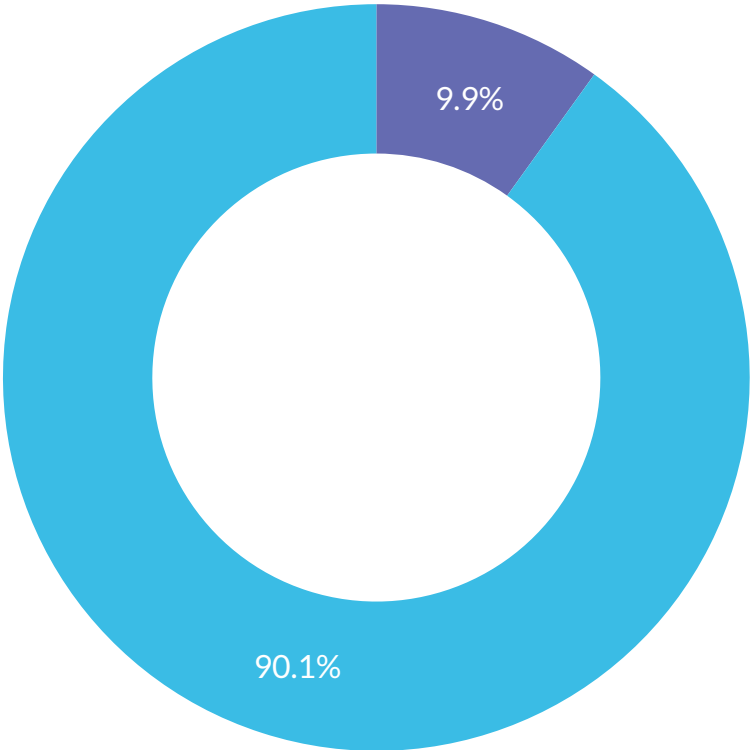
Answered
131
Unanswered
0

Choice	Total
● No	7
● Yes	124

Q61

Are you competent with wilderness navigation techniques?*

MULTIPLE CHOICE



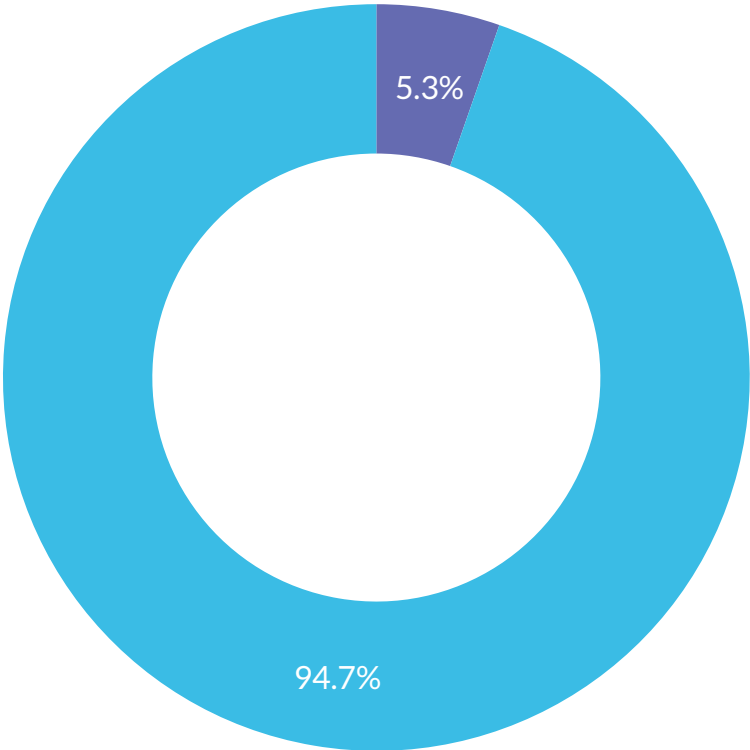
Answered **131**
Unanswered **0**

Choice	Total
● No	13
● Yes	118

Q62

Are you competent at using knots and ropework in rope rescue?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

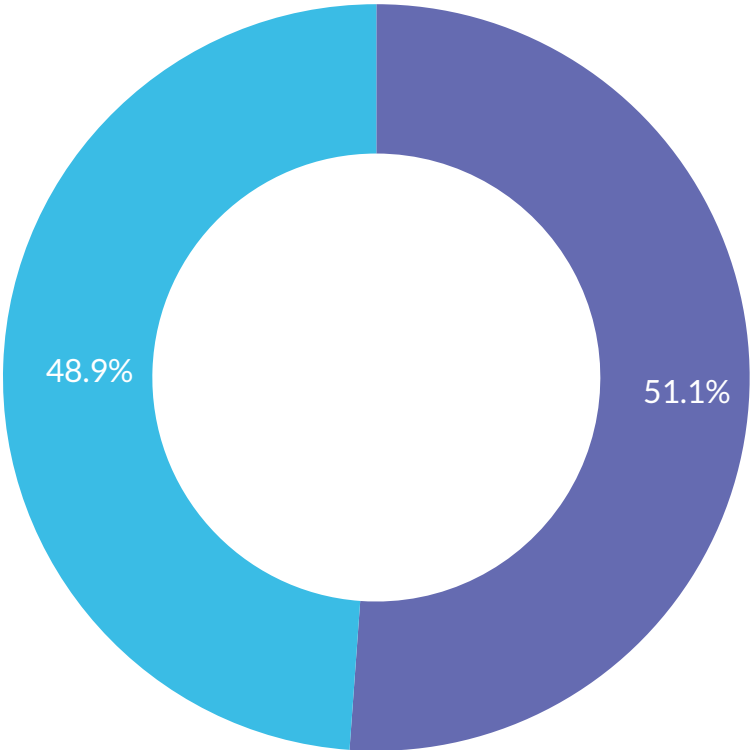
Choice	Total
● No	7
● Yes	124

Q63

Can you apply a HALO, Asherman's or other commercial chest seal?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**

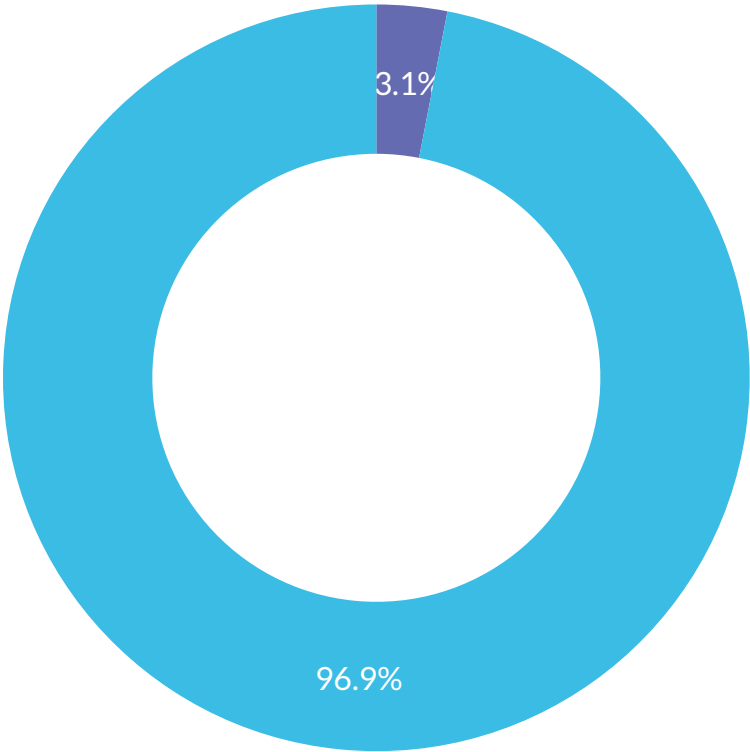


Choice	Total
No	67
Yes	64

Q64

Can you apply an improvised chest seal?*

MULTIPLE CHOICE



Answered
131
Unanswered
0

Choice	Total
No	4
Yes	127

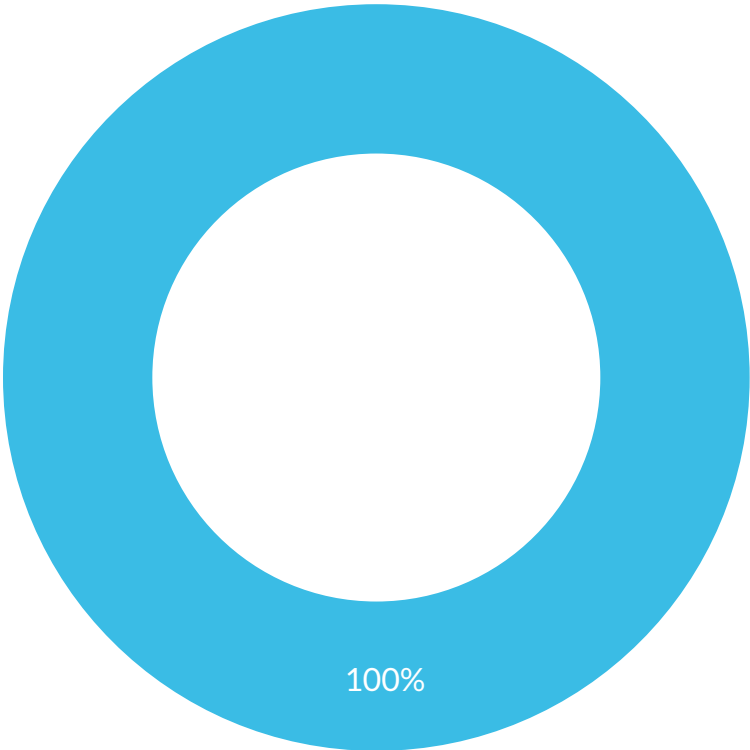
Q65

Can you insert a needle correctly and safely for decompression of a tension pneumothorax?*

MULTIPLE CHOICE

Answered **131**

Unanswered **0**

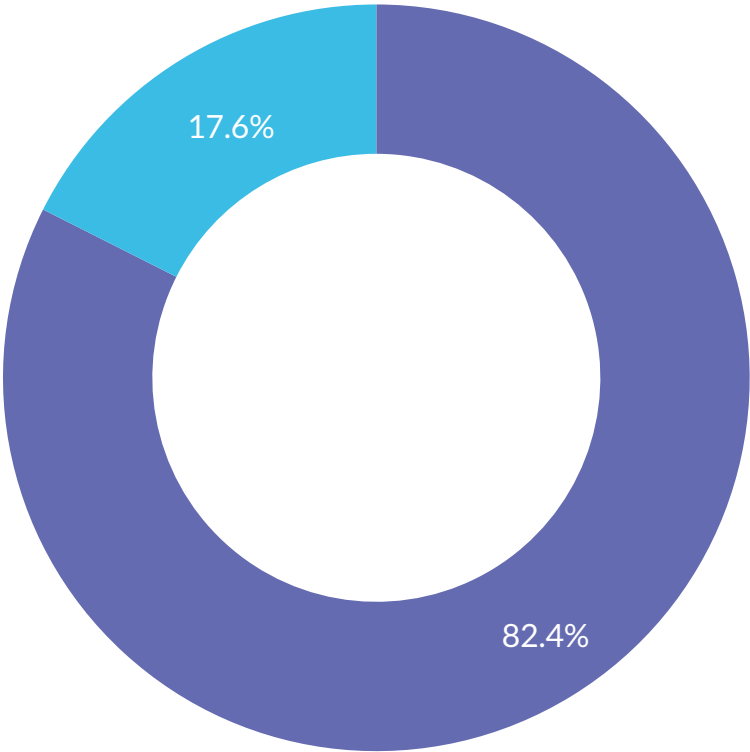


Choice	Total
● No	0
● Yes	131

Q66

Can you insert a formal chest drain?*

MULTIPLE CHOICE



Answered
131
Unanswered
0

Choice	Total
● No	108
● Yes	23

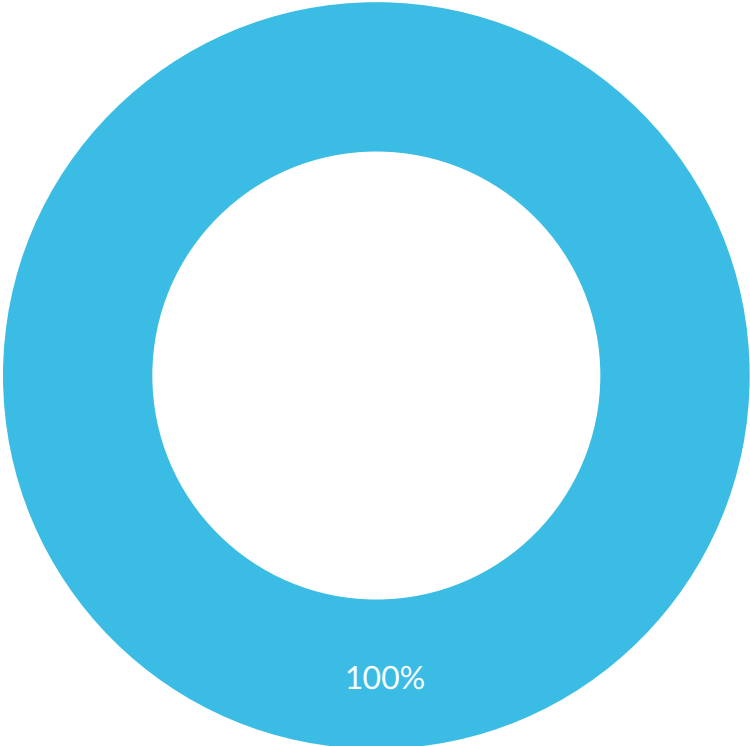
Q67

Are you competent with pelvic stabilisation using the sheet method?*

MULTIPLE CHOICE

Answered **131**

Unanswered **0**



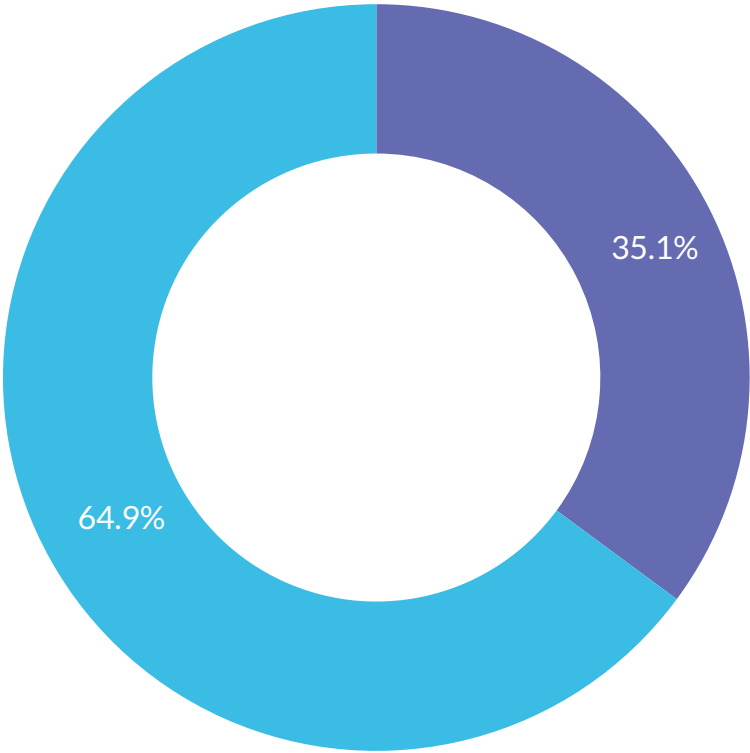
Choice	Total
● No	0
● Yes	131

Q68

Are you competent with commercial pelvic binders viz T-Pod, SAM Pelvic Sling II and PelviGrip?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**

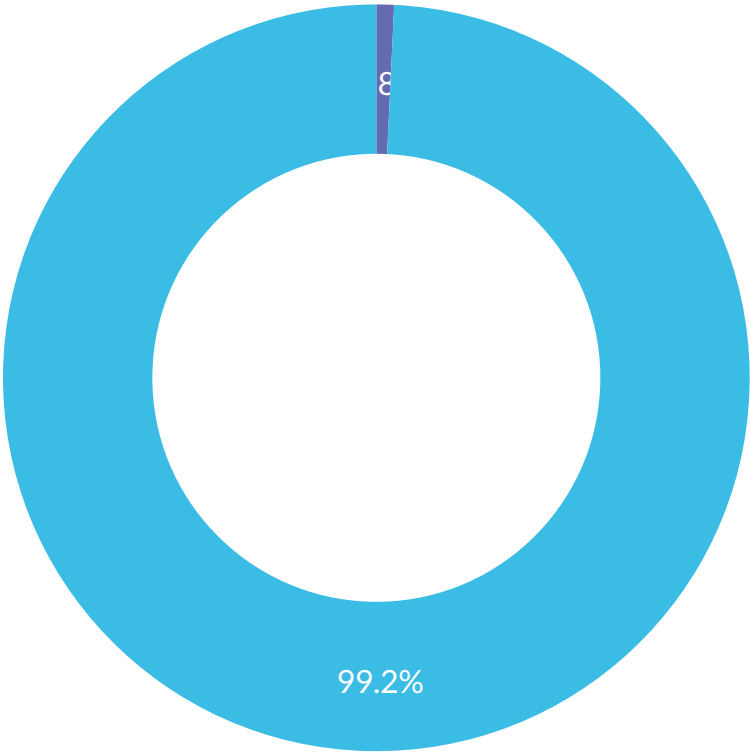


Choice	Total
No	46
Yes	85

Q69

Are you comfortable with spinal immobilisation?*

MULTIPLE CHOICE



Answered
131
Unanswered
0

Choice	Total
● No	1
● Yes	130

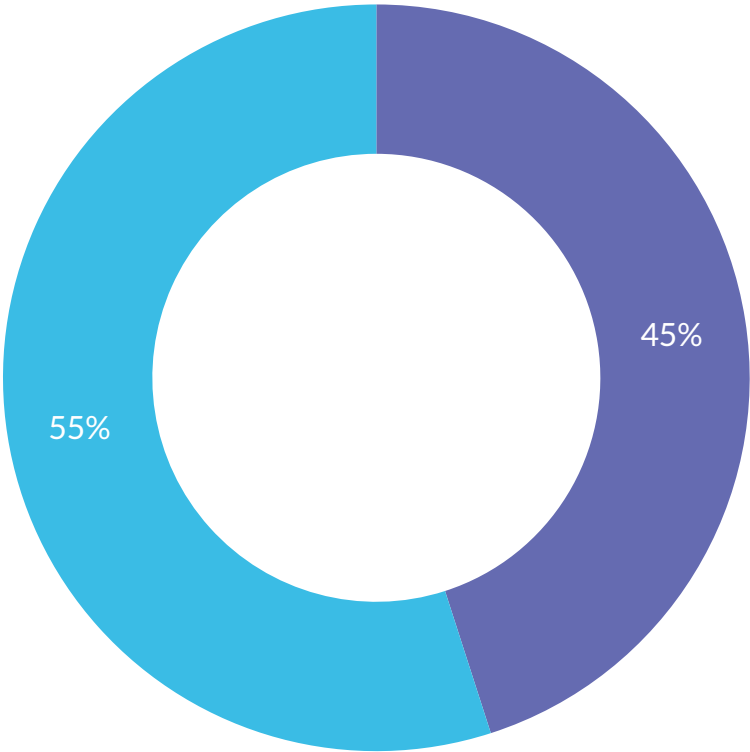
Q70

Are you comfortable with spinal clearance guidelines?*

MULTIPLE CHOICE

Answered
131

Unanswered
0

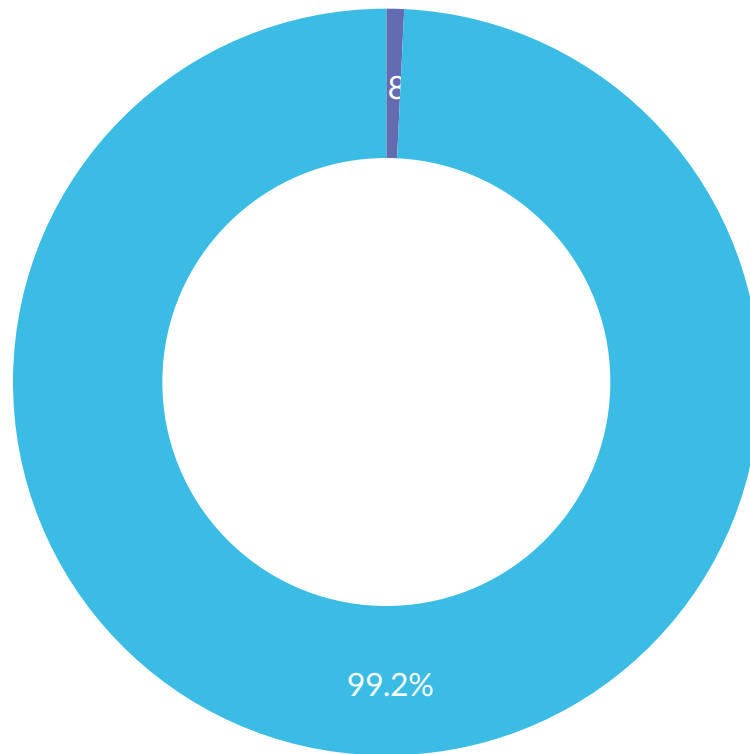


Choice	Total
No	59
Yes	72

Q71

MULTIPLE CHOICE

Are you able to manage the patient's airway using basic and advanced airway management techniques, including rescue devices, and performing a cricothyroidotomy for a failed airway?*



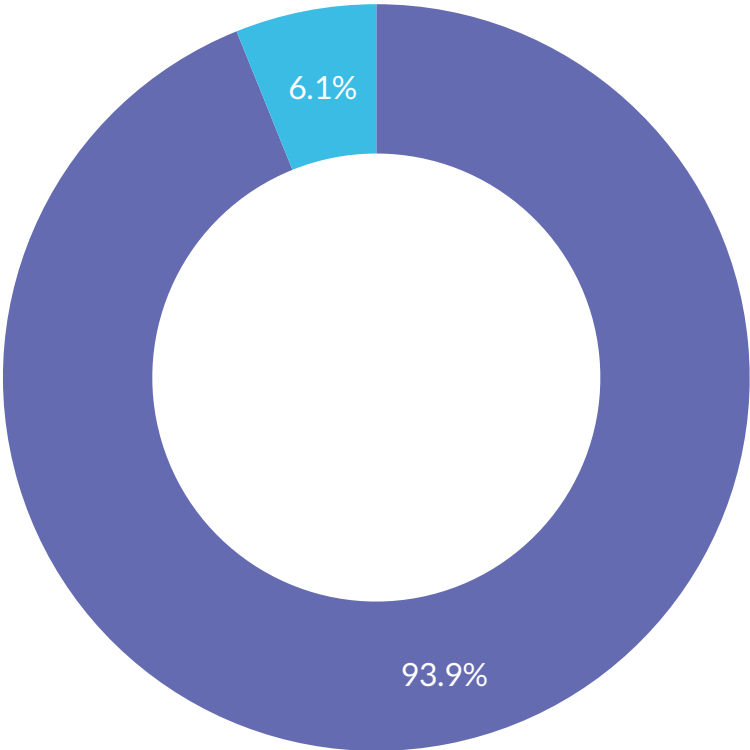
Answered
131
Unanswered
0

Choice	Total
● No	1
● Yes	130

Q72

Can you perform field ultrasonography (eFAST protocol), if equipment is available?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

Choice	Total
● No	123
● Yes	8

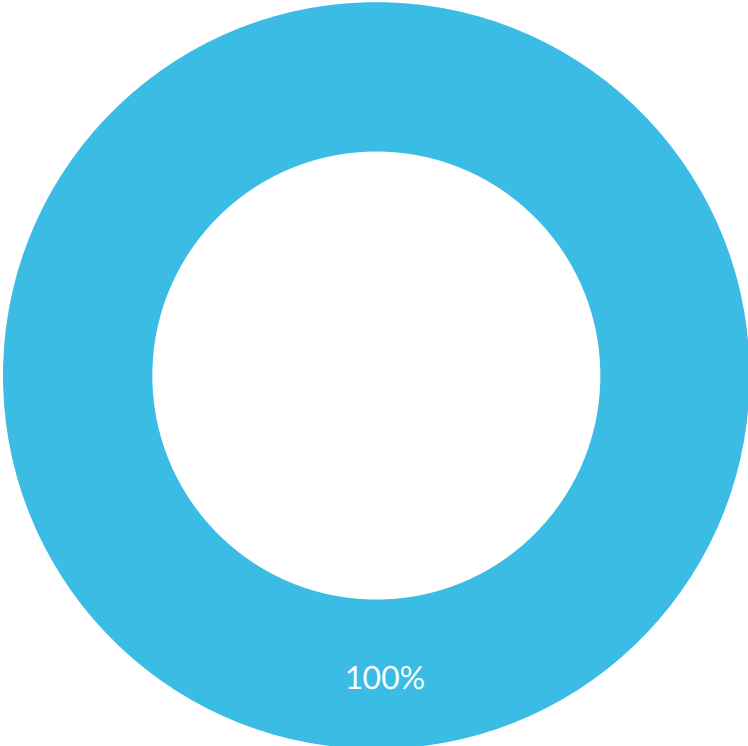
Q73

Can you apply soft tissue bandaging techniques for minor orthopaedic injuries?*

MULTIPLE CHOICE

Answered **131**

Unanswered **0**

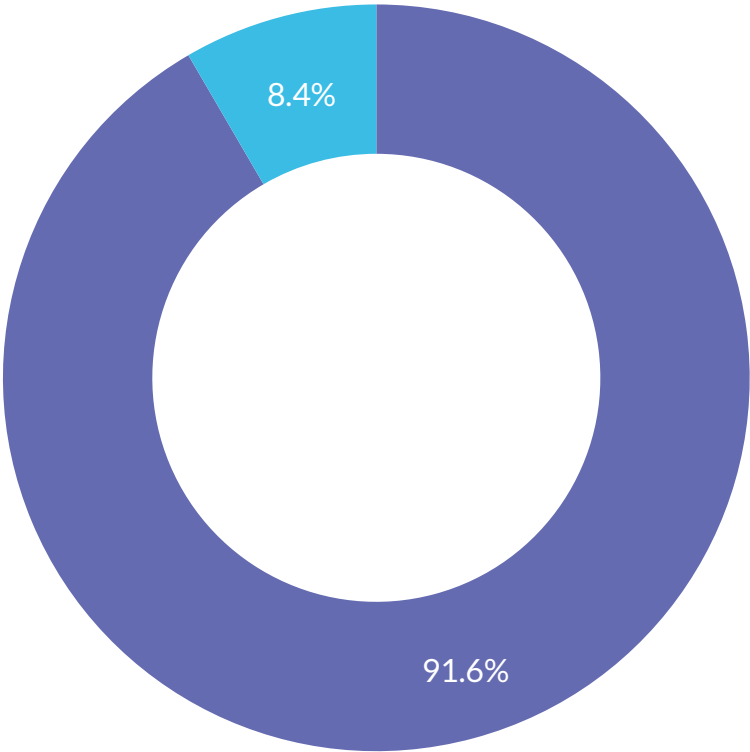


Choice	Total
● No	0
● Yes	131

Q74

Are you familiar with ski- and snow-rescue techniques?*

MULTIPLE CHOICE



Answered
131
Unanswered
0

Choice	Total
● No	120
● Yes	11

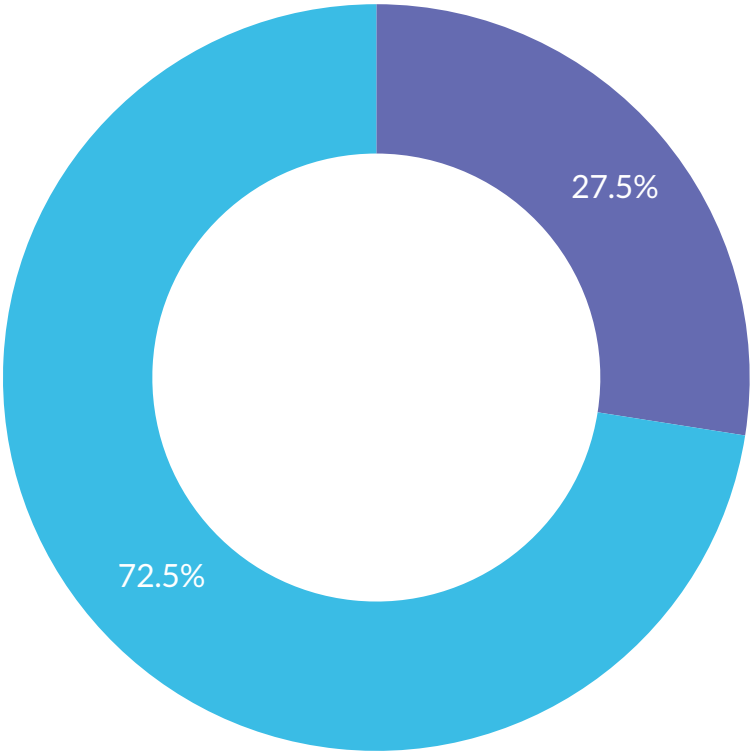
Q75

Are you competent enough in the mountain environment to conduct mountain rescue operations?*

MULTIPLE CHOICE

Answered
131

Unanswered
0

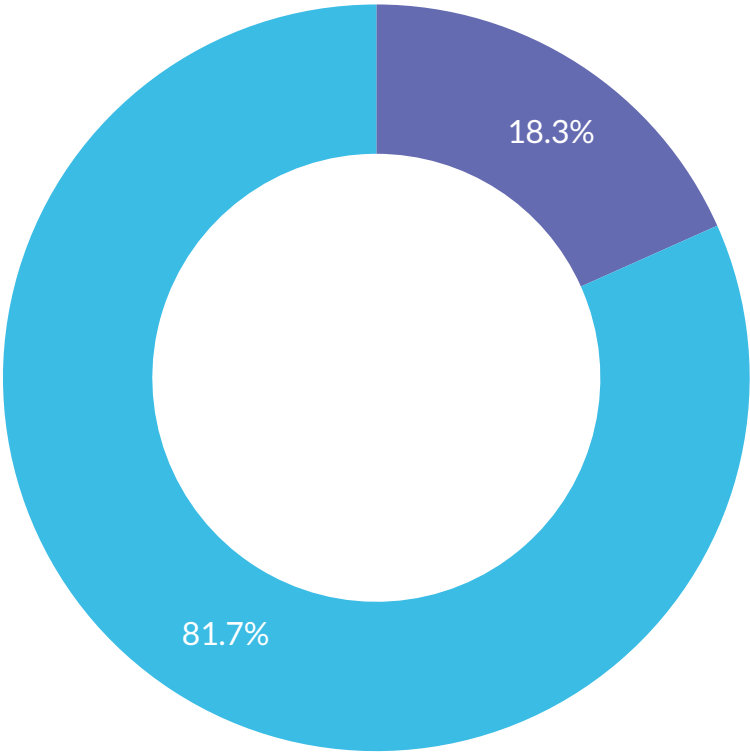


Choice	Total
No	36
Yes	95

Q76

Are you familiar with outdoor camp craft?*

MULTIPLE CHOICE



Answered
131
Unanswered
0

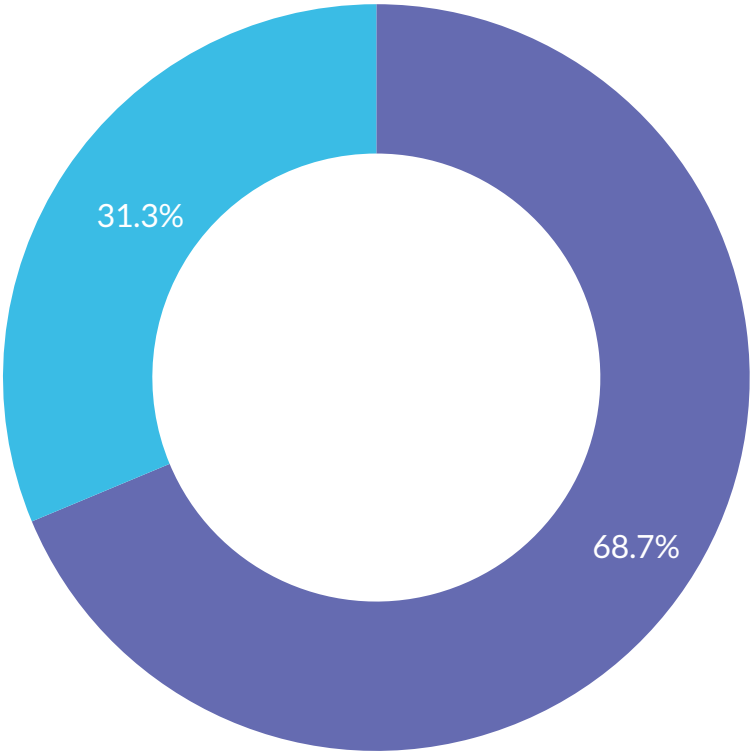
Choice	Total
● No	24
● Yes	107



Are you able to perform and interpret a urine dipstix test?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**



Choice	Total
● No	90
● Yes	41

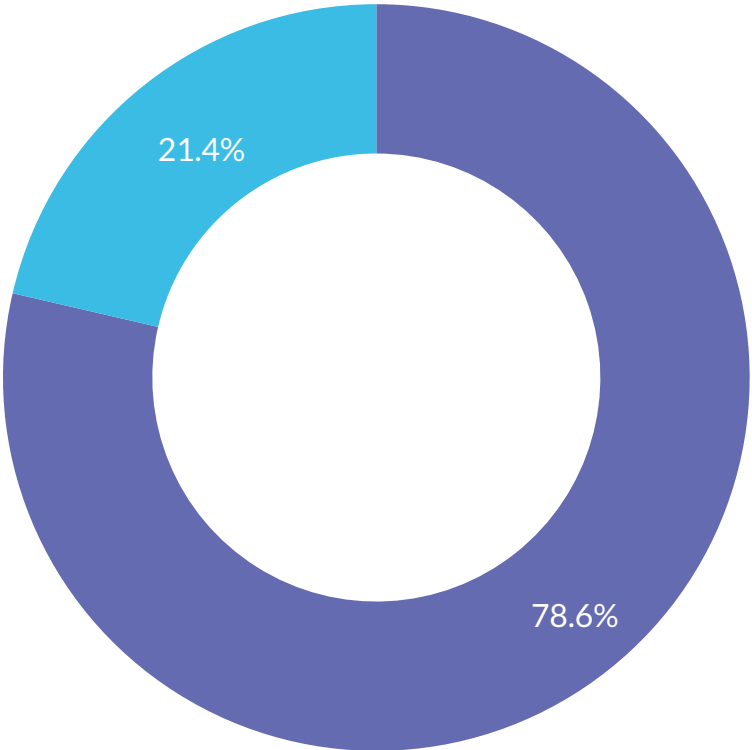
Q78

Are you able to perform and interpret auroscopy (otoscopy or instrumented ear examination)?*

MULTIPLE CHOICE

Answered **131**

Unanswered **0**



Choice	Total
No	103
Yes	28

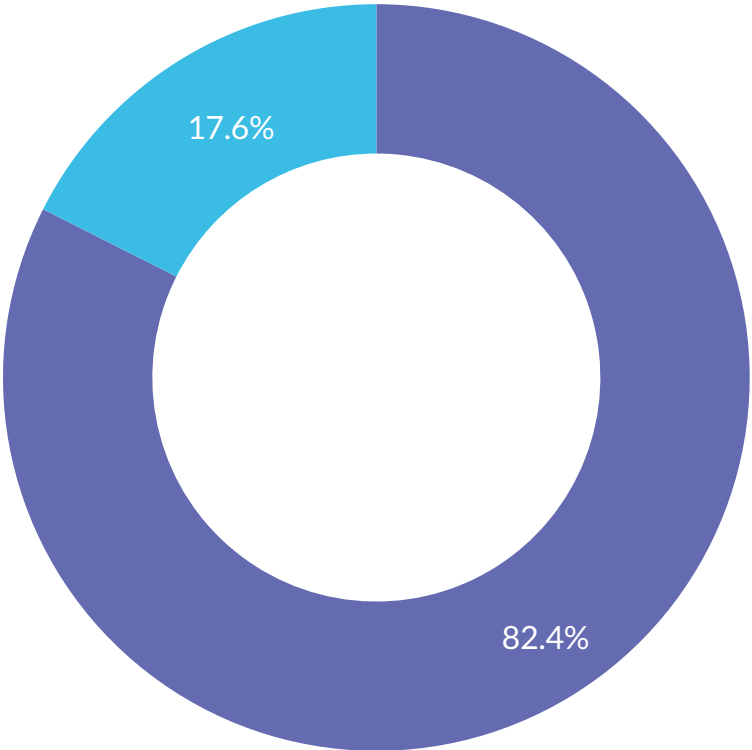
Q79

Are you able to perform and interpret ophthalmoscopy (fundoscopy or instrumented eye examination)?*

MULTIPLE CHOICE

Answered **131**

Unanswered **0**

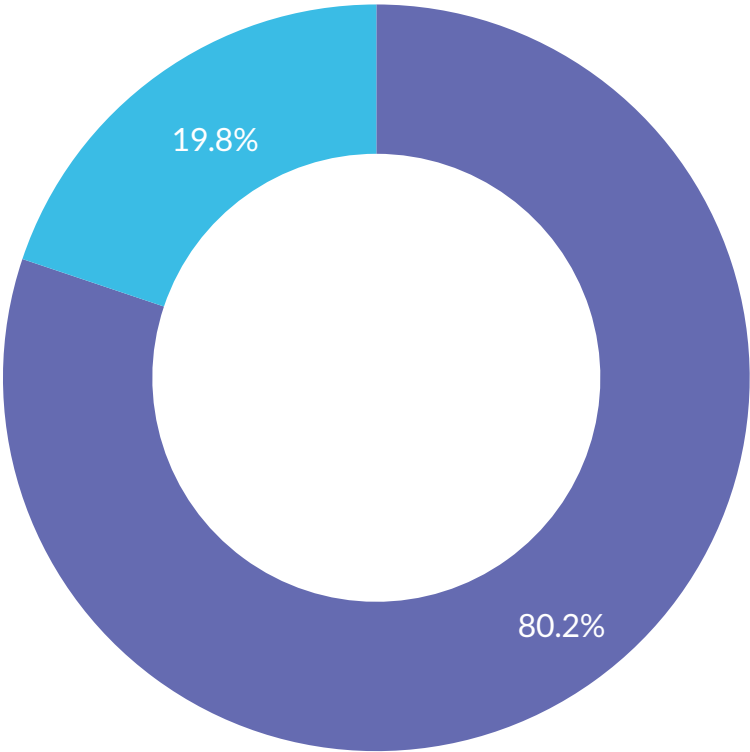


Choice	Total
No	108
Yes	23

Q80

Are you able to perform and interpret pharyngoscopy?*

MULTIPLE CHOICE



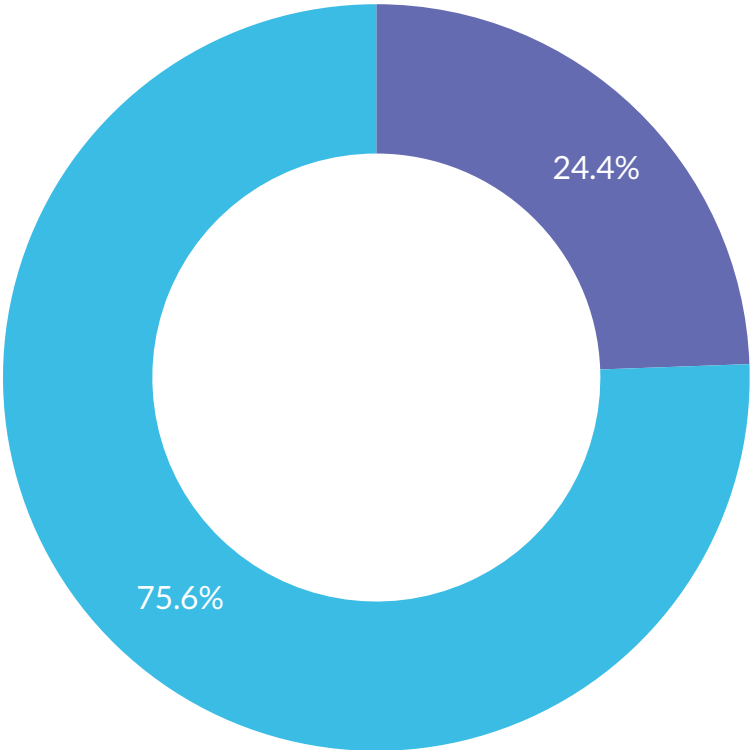
Answered
131
Unanswered
0

Choice	Total
● No	105
● Yes	26

Q81

Are you able to use various commercial or improvised water purification techniques?*

MULTIPLE CHOICE



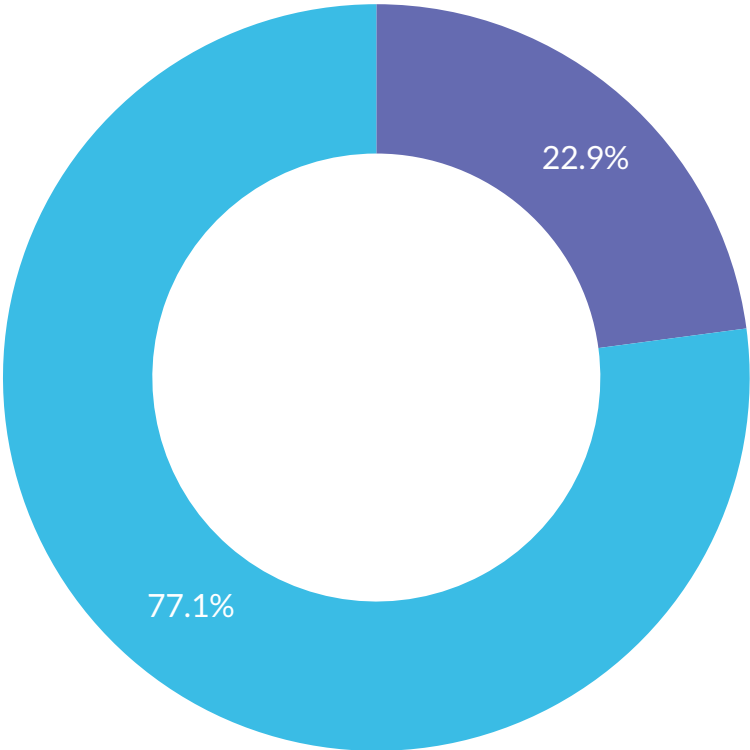
Answered
131
Unanswered
0

Choice	Total
No	32
Yes	99

Q82

Are you able to use improvised water collection techniques?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

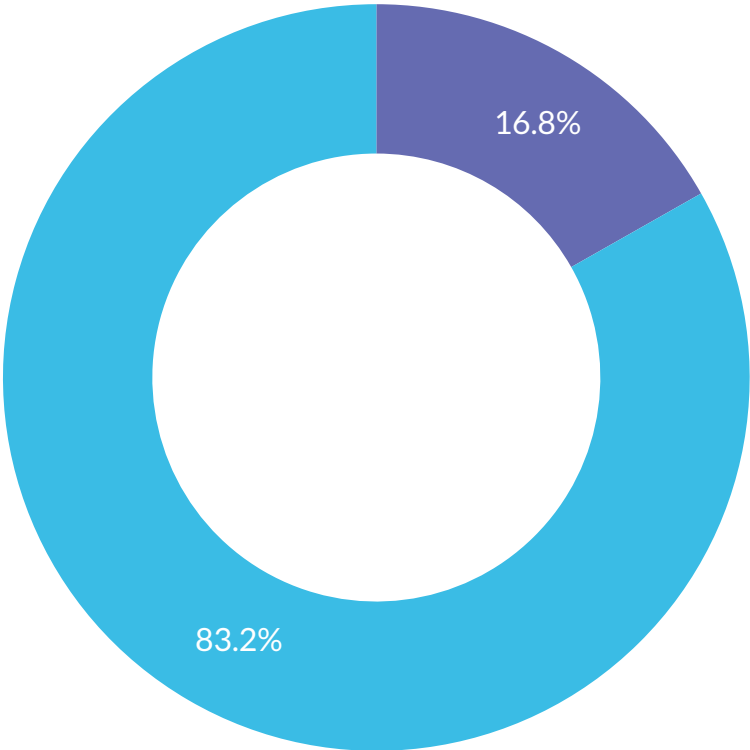
Choice	Total
No	30
Yes	101

Q83

Are you able to use layering strategies to survive cold weather?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**

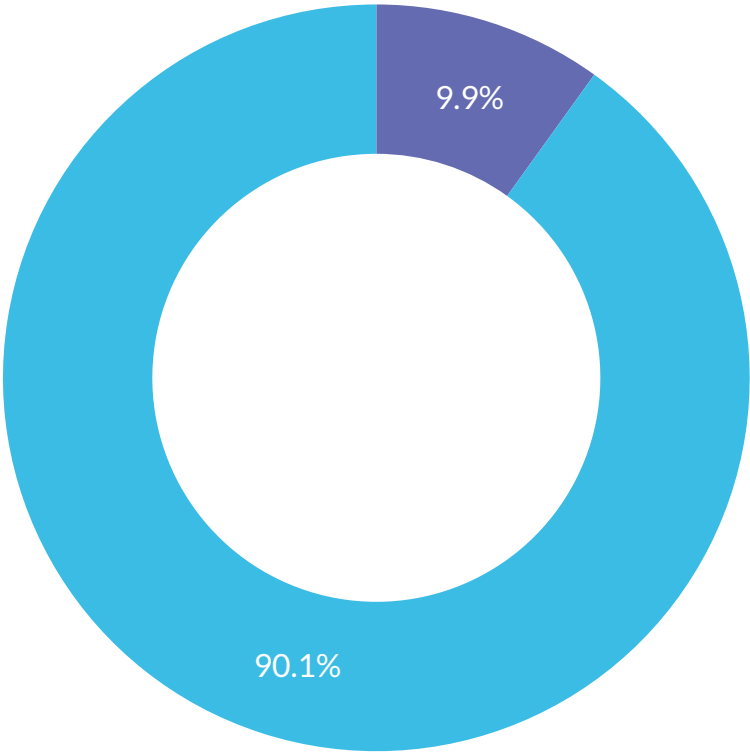


Choice	Total
No	22
Yes	109

Q84

Can you conduct swift water rescue techniques?*

MULTIPLE CHOICE



Answered
131
Unanswered
0

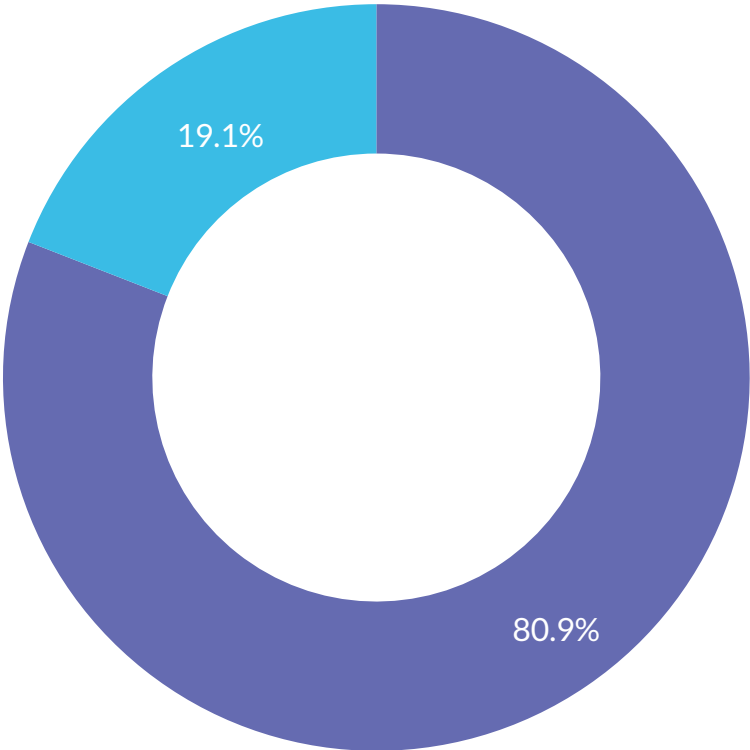
Choice	Total
● No	13
● Yes	118

Q85

Can you perform local and regional anaesthesia techniques?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**



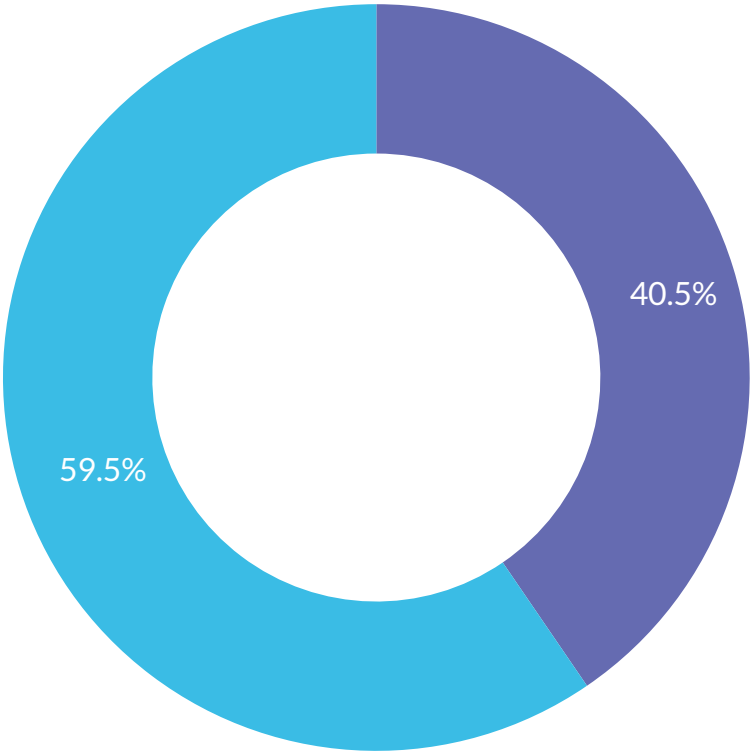
Choice	Total
No	106
Yes	25

Q86

Are you able to pack wilderness and expedition medical kits?*

MULTIPLE CHOICE

Answered **131**
Unanswered **0**

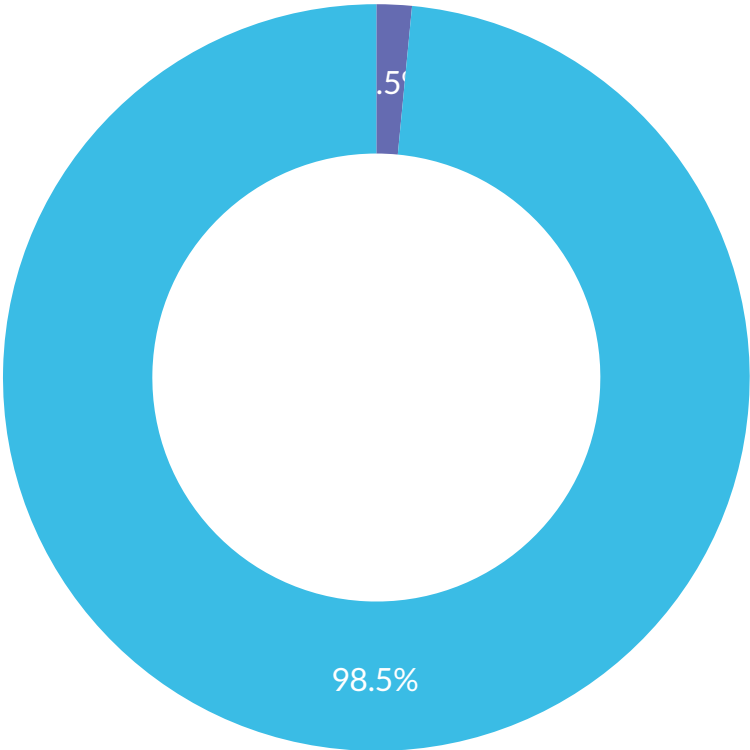


Choice	Total
No	53
Yes	78

Q87

Are you competent in radio and other communication techniques?*

MULTIPLE CHOICE



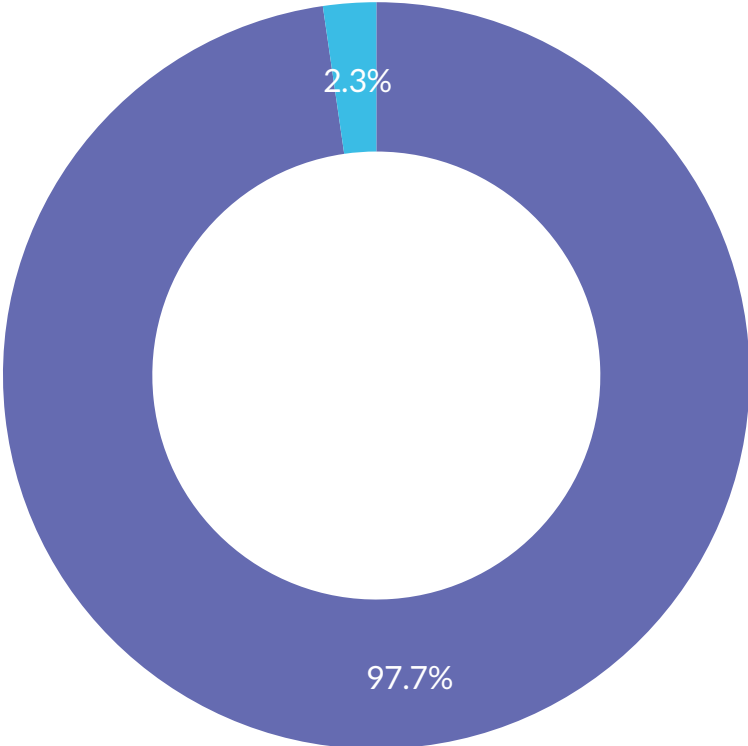
Answered **131**
Unanswered **0**

Choice	Total
No	2
Yes	129

Q88

Can you perform temporary fillings and teeth extractions, under dental anaesthesia?*

MULTIPLE CHOICE



Answered **131**
Unanswered **0**

Choice	Total
● No	128
● Yes	3

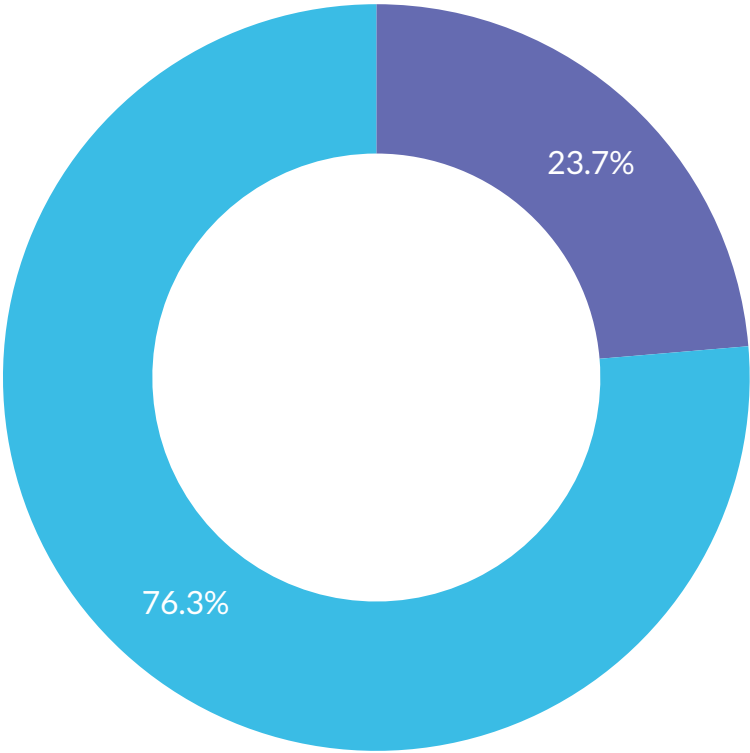
Q89

Can you create litter fabrications and conduct patient transport by litter systems?*

MULTIPLE CHOICE

Answered **131**

Unanswered **0**



Choice	Total
No	31
Yes	100

Emergency medicine specialists

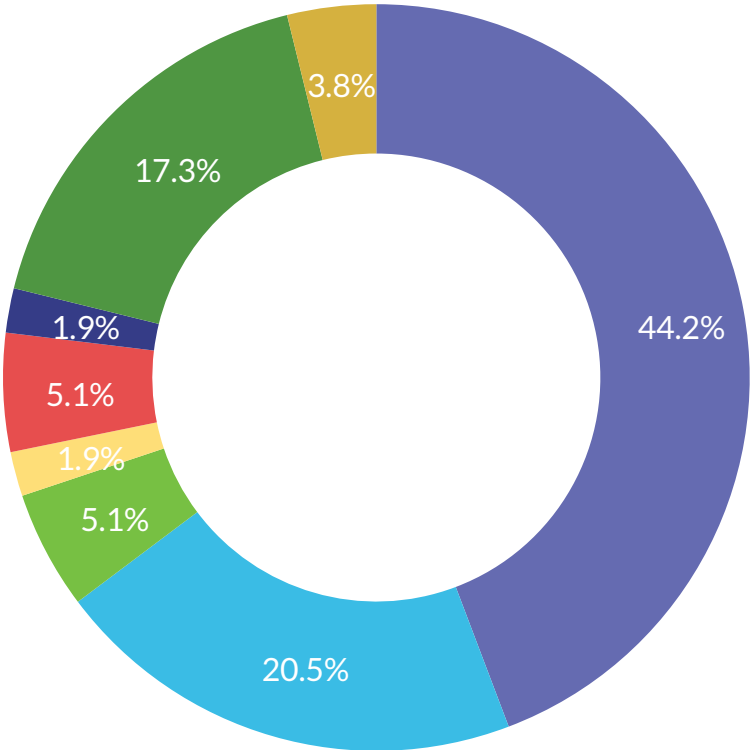


What is your highest qualification in Emergency Medicine?*

MULTIPLE CHOICE

Answered
77

Unanswered
0



Choice	Total
● FCEM (SA)	69
● MMed(Emergency Medicine)	32
● Other non-SA fellowship in EM	8
● M.Sc.(Emergency Medicine)	3
● M.Med.Sci	0
● M.Phil.(Emergency Medicine)	8

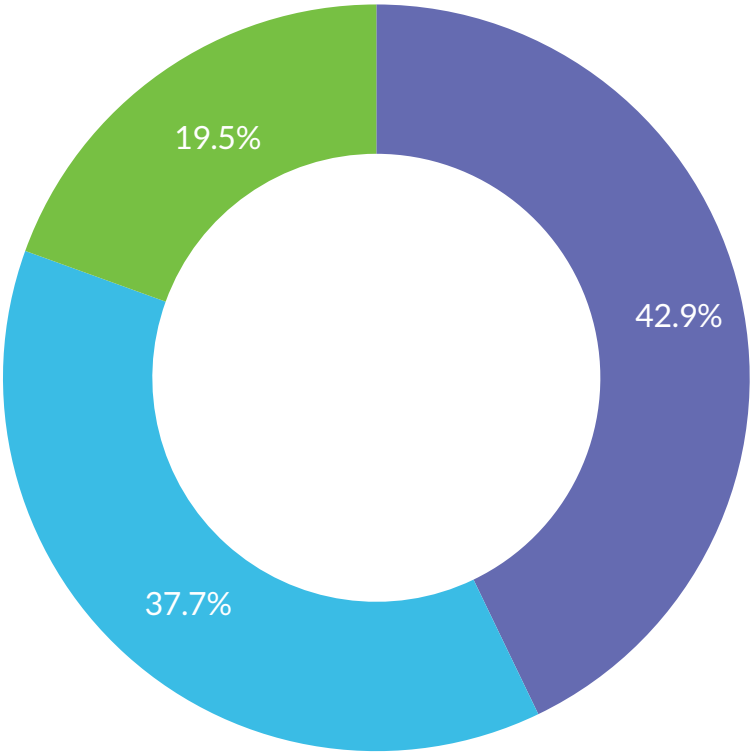
● PhD	3
● H.Dip.(EM)(SA)	0
● DipPEC(SA)	27
● Other (Please specify)	6

Q2

What is your current age?*

MULTIPLE CHOICE

Answered
77
Unanswered
0

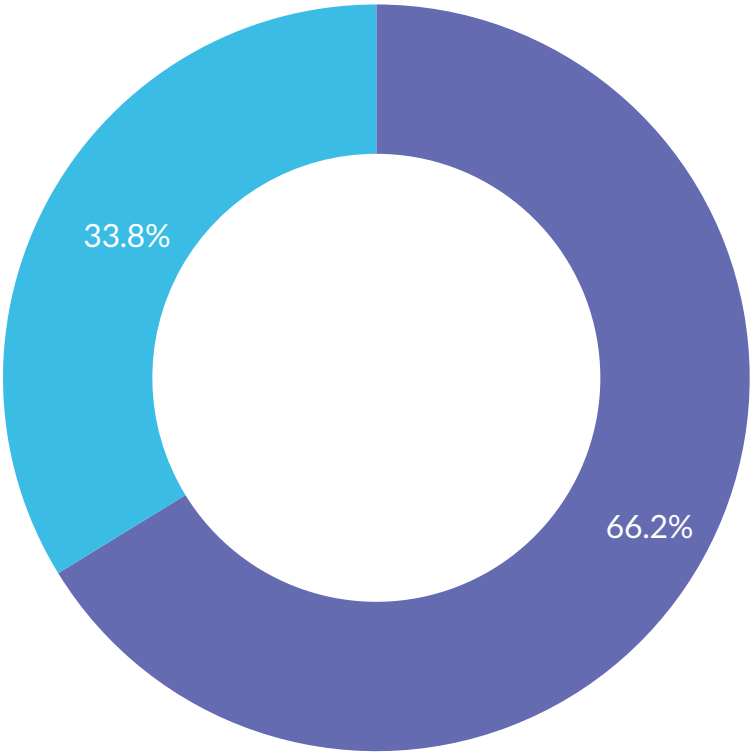


Choice	Total
< 40 years	33
41-50 years	29
> 50 years	15



What is your gender?*

MULTIPLE CHOICE



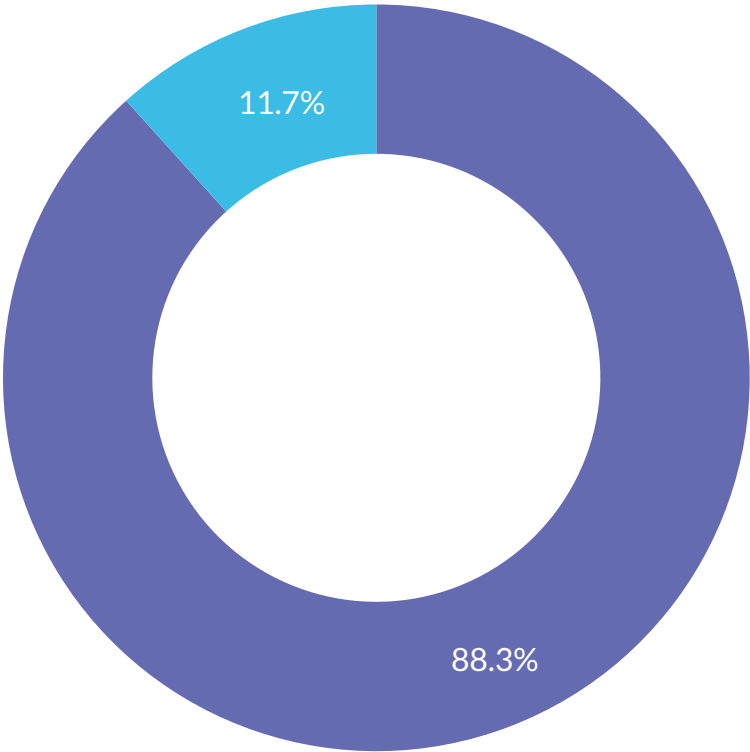
Answered
77
Unanswered
0

Choice	Total
● Male	51
● Female	26

Q4

Which country do you currently work in?*

MULTIPLE CHOICE



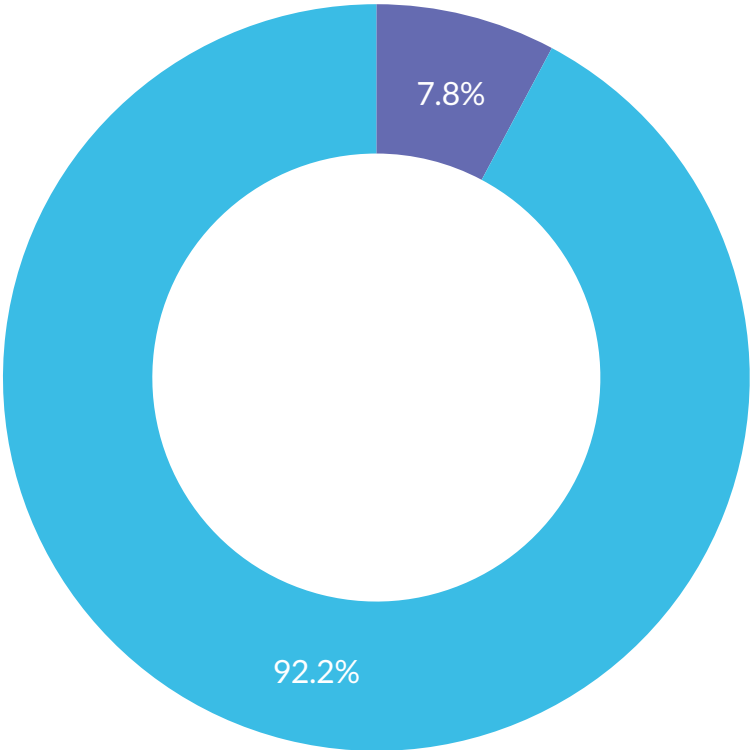
Answered
77
Unanswered
0

Choice	Total
● South Africa	68
● Outside South Africa	9

Q5

Are you currently actively involved in the pre-hospital environment?*

MULTIPLE CHOICE



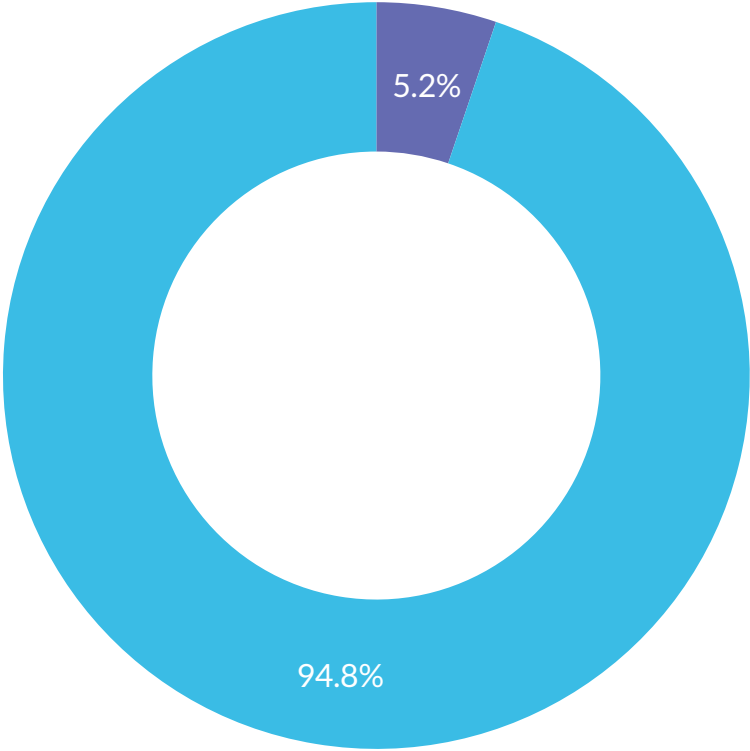
Answered
77
Unanswered
0

Choice	Total
● Yes	6
● No	71



Do you work in the wilderness / mountain rescue environment?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

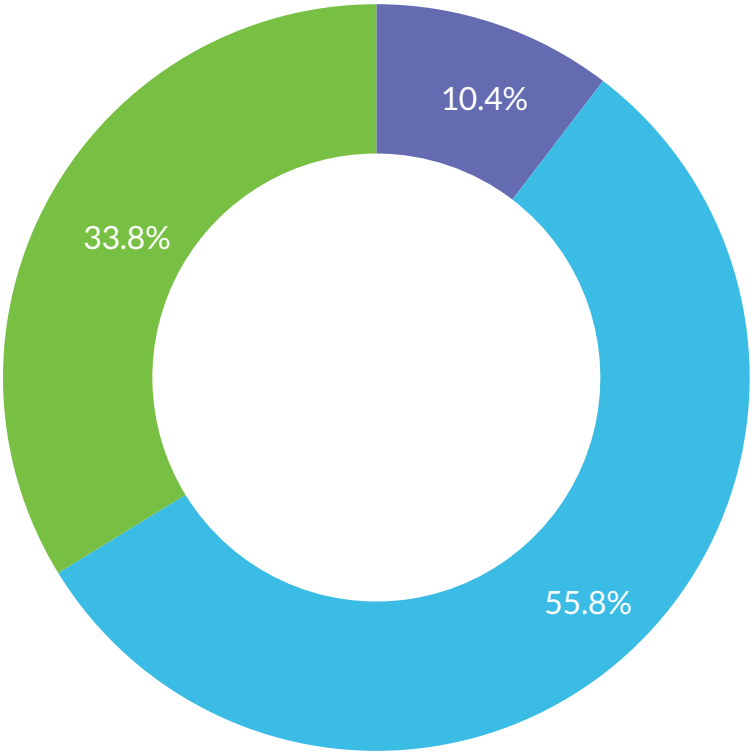
Choice	Total
● Yes	4
● No	73



How knowledgeable are you about Emergency Medical Service (EMS) systems currently?*

MULTIPLE CHOICE

Answered
77
Unanswered
0

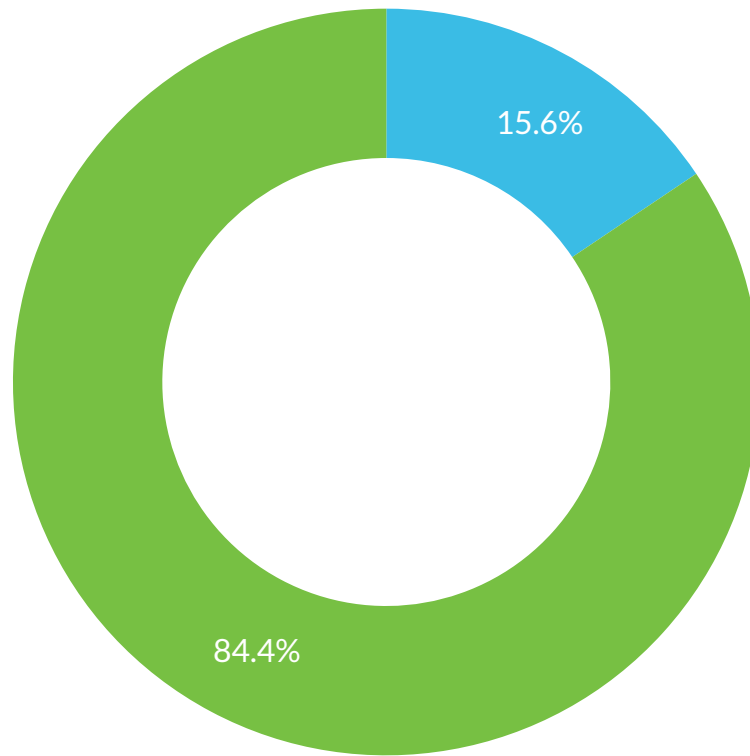


Choice	Total
● Little to no knowledge	8
● Average knowledge	43
● Very knowledgeable	26



MULTIPLE CHOICE

How important is it for the Wilderness Emergency Medicine (WEM) prehospital provider to be able to conduct a full primary and secondary survey in medical, paediatric and trauma patients?*



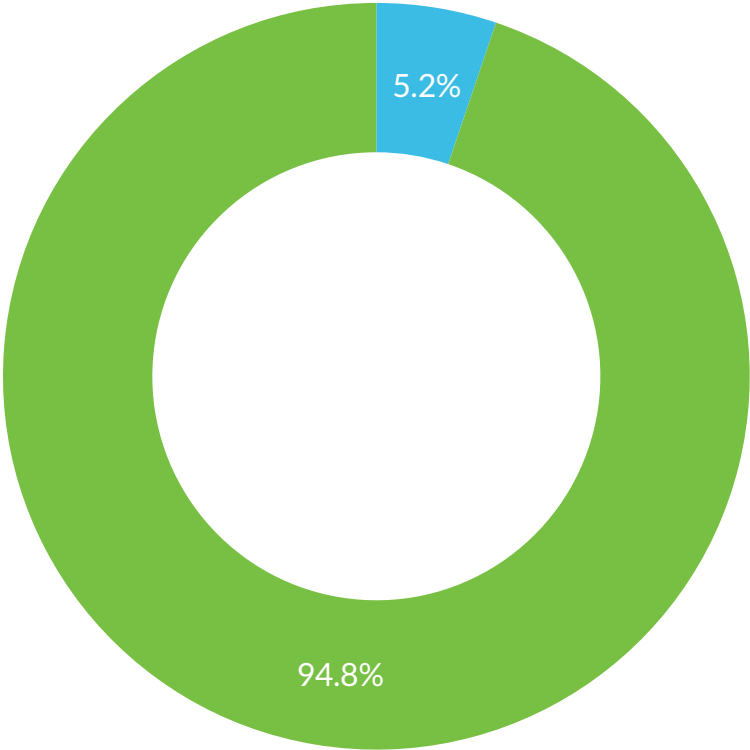
Answered
77
Unanswered
0

Choice	Total
● Not important	0
● Important	12
● Very important	65



How knowledgeable should the WEM prehospital provider be with respect to cardio-pulmonary resuscitation with reference to the latest guidelines?*

MULTIPLE CHOICE



Answered
77

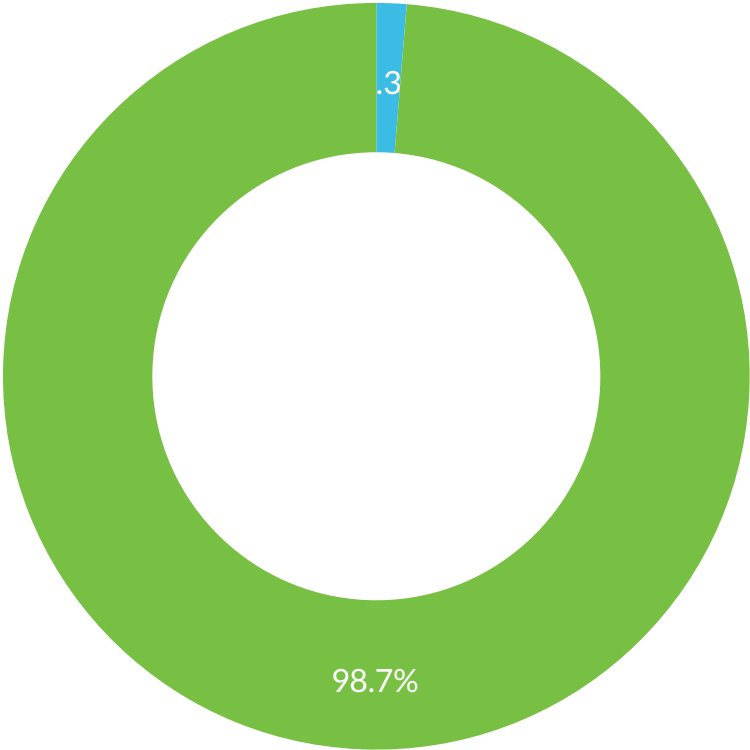
Unanswered
0

Choice	Total
● Not knowledgeable	0
● Average knowledge	4
● Very knowledgeable	73

Q10

How well should the WEM prehospital provider know haemorrhage control techniques and devices used in the austere environment?*

MULTIPLE CHOICE



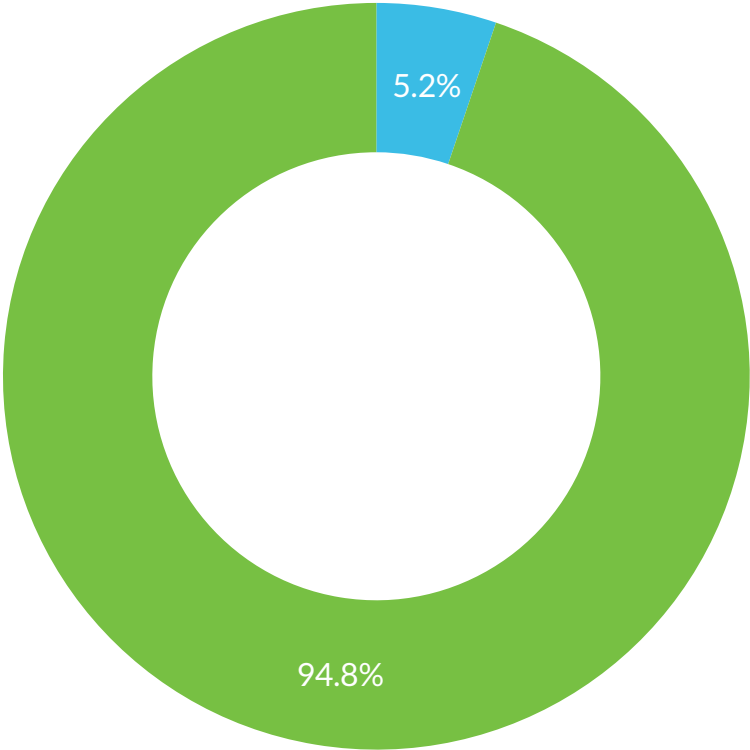
Answered
77
Unanswered
0

Choice	Total
Does not need to know this	0
Should know that these exist but not necessarily competent to use them	1
Should be very competent in using them	76

Q11

How knowledgeable should the WEM prehospital provider be with respect to all aspects of vascular access and emergency vascular access techniques?*

MULTIPLE CHOICE



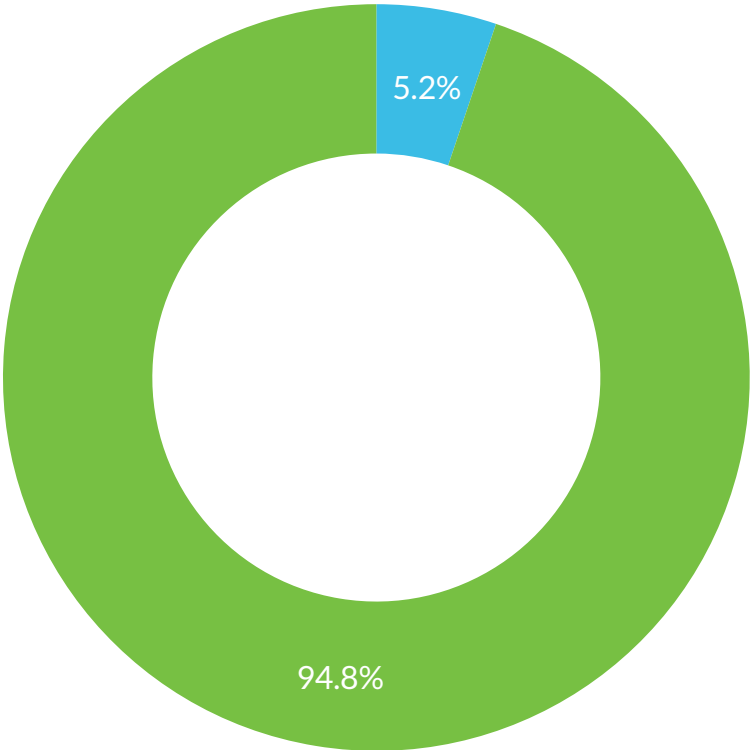
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	4
● Very knowledgeable	73

Q12

How knowledgeable should the WEM prehospital provider be with respect fluid resuscitation?*

MULTIPLE CHOICE



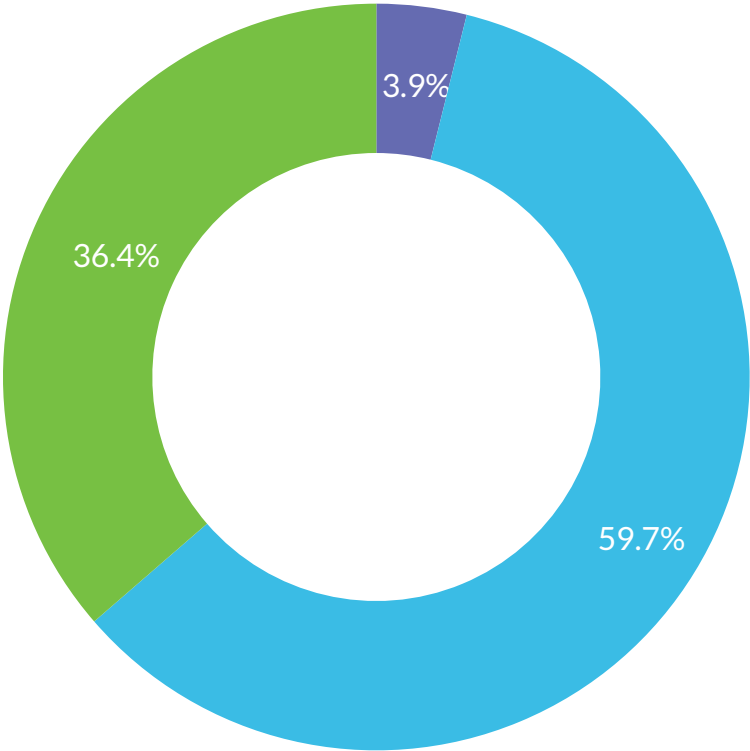
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	4
● Very knowledgeable	73

Q13

MULTIPLE CHOICE

How knowledgeable should the WEM prehospital provider be with respect to wound care including antibiotic usage and wound closure techniques in protracted field care?*



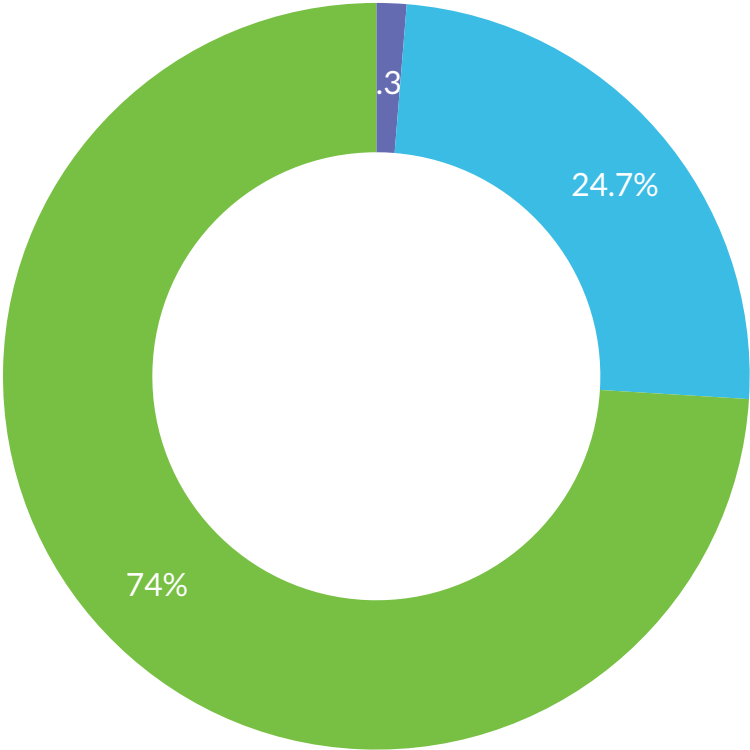
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	3
● Average knowledge	46
● Very knowledgeable	28

Q14

How knowledgeable should the WEM prehospital provider be with respect to animal bites including envenomation syndromes?*

MULTIPLE CHOICE



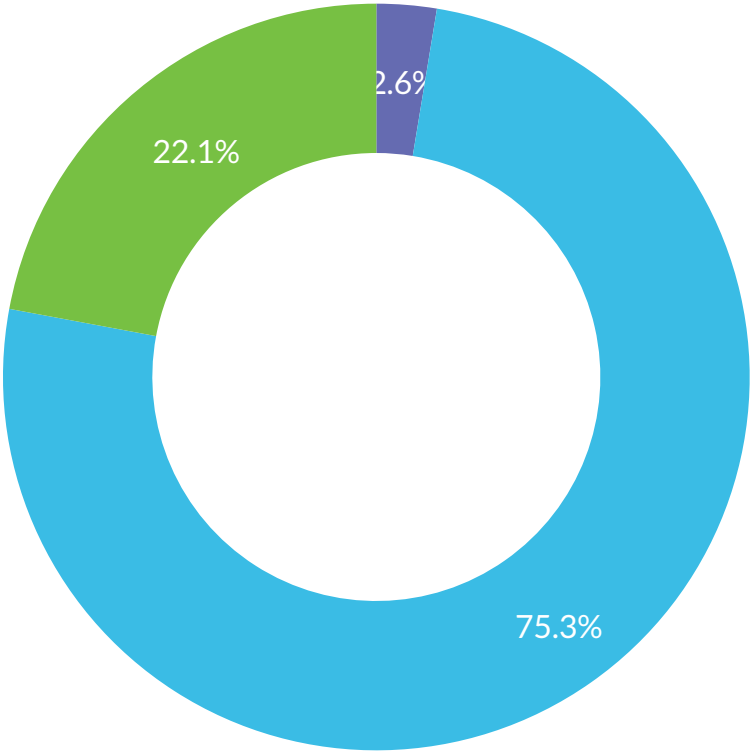
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	1
● Average knowledge	19
● Very knowledgeable	57

Q15

MULTIPLE CHOICE

How knowledgeable should the WEM prehospital provider be with respect to the understanding of rabies and assessing risk / exposure as well as the management of this problem?*



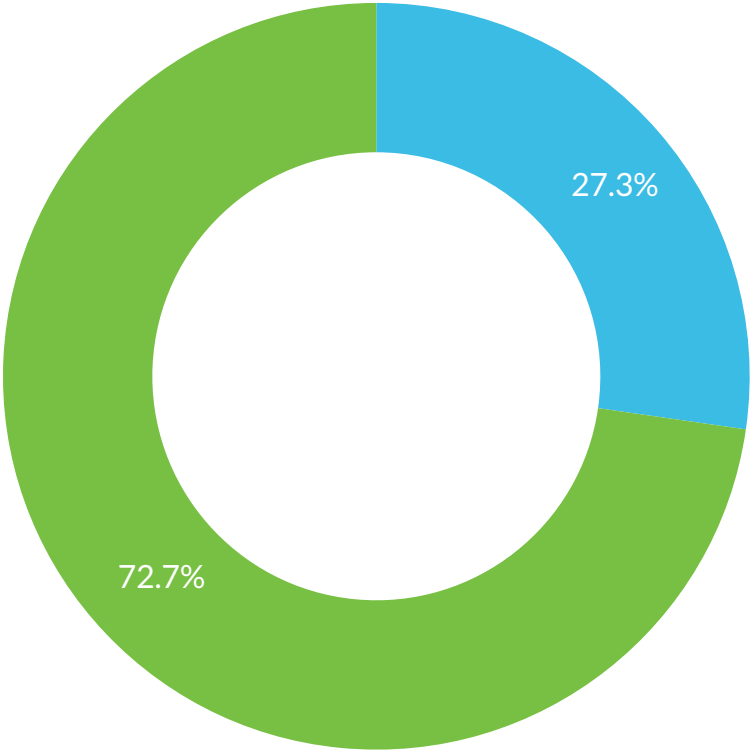
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	2
● Average knowledge	58
● Very knowledgeable	17

Q16

How knowledgeable should the WEM prehospital provider be with respect plant toxicology and the management of herbal toxicities in humans?*

MULTIPLE CHOICE



Answered
77

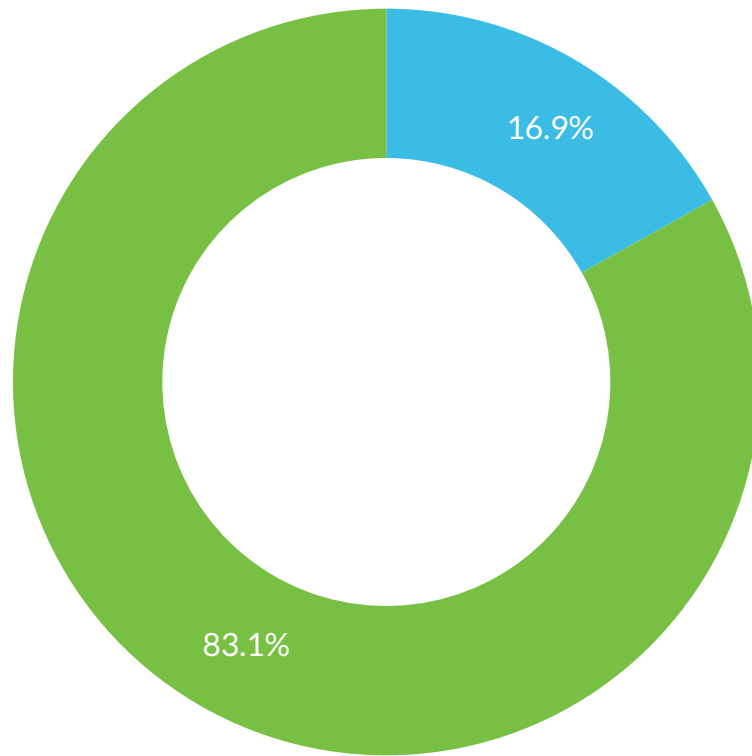
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	21
● Very knowledgeable	56

Q17

MULTIPLE CHOICE

How knowledgeable should the WEM prehospital provider be with respect to the management of all types of medical (non-trauma) emergencies in the austere environment?*



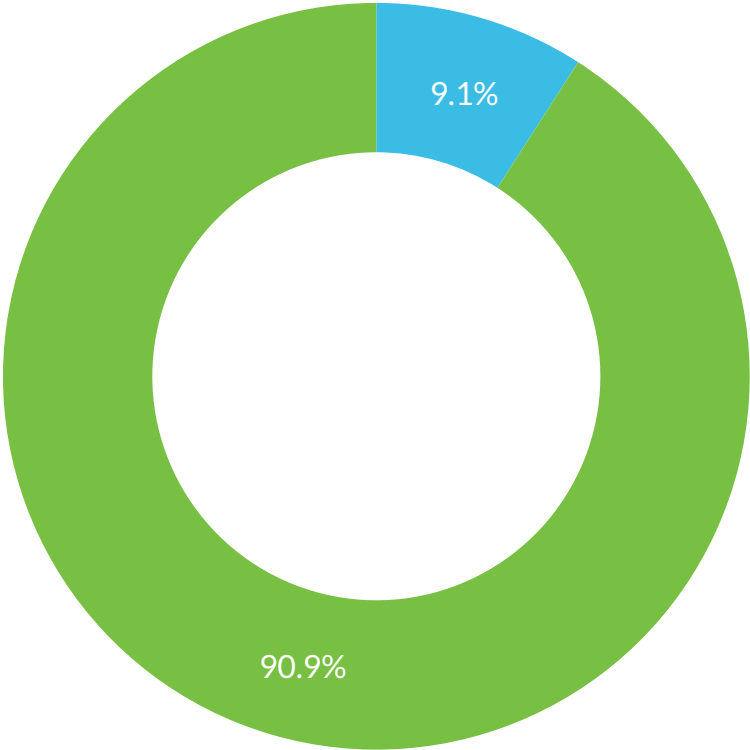
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	13
● Very knowledgeable	64

Q18

How knowledgeable should the WEM prehospital provider be with respect to the recognition and management of altitude related illnesses?*

MULTIPLE CHOICE



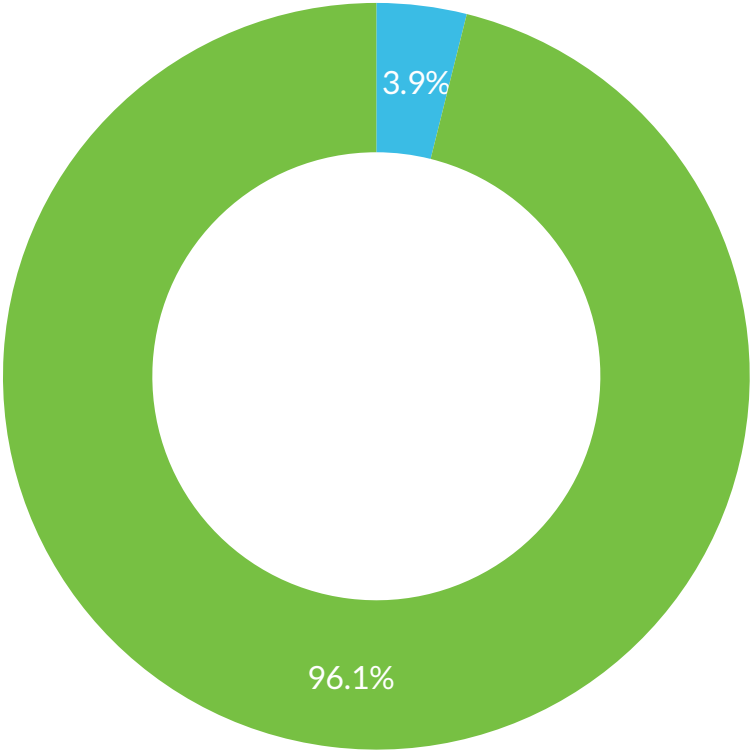
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	7
● Very knowledgeable	70

Q19

How knowledgeable should the WEM prehospital provider be with respect to the management of cold- and heat-related injuries and illnesses?*

MULTIPLE CHOICE



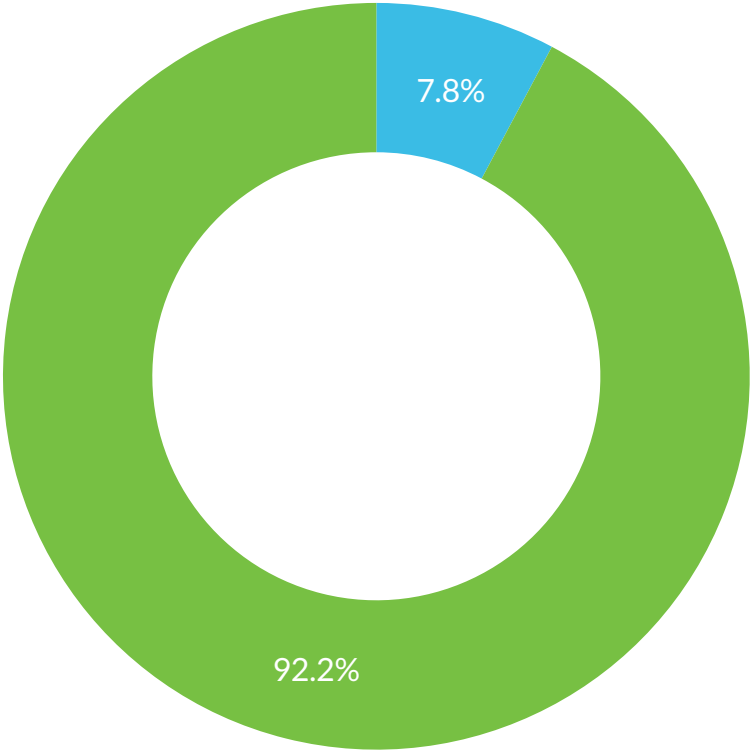
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	3
● Very knowledgeable	74

Q20

How knowledgeable should the WEM prehospital provider be with respect to submersion injuries / drowning injuries and diving-related accidents?*

MULTIPLE CHOICE



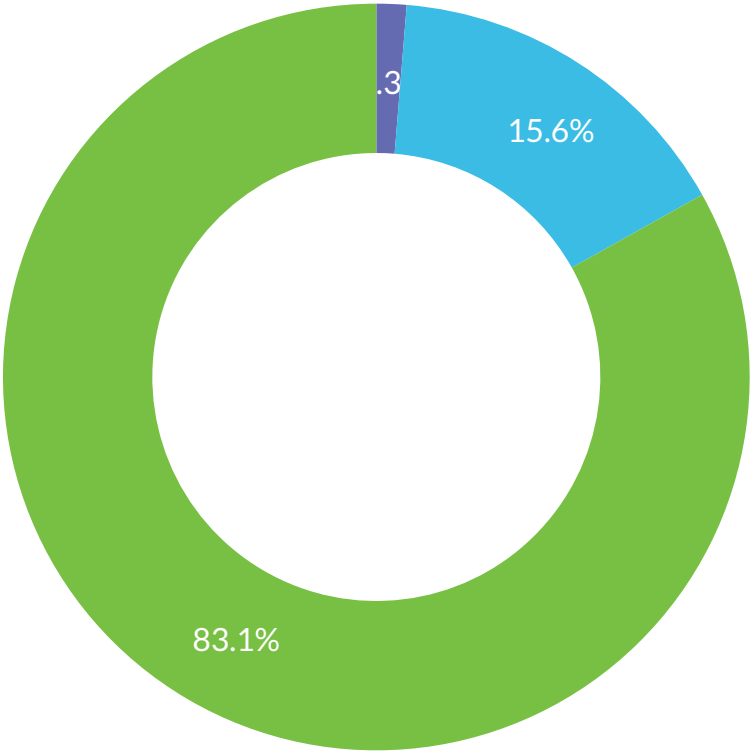
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	6
● Very knowledgeable	71

Q21

MULTIPLE CHOICE

How knowledgeable should the WEM prehospital provider be with respect to avalanche-related injuries, their identification and assessment, and their management?*



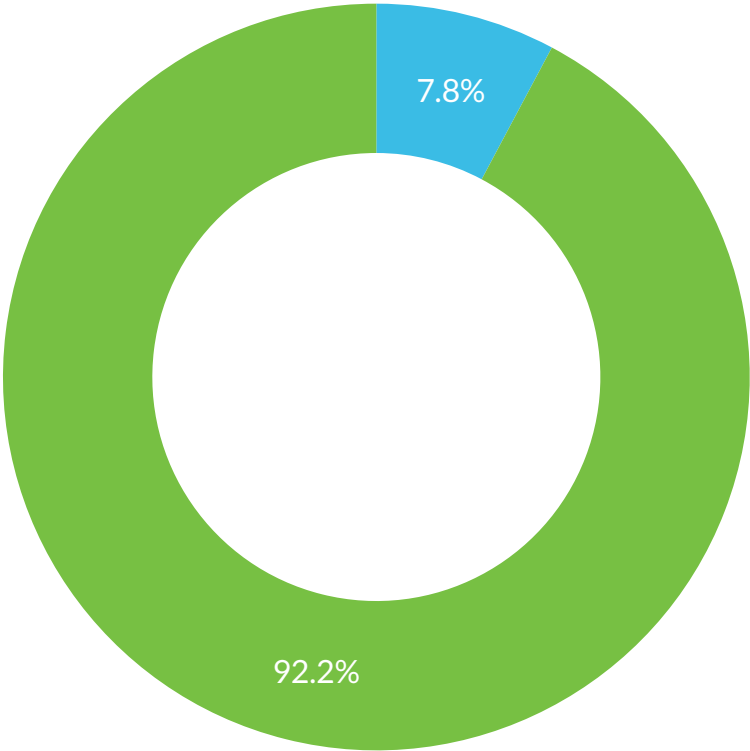
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	1
● Average knowledge	12
● Very knowledgeable	64

Q22

MULTIPLE CHOICE

How knowledgeable should the WEM prehospital provider be with respect to lightning-related injuries, how to recognise these injuries and their complications, and how to manage them?*



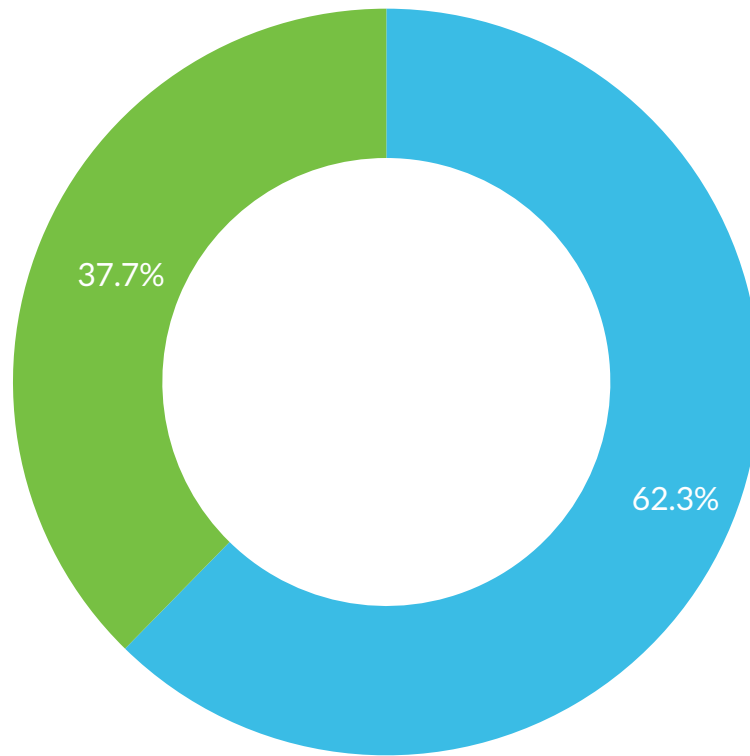
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	6
● Very knowledgeable	71

Q23

MULTIPLE CHOICE

How knowledgeable should the WEM prehospital provider be with respect to the assessment, categorisation, determination of depth and affected surface area, and the management of burn injuries?*



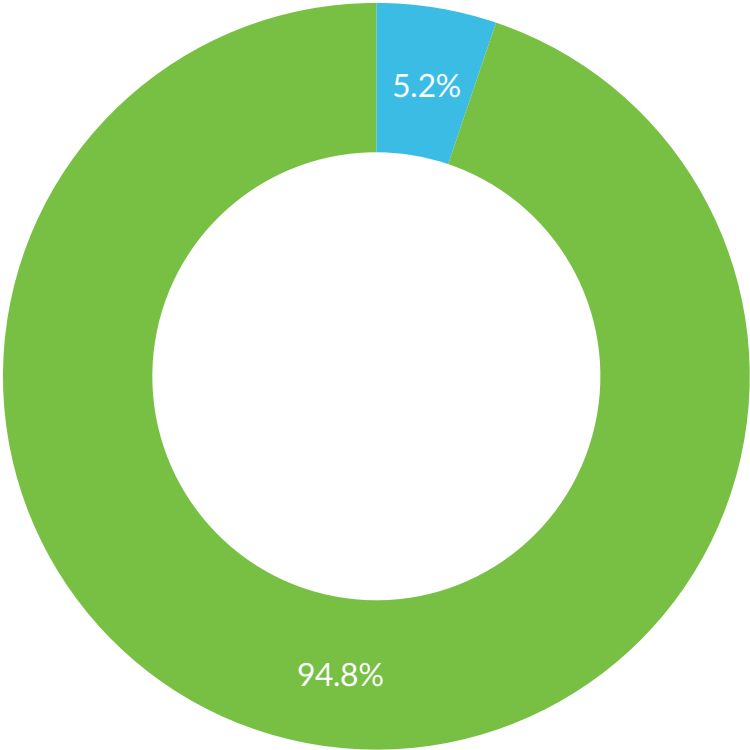
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	48
● Very knowledgeable	29

Q24

How knowledgeable should the WEM prehospital provider be with respect to dealing with all types of major and minor trauma in the austere environment?*

MULTIPLE CHOICE



Answered
77

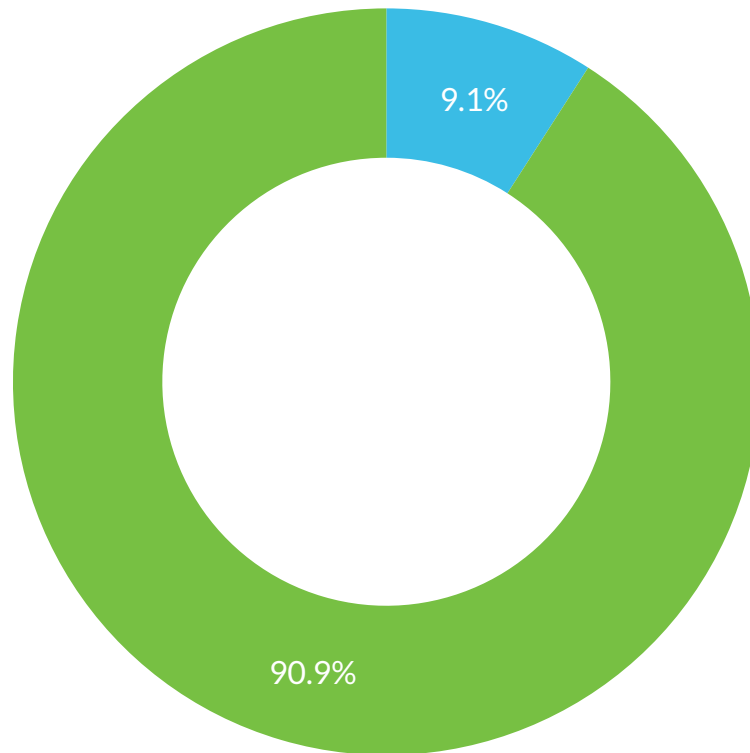
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	4
● Very knowledgeable	73

Q25

MULTIPLE CHOICE

How knowledgeable should the WEM prehospital provider be with respect to the assessment and management of orthopaedic injuries in the wilderness environment when protracted field care may be required?*



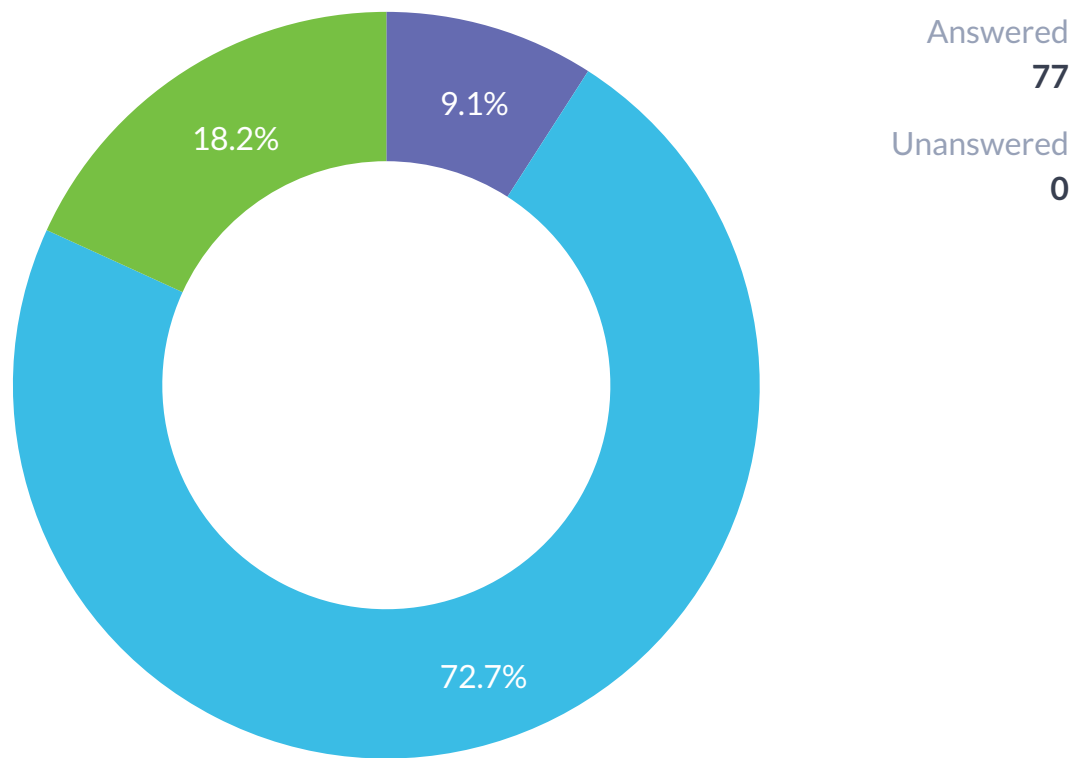
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	7
● Very knowledgeable	70

Q26

MULTIPLE CHOICE

How knowledgeable should the WEM prehospital provider be with respect to conducting a primary health care assessment (history taking, clinical examination, develop a problem list, develop a list of differential diagnoses, request and conduct simple primary health care investigations) and the development of a management plan?*



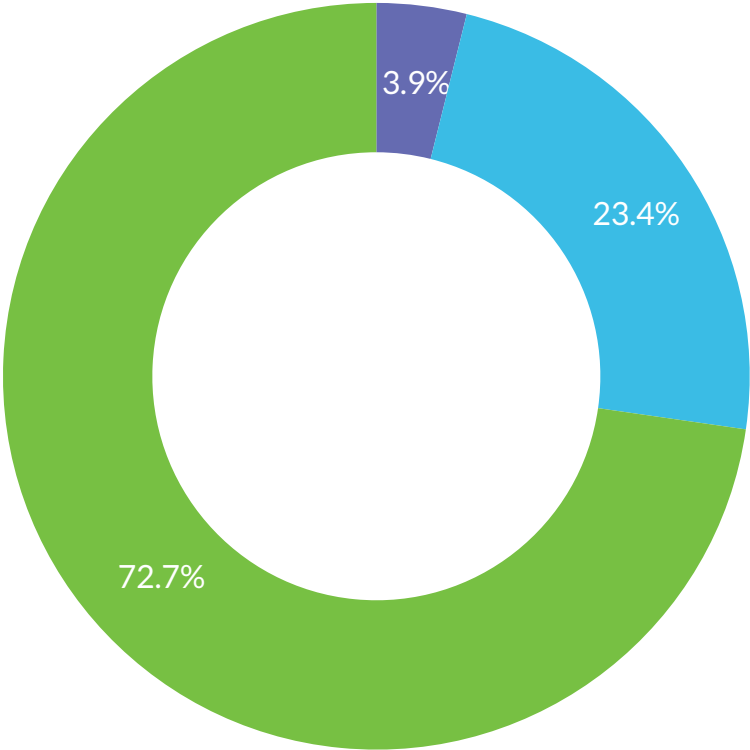
Choice	Total
● Little to no knowledge	7

- Average knowledge 56
- Very knowledgeable 14

Q27

How knowledgeable should the WEM prehospital provider be with respect to the presentation, assessment and management of tropical diseases?*

MULTIPLE CHOICE



Answered
77

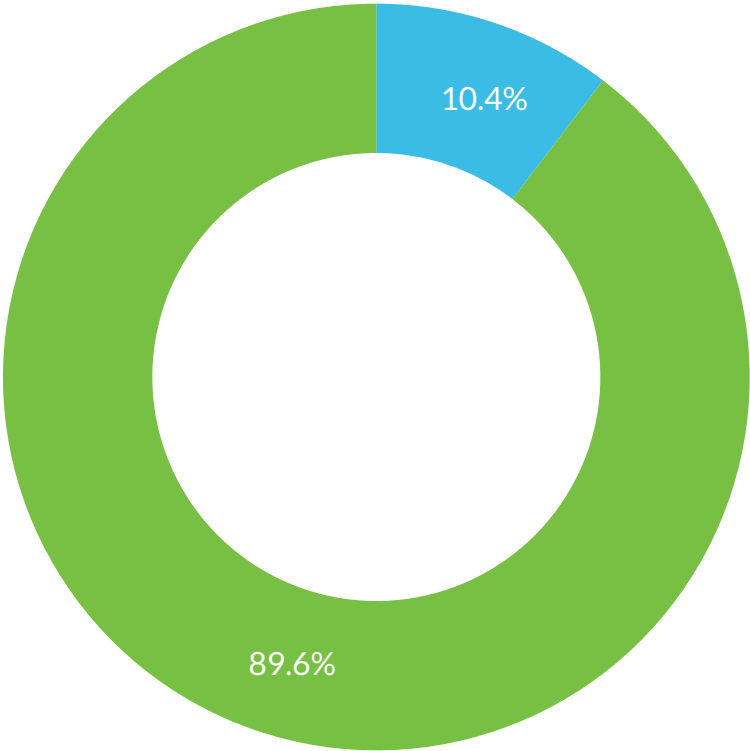
Unanswered
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Choice	Total
● Little to no knowledge	3
● Average knowledge	18
● Very knowledgeable	56

Q28

How knowledgeable should the WEM prehospital provider be with respect to the management of a disaster / major incident in the wilderness / austere environment?*

MULTIPLE CHOICE



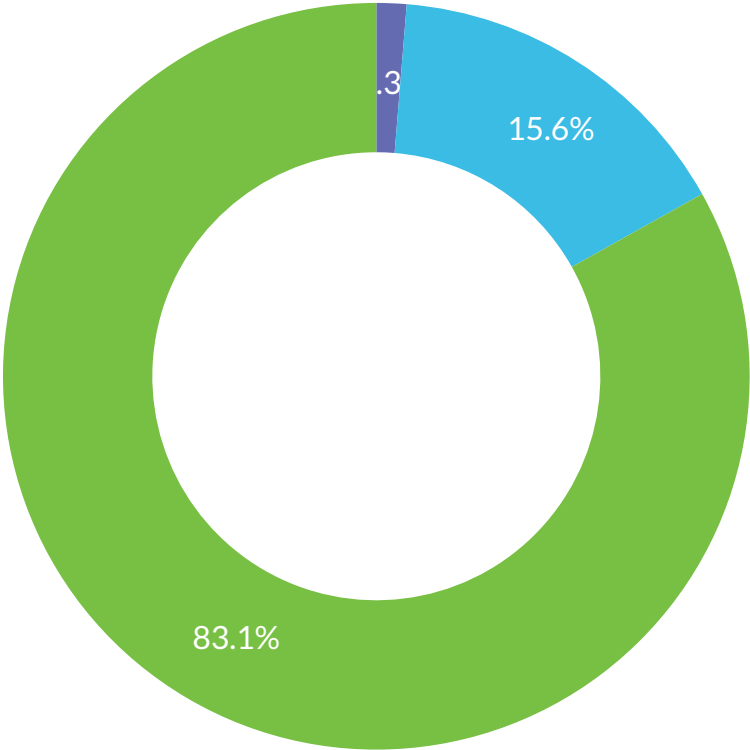
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	0
● Average knowledge	8
● Very knowledgeable	69

Q29

How knowledgeable should the WEM prehospital provider be with respect to the recognition of edible and medicinal plants in the geographic area they work in?*

MULTIPLE CHOICE



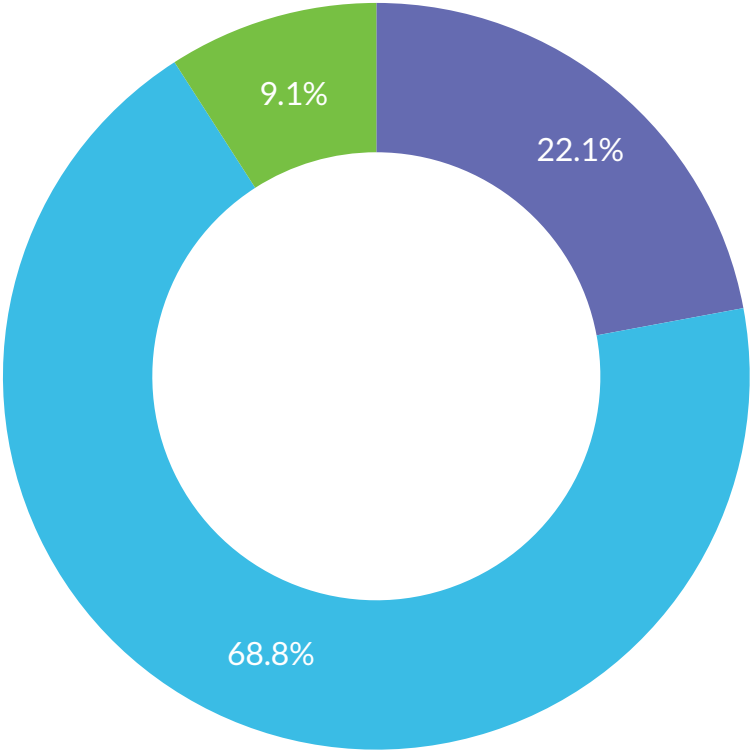
Answered
77
Unanswered
0

Choice	Total
No	1
Some plants only	12
Very knowledgeable	64

Q30

How knowledgeable should the WEM prehospital provider be with respect to the assessment and management of dental problems in the field?*

MULTIPLE CHOICE



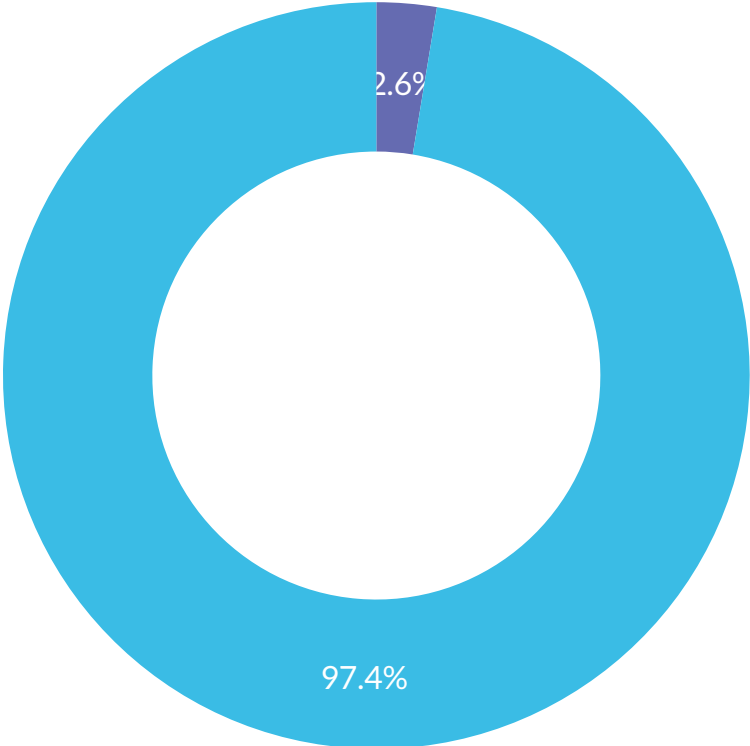
Answered
77
Unanswered
0

Choice	Total
● Little to no knowledge	17
● Average knowledge	53
● Very knowledgeable	7

Q31

Should the WEM prehospital provider complete an annual helicopter safety briefing?*

MULTIPLE CHOICE



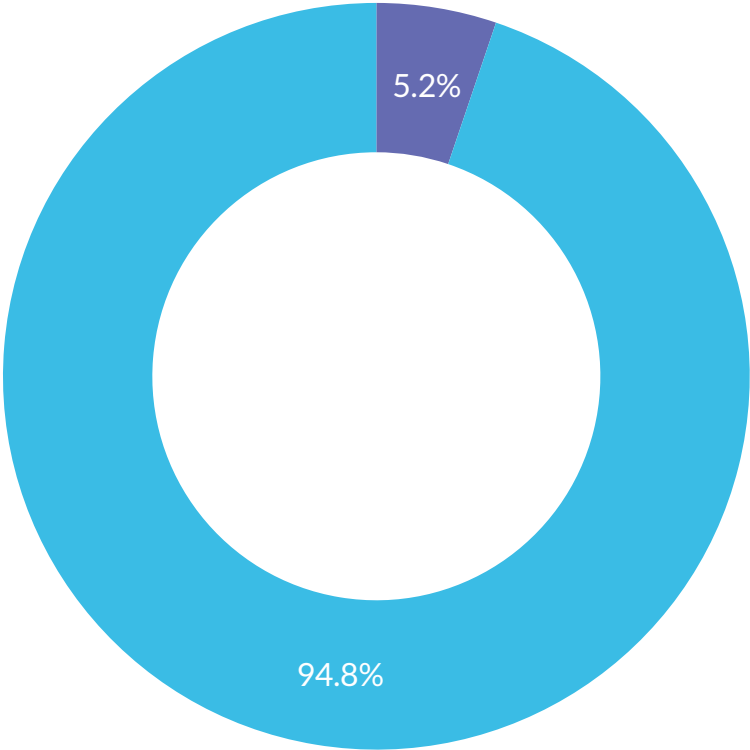
Answered
77
Unanswered
0

Choice	Total
No	2
Yes	75

Q32

Should the WEM prehospital provider have an updated Aviation Health Care Provider course (or equivalent) certification?*

MULTIPLE CHOICE



Answered
77

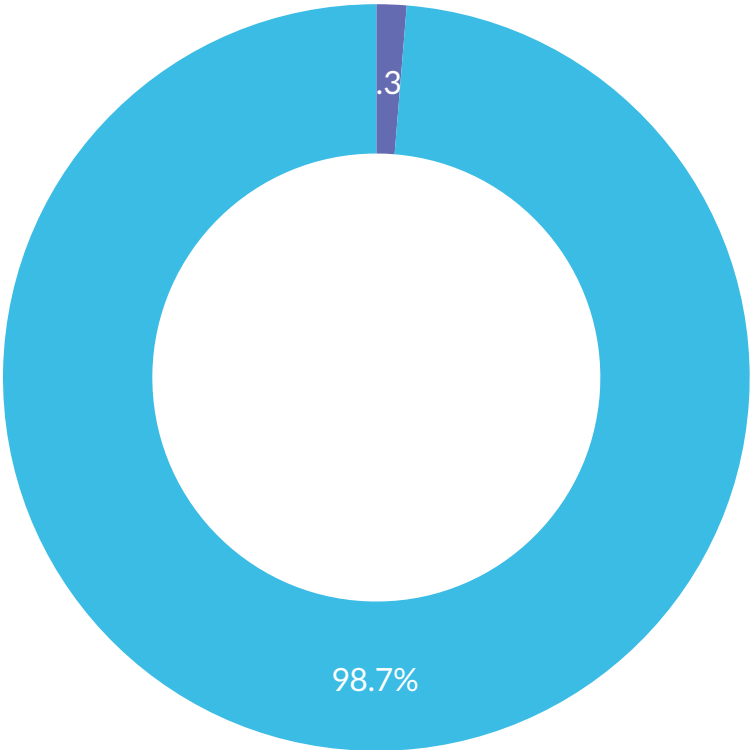
Unanswered
0

Choice	Total
No	4
Yes	73

Q33

Should the WEM prehospital provider have a valid Basic Life Support for Healthcare Providers (BLS) certificate?*

MULTIPLE CHOICE



Answered
77

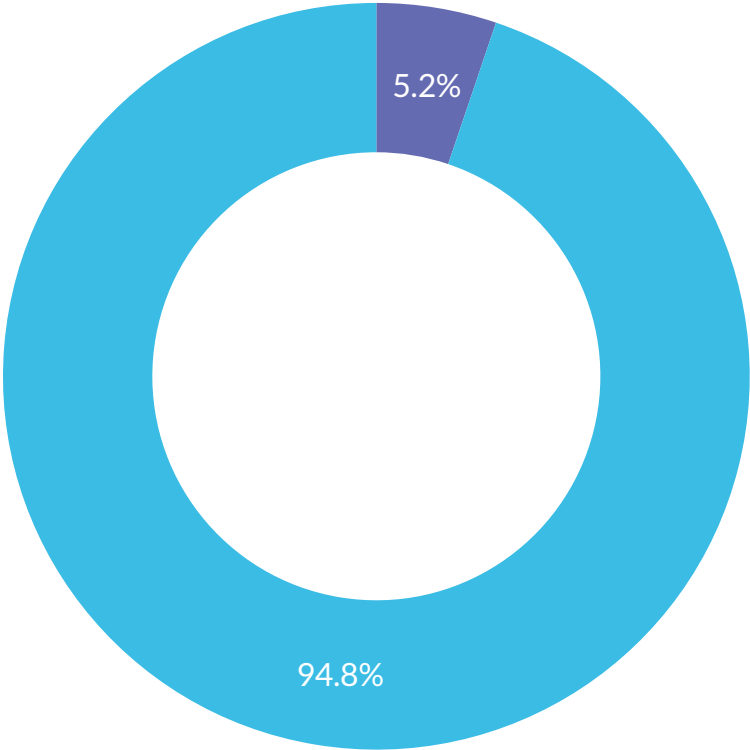
Unanswered
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Choice	Total
No	1
Yes	76

Q34

Should the WEM prehospital provider have a valid Advanced Cardiovascular Life Support (ACLS) or ACLS-Experienced Provider (ACLS-EP) certification?*

MULTIPLE CHOICE



Answered
77

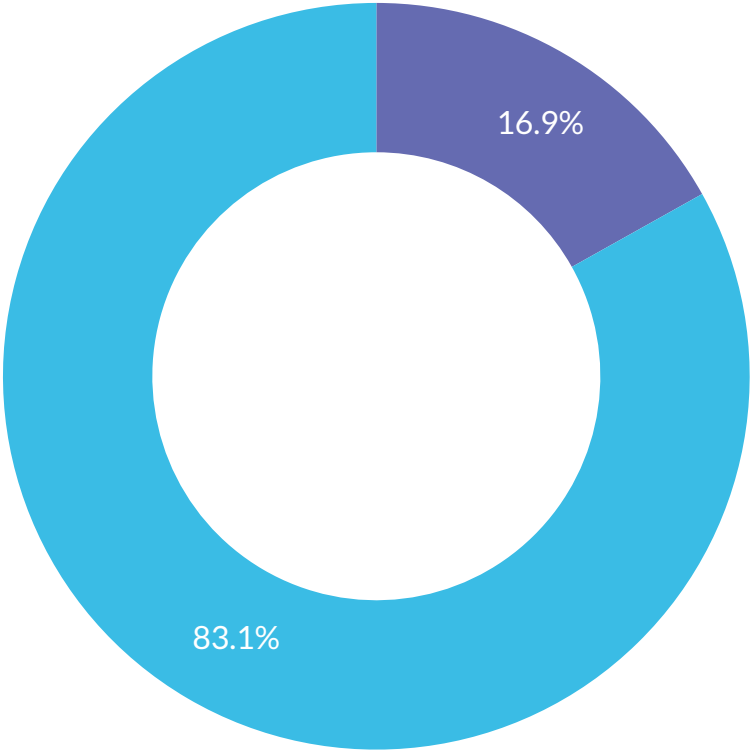
Unanswered
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Choice	Total
No	4
Yes	73

Q35

Should the WEM prehospital provider have a valid Paediatric Advanced Life Support (PALS) or Advanced Paediatric Life Support (APLS) certification?*

MULTIPLE CHOICE



Answered
77

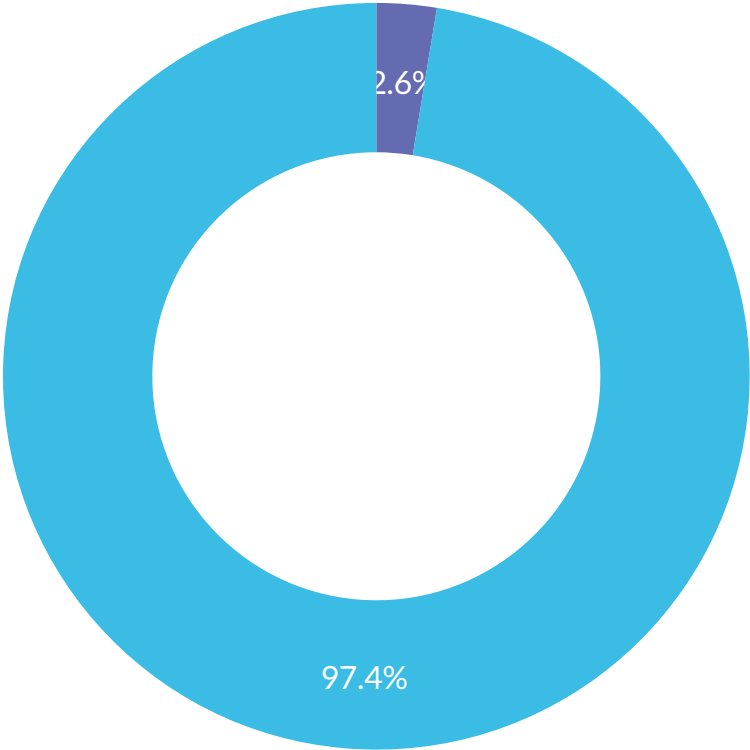
Unanswered
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Choice	Total
No	13
Yes	64

Q36

Should the WEM prehospital provider have a valid Advanced Trauma Life Support (ATLS) or Prehospital Trauma Life Support (PHTLS) certification?*

MULTIPLE CHOICE



Answered
77

Unanswered
0

Choice	Total
No	2
Yes	75

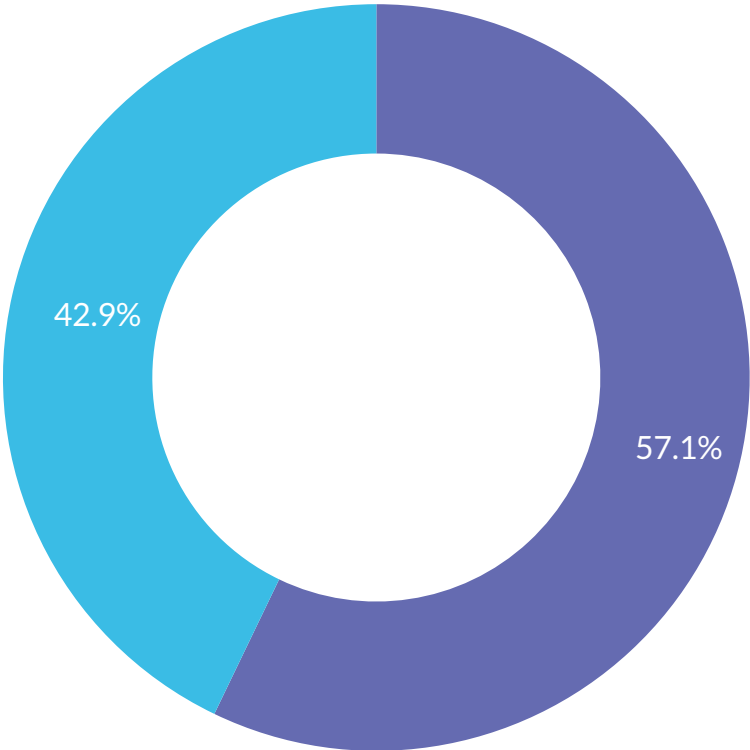
Q37

Should the WEM prehospital provider have a valid International Trauma Life Support (ITLS) certification?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

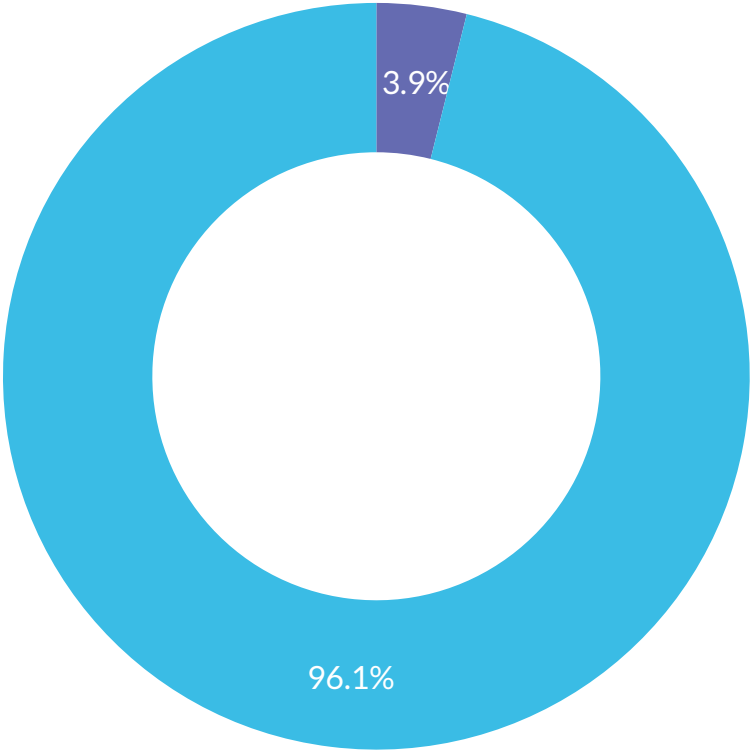


Choice	Total
No	44
Yes	33

Q38

Should the WEM prehospital provider have done a basic wilderness first aid or first responder course that is current and valid?*

MULTIPLE CHOICE



Answered
77

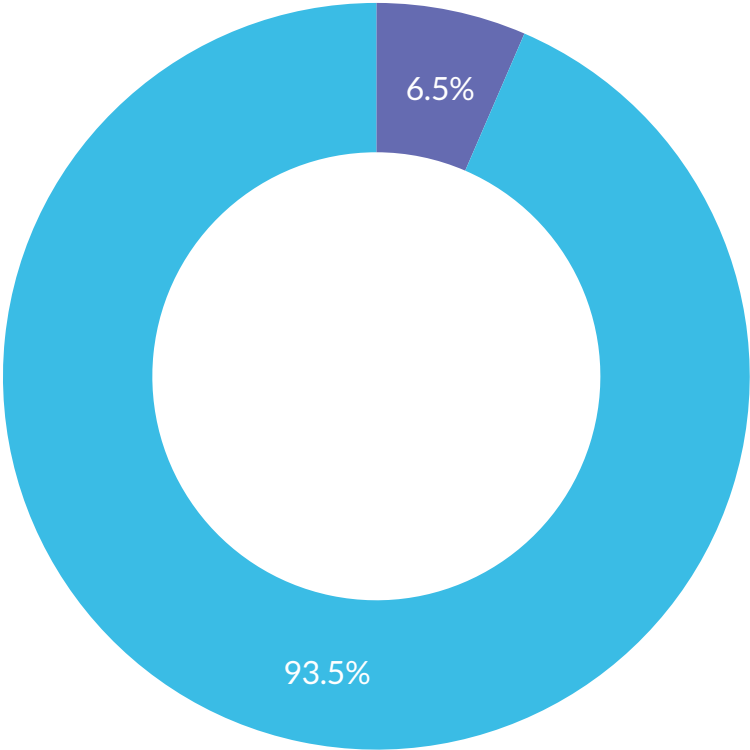
Unanswered
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Choice	Total
No	3
Yes	74

Q39

Should the WEM prehospital provider have done an Advanced Wilderness Emergency Medicine course or equivalent that is current and valid?*

MULTIPLE CHOICE



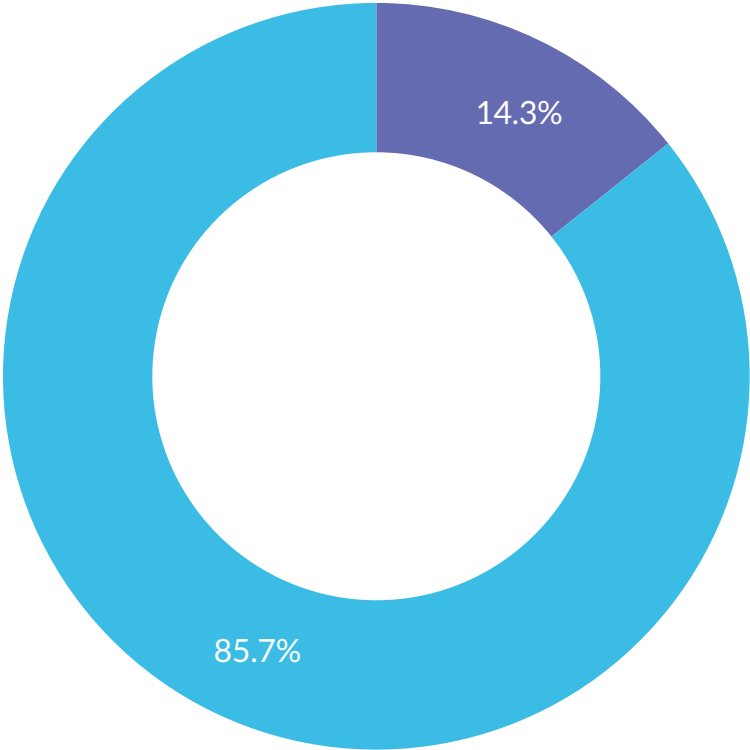
Answered
77
Unanswered
0

Choice	Total
No	5
Yes	72

Q40

Should the WEM prehospital provider have done an Advanced Medical Life Support (AMLS) course or equivalent which is current and valid?*

MULTIPLE CHOICE



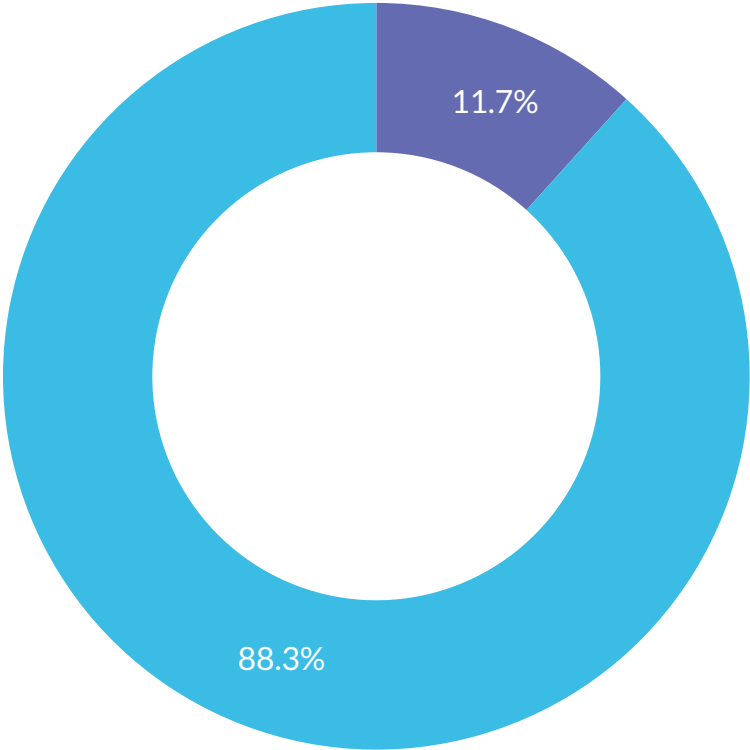
Answered
77
Unanswered
0

Choice	Total
No	11
Yes	66

Q41

Should the WEM prehospital provider have done a Major Incident Medical Management and Support (MIMMS) course which is current and valid?*

MULTIPLE CHOICE



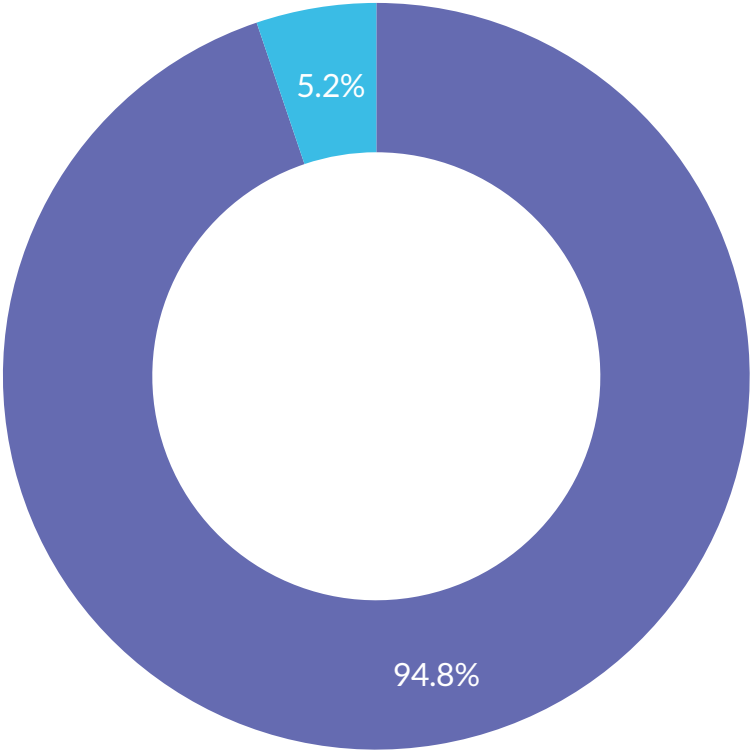
Answered
77
Unanswered
0

Choice	Total
No	9
Yes	68

Q42

Should the WEM prehospital provider have done a Hospital Major Incident Medical Management and Support (HMIMMS) course which is current and valid?*

MULTIPLE CHOICE



Answered
77

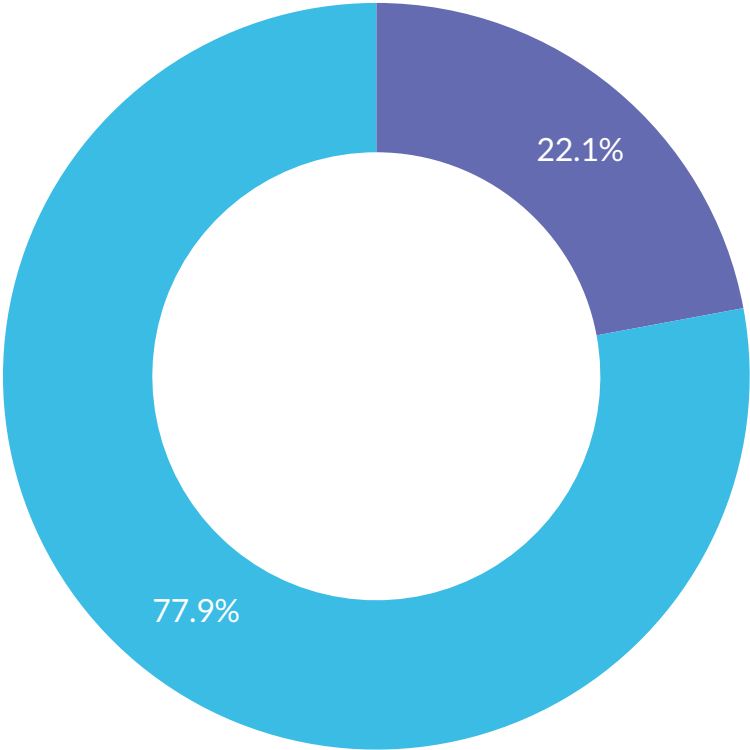
Unanswered
0

Choice	Total
● No	73
● Yes	4

Q43

Should the WEM prehospital provider have done an Airway Interventions and Management in Emergencies (AIME) course which is current and valid?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

Choice	Total
No	17
Yes	60

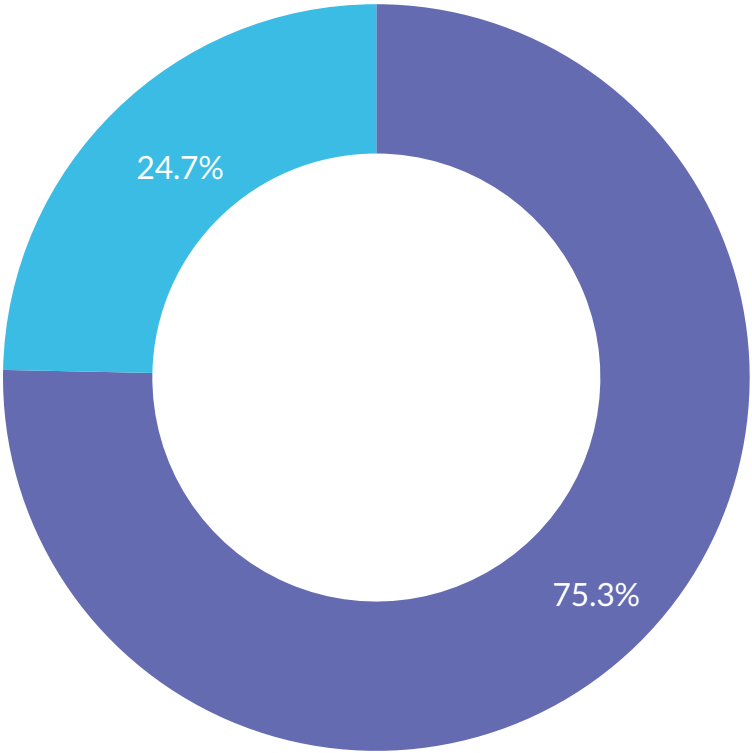
Q44

Should the WEM prehospital provider have done a basic point-of-care ultrasound course?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

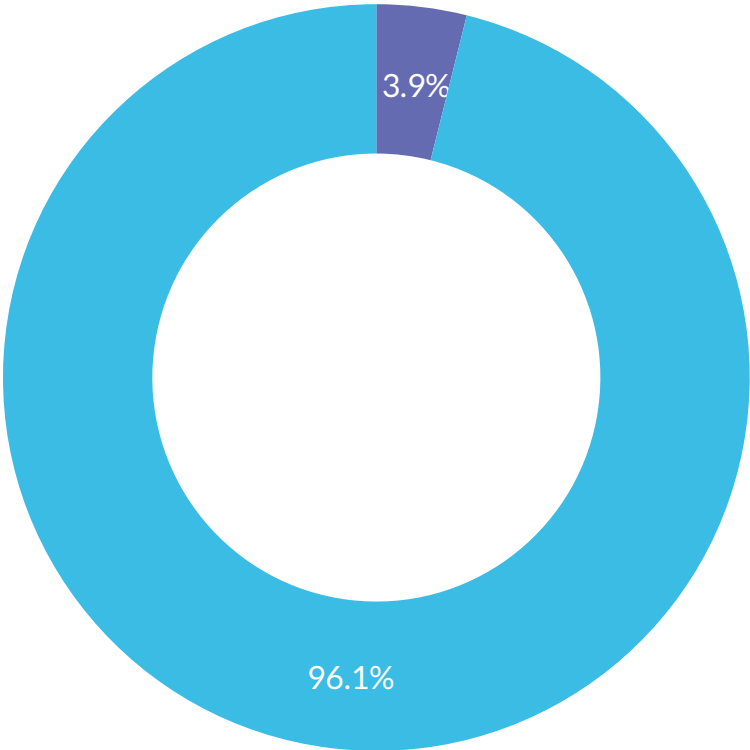


Choice	Total
● No	58
● Yes	19

Q45

Should the WEM prehospital provider have done any formal survival training?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

Choice	Total
No	3
Yes	74

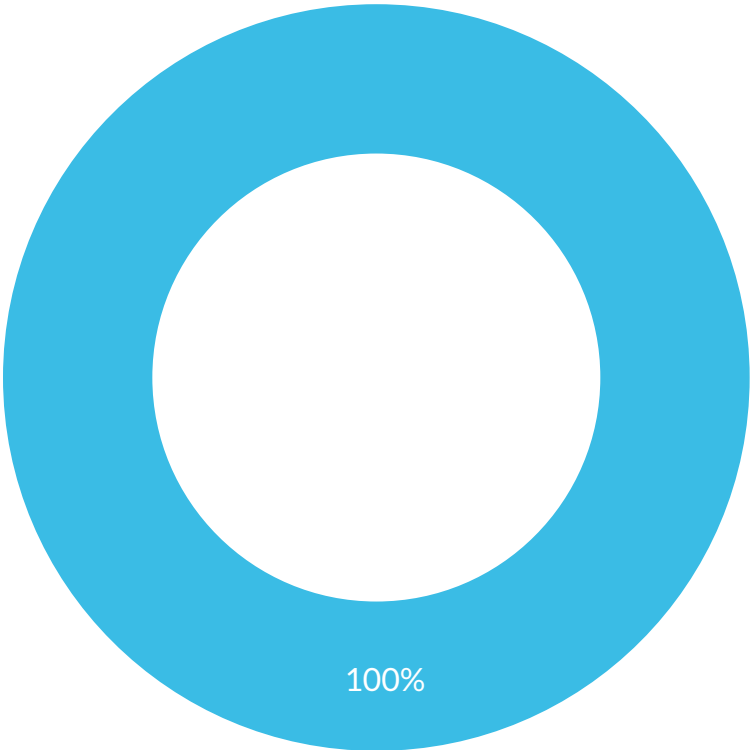
Q46

Should the WEM prehospital provider be able to effectively perform chest compressions?*

MULTIPLE CHOICE

Answered
77

Unanswered
0



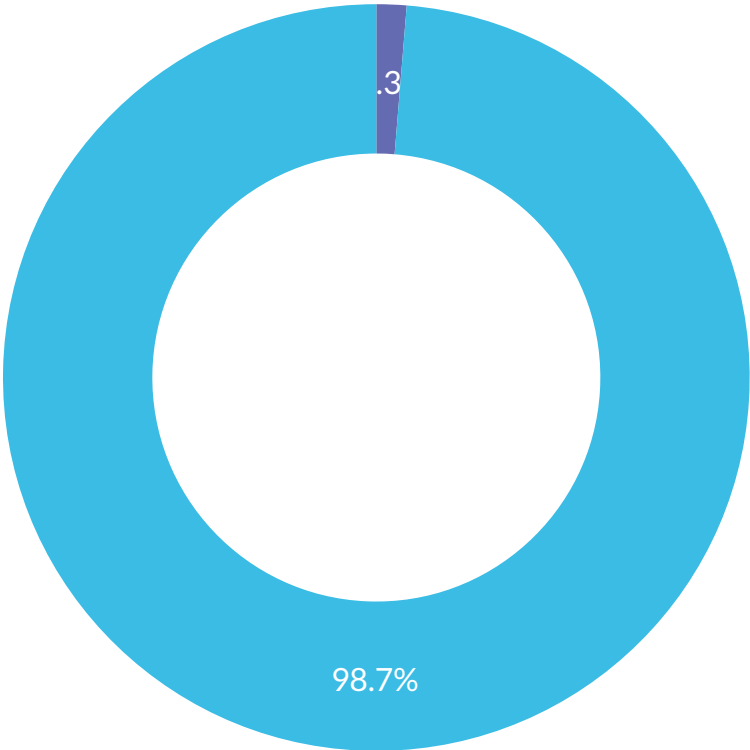
Choice	Total
● No	0
● Yes	77

Q47

Should the WEM prehospital provider be able to defibrillate using a manual defibrillator?*

MULTIPLE CHOICE

Answered
77
Unanswered
0



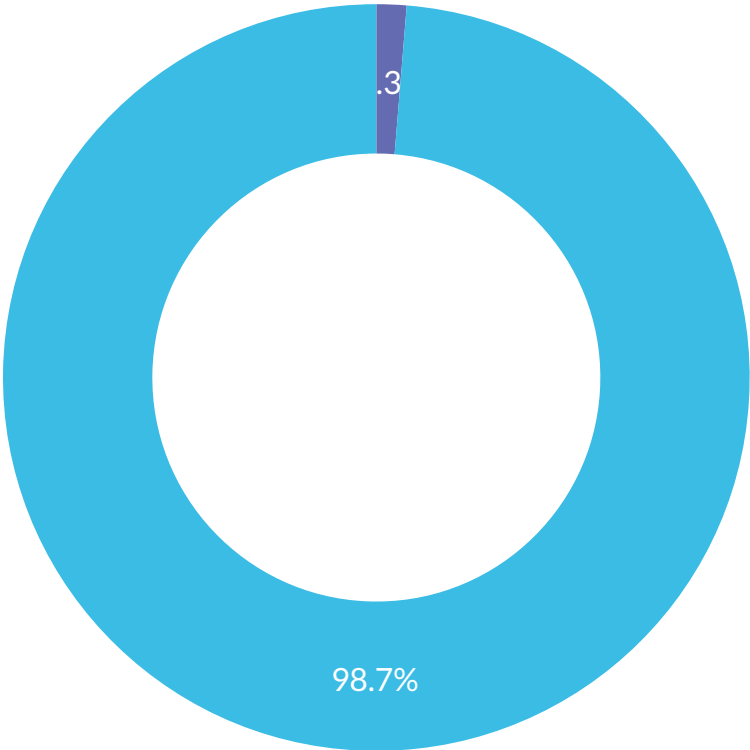
Choice	Total
No	1
Yes	76

Q48

Should the WEM prehospital provider be able to defibrillate using an automated external defibrillator?*

MULTIPLE CHOICE

Answered
77
Unanswered
0



Choice	Total
No	1
Yes	76

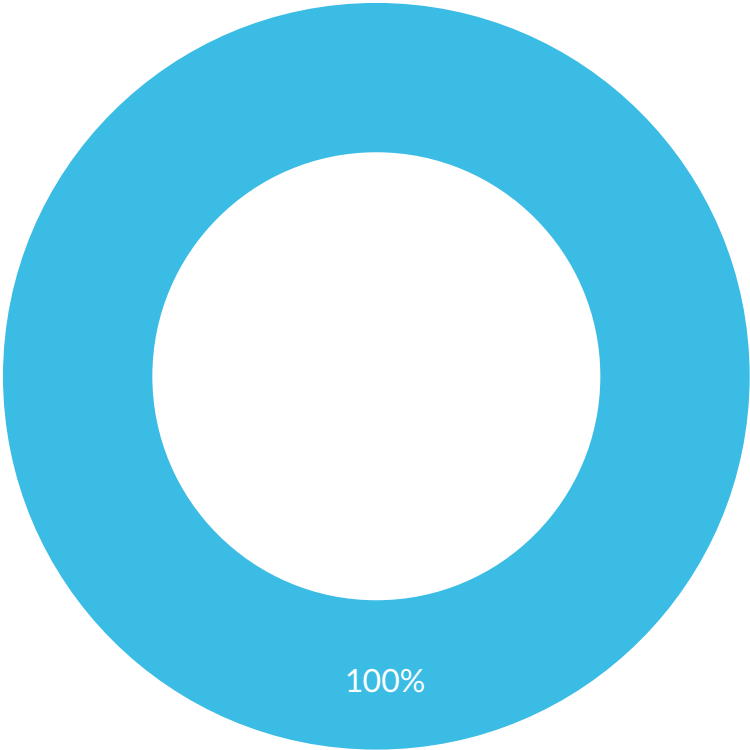
Q49

Should the WEM prehospital provider be able to effectively and comfortably perform bag-valve-mask ventilation?*

MULTIPLE CHOICE

Answered
77

Unanswered
0



Choice	Total
● No	0
● Yes	77

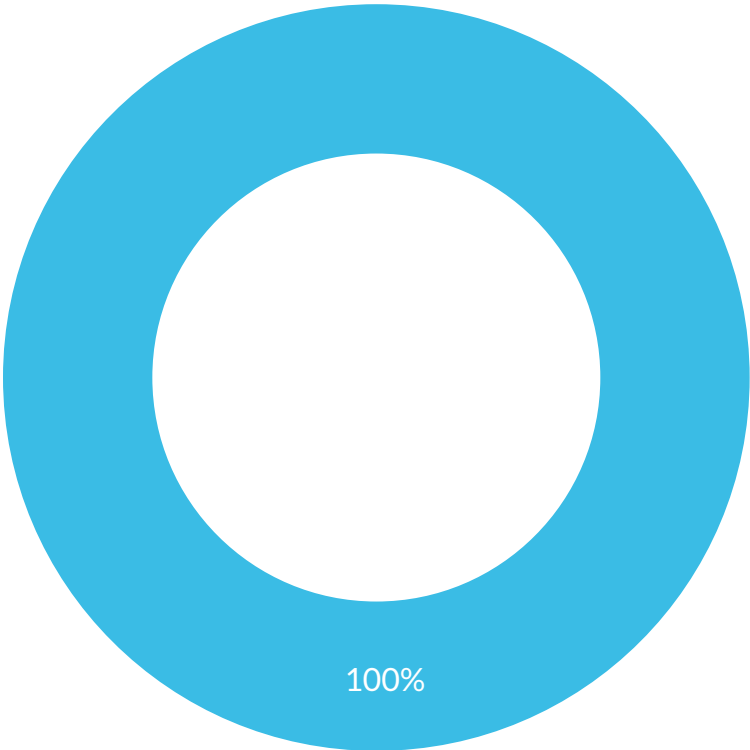
Q50

Should the WEM prehospital provider be able to use a commercial tourniquet?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

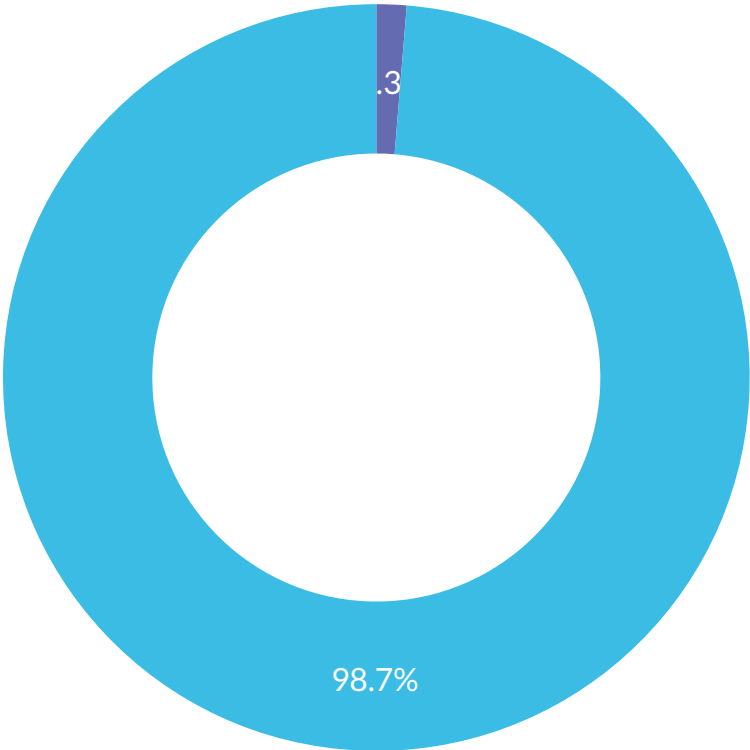


Choice	Total
● No	0
● Yes	77

Q51

Should the WEM prehospital provider be able to safely use topical haemostatic agents?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

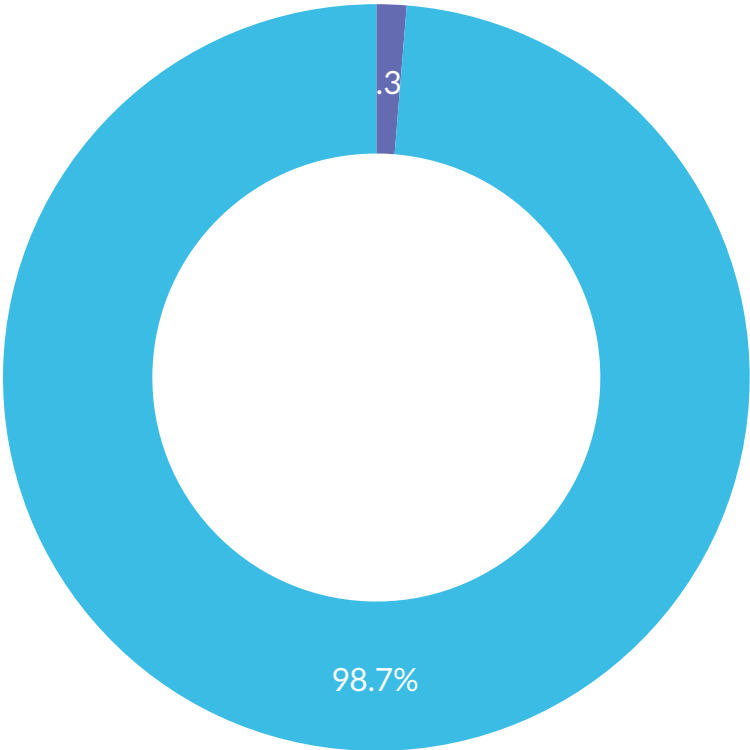
Choice	Total
● No	1
● Yes	76

Q52

Should the WEM prehospital provider be able to use a tactical haemostatic bandage?*

MULTIPLE CHOICE

Answered
77
Unanswered
0



Choice	Total
No	1
Yes	76

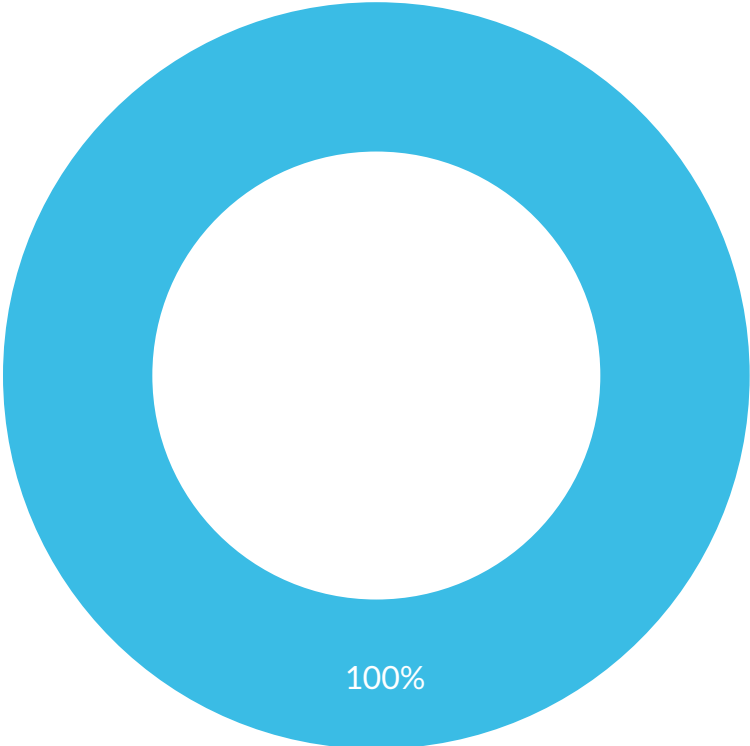
Q53

Should the WEM prehospital provider be able to obtain intra-venous access?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

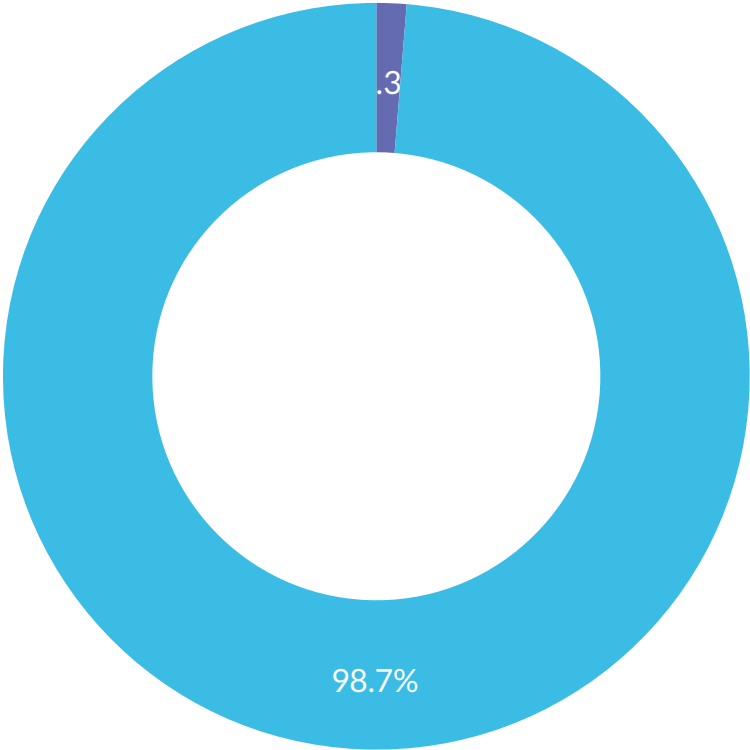


Choice	Total
● No	0
● Yes	77

Q54

Should the WEM prehospital provider be able to obtain intra-osseous access with both commercial and fabricated devices such as a bone marrow needle?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

Choice	Total
No	1
Yes	76

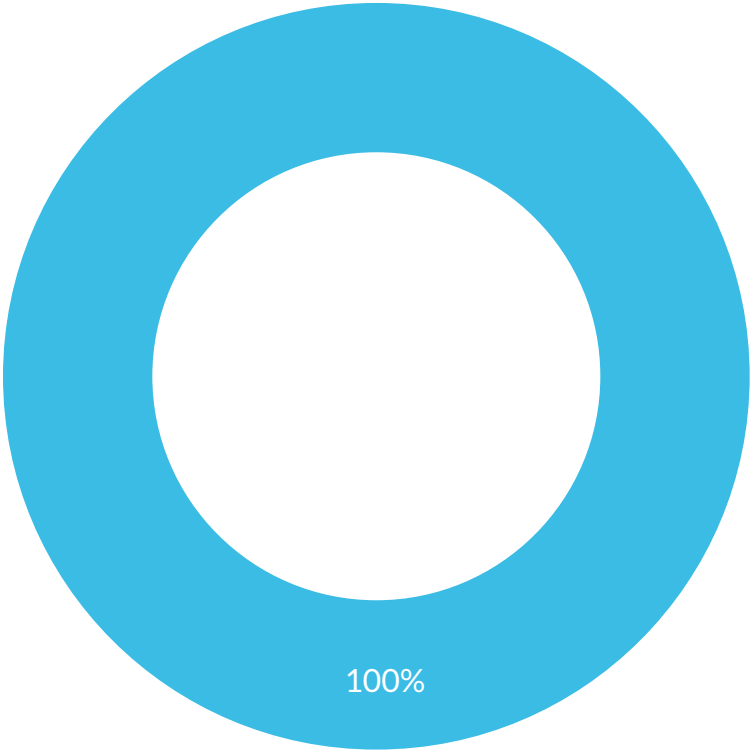
Q55

Should the WEM prehospital provider be able to comfortably perform splintage using standard splintage devices?*

MULTIPLE CHOICE

Answered
77

Unanswered
0



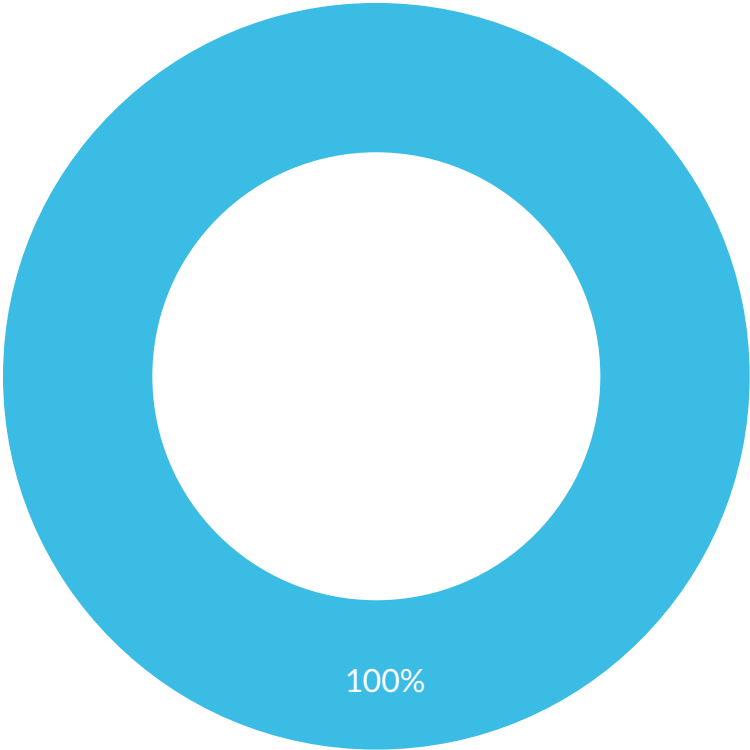
Choice	Total
● No	0
● Yes	77

Q56

Should the WEM prehospital provider be able to comfortably perform splintage using improvised devices?

*

MULTIPLE CHOICE



Answered
77

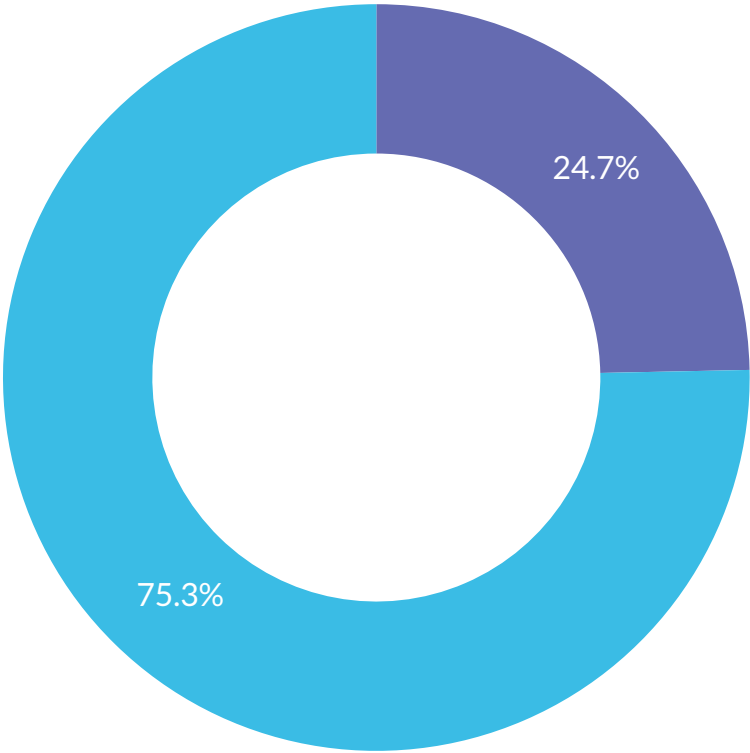
Unanswered
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Choice	Total
<input type="radio"/> No	0
<input checked="" type="radio"/> Yes	77

Q57

Should the WEM prehospital provider be able to irrigate a wound and mechanically debride it?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

Choice	Total
● No	19
● Yes	58

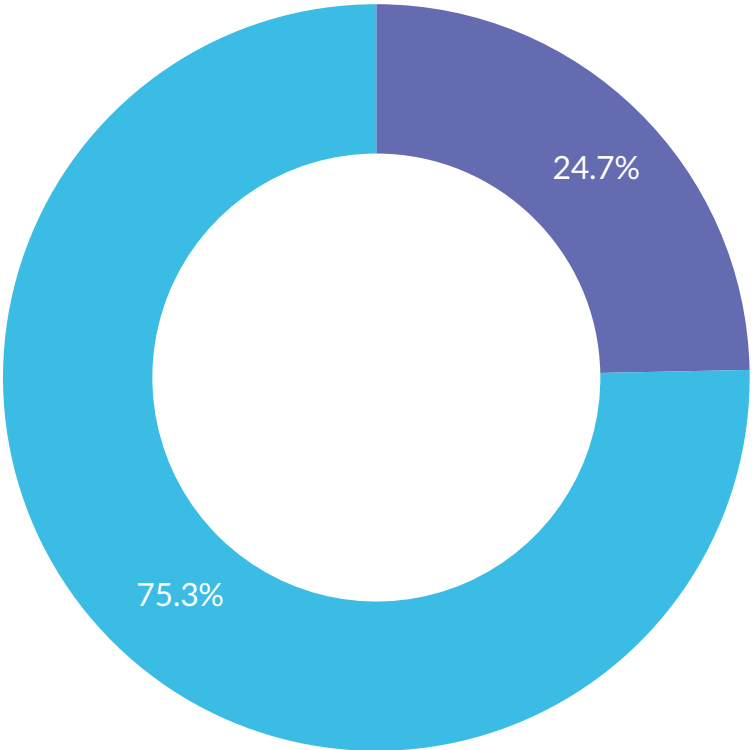
Q58

Should the WEM prehospital provider be able to close wounds using various techniques including suturing?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

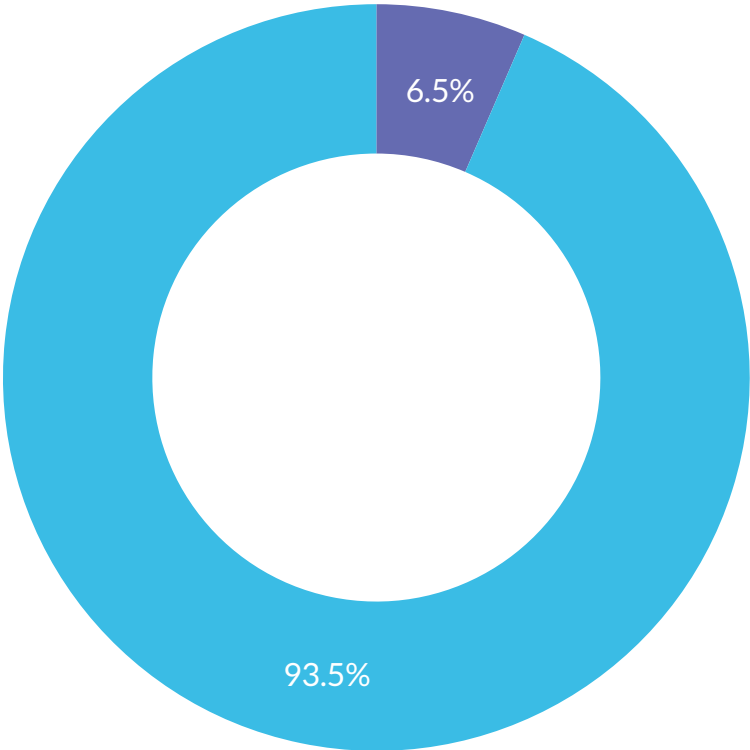


Choice	Total
No	19
Yes	58

Q59

Should the WEM prehospital provider be able to use a Gamow Bag or equivalent?*

MULTIPLE CHOICE



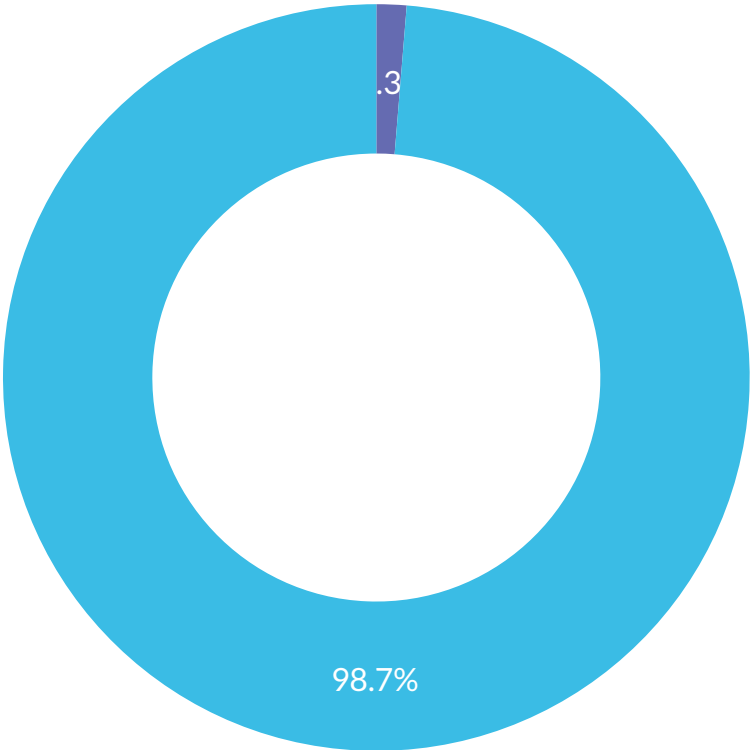
Answered
77
Unanswered
0

Choice	Total
● No	5
● Yes	72

Q60

Should the WEM prehospital provider be competent in search and rescue techniques?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

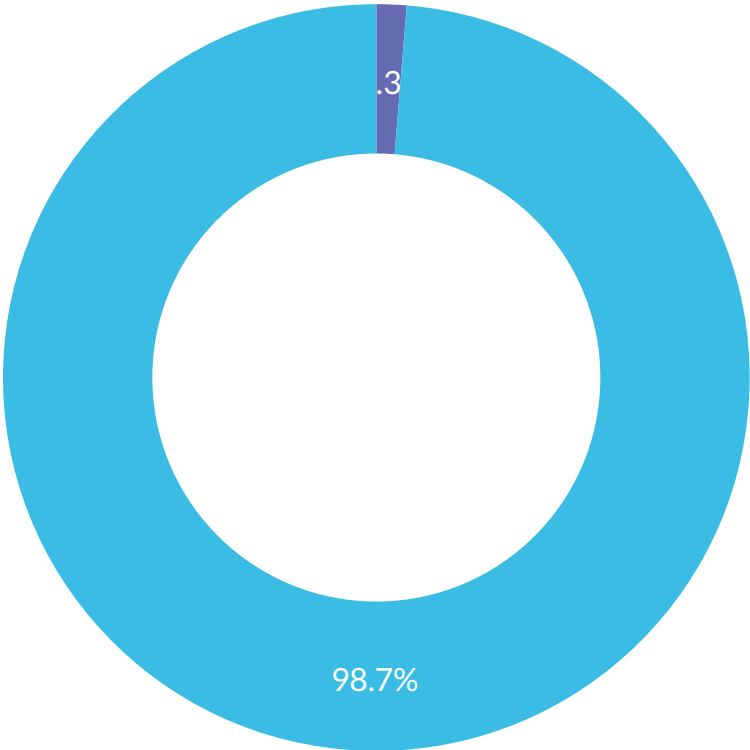
Choice	Total
No	1
Yes	76

Q61

Should the WEM prehospital provider be competent with wilderness navigation techniques?*

MULTIPLE CHOICE

Answered
77
Unanswered
0

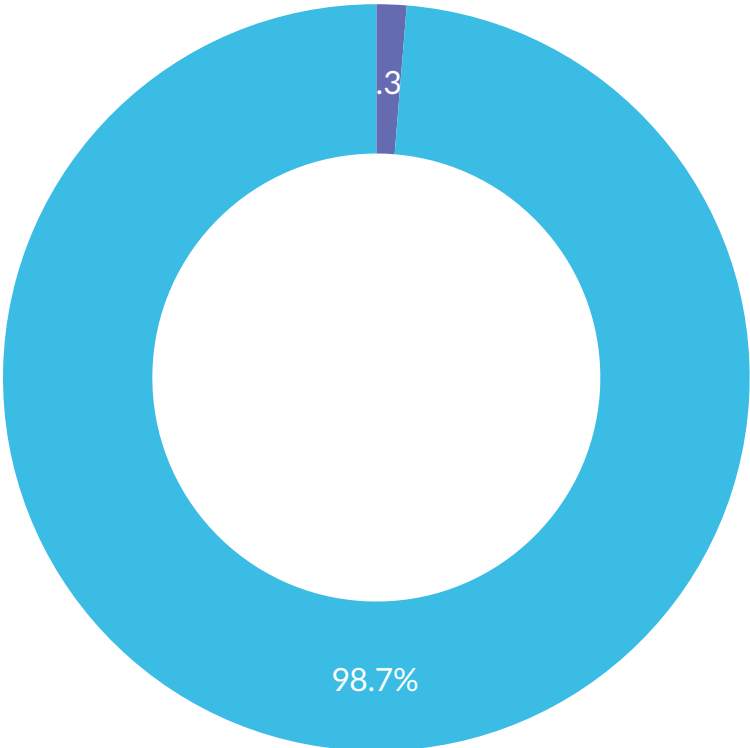


Choice	Total
No	1
Yes	76

Q62

Should the WEM prehospital provider be competent at using knots and ropework in rope rescue?*

MULTIPLE CHOICE



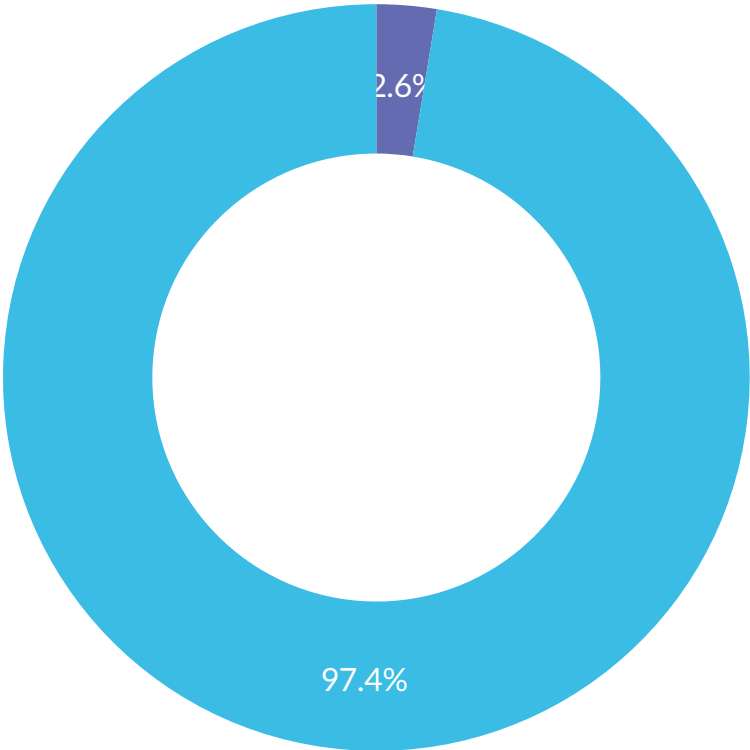
Answered
77
Unanswered
0

Choice	Total
No	1
Yes	76

Q63

Should the WEM prehospital provider be able to apply a HALO, Asherman's or other commercial chest seal?*

MULTIPLE CHOICE



Answered
77

Unanswered
0

Choice	Total
No	2
Yes	75

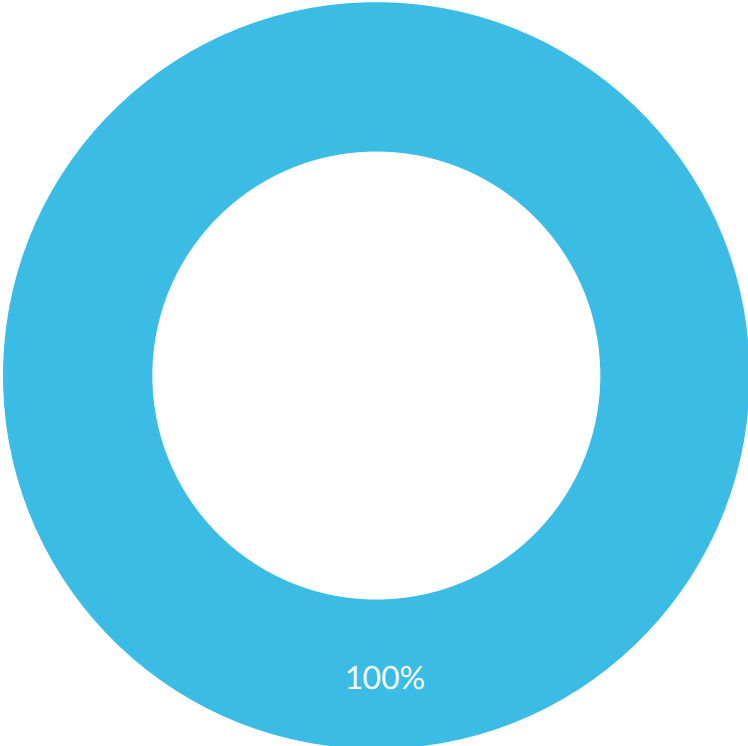
Q64

Should the WEM prehospital provider be able to apply an improvised chest seal?*

MULTIPLE CHOICE

Answered
77

Unanswered
0



Choice	Total
● No	0
● Yes	77

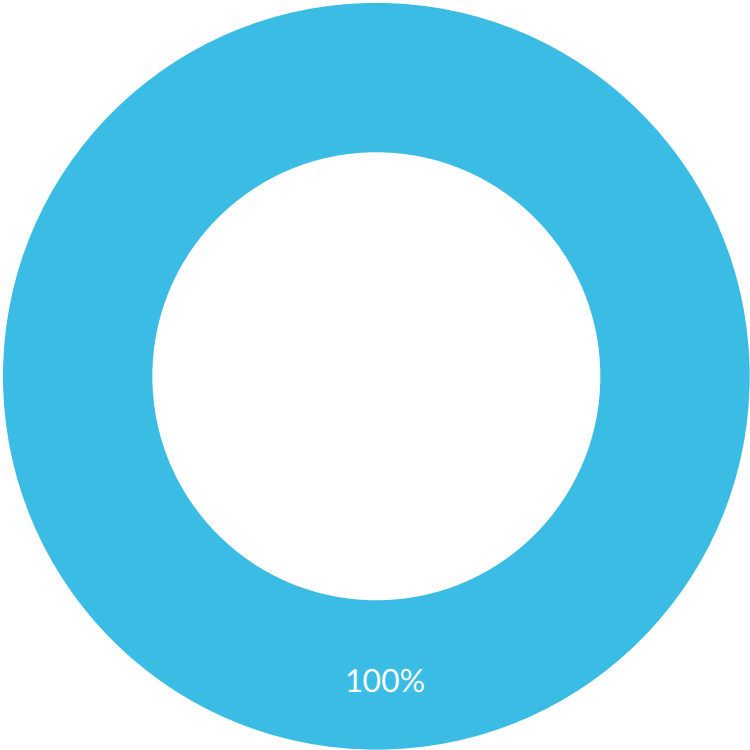
Q65

Should the WEM prehospital provider be able to insert a needle correctly and safely for decompression of a tension pneumothorax?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

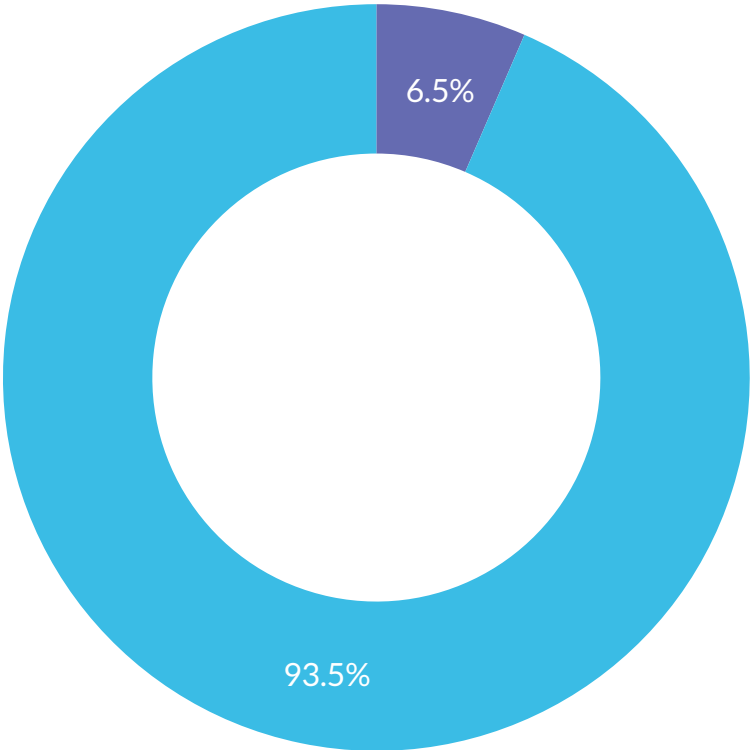


Choice	Total
● No	0
● Yes	77

Q66

Should the WEM prehospital provider be able to insert a formal chest drain in a protracted field care situation?*

MULTIPLE CHOICE



Answered
77

Unanswered
0

Choice	Total
No	5
Yes	72

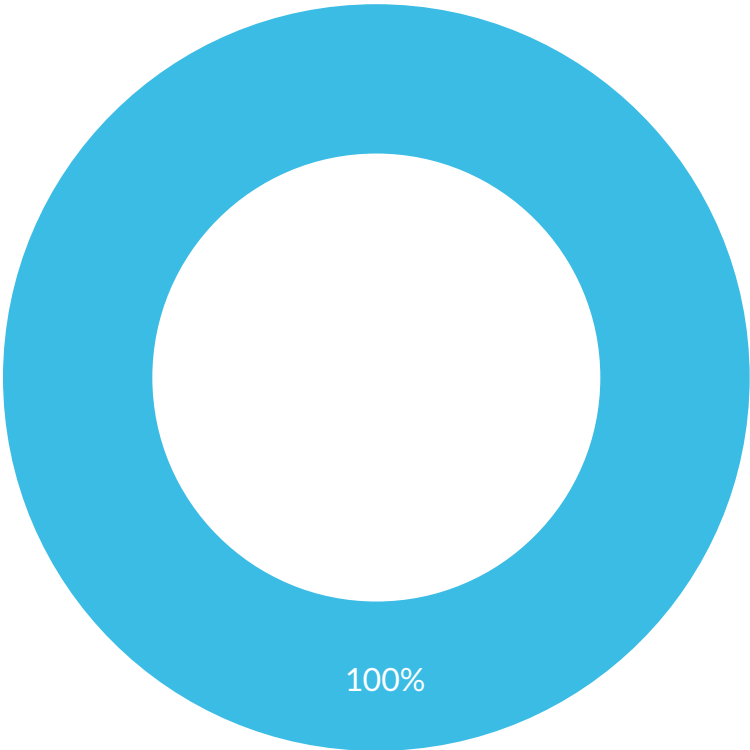
Q67

Should the WEM prehospital provider be competent with pelvic stabilisation using the sheet method?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

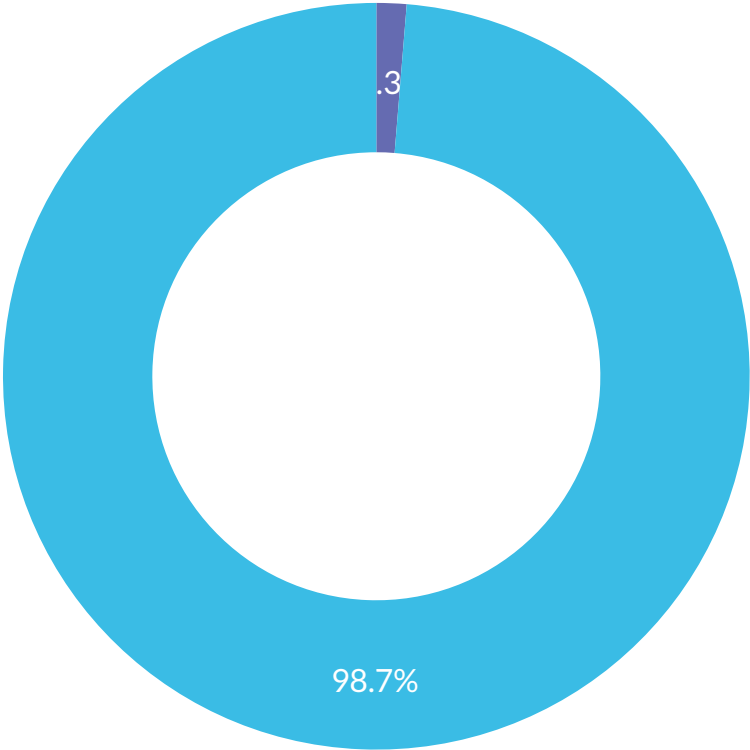


Choice	Total
● No	0
● Yes	77

Q68

Should the WEM prehospital provider be competent with commercial pelvic binders viz T-Pod, SAM Pelvic Sling II and PelviGrip?*

MULTIPLE CHOICE



Answered
77

Unanswered
0

Choice	Total
No	1
Yes	76

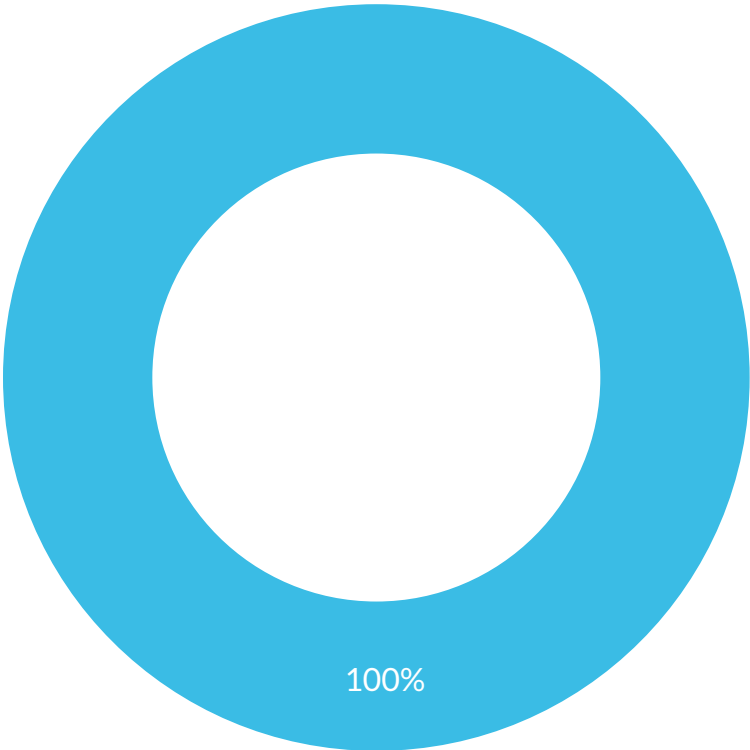
Q69

Should the WEM prehospital provider be competent with spinal immobilisation?*

MULTIPLE CHOICE

Answered
77

Unanswered
0



Choice	Total
● No	0
● Yes	77

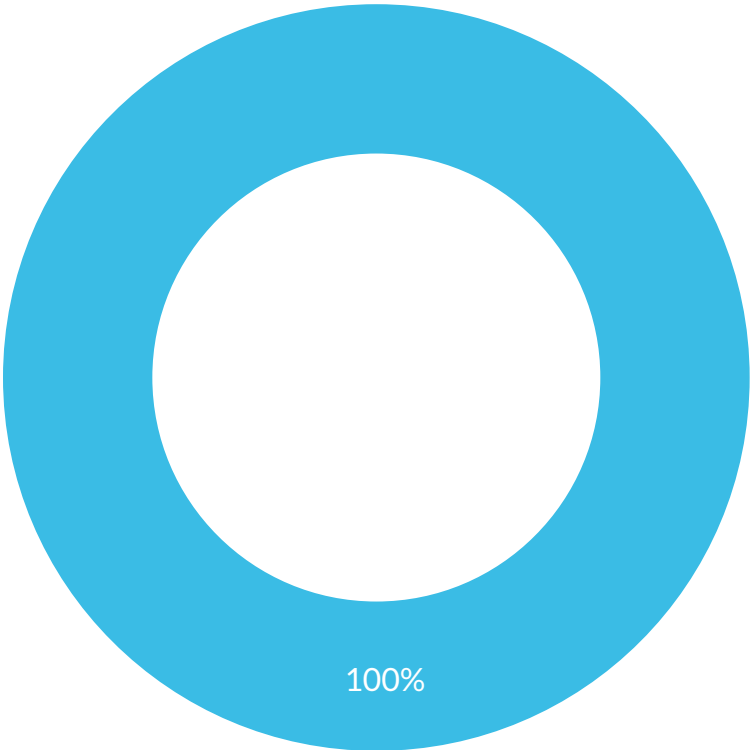
Q70

Should the WEM prehospital provider be competent with spinal clearance guidelines?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

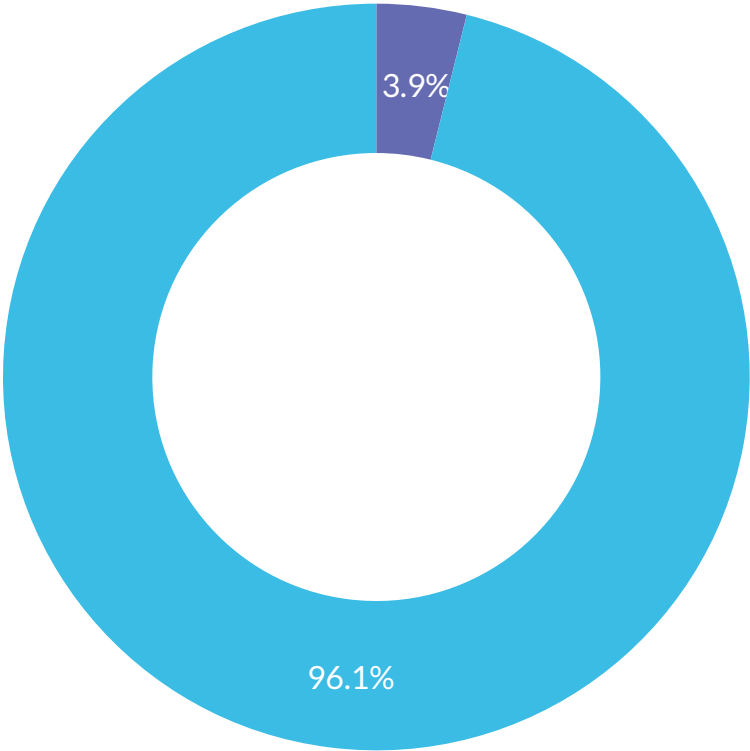


Choice	Total
● No	0
● Yes	77

Q71

MULTIPLE CHOICE

Should the WEM prehospital provider be able to manage the patient's airway using basic and advanced airway management techniques, including rescue devices, and performing a cricothyroidotomy for a failed airway?*



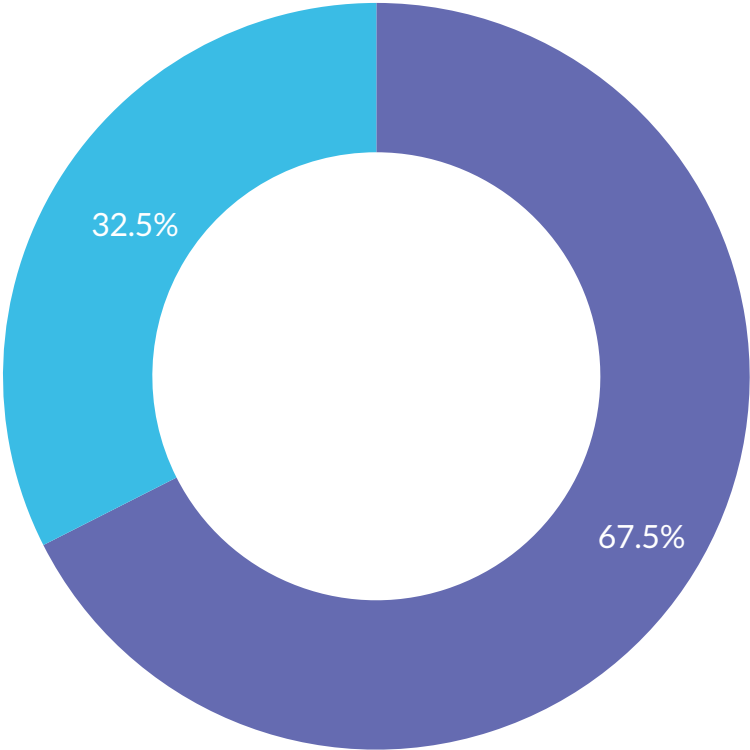
Answered
77
Unanswered
0

Choice	Total
● No	3
● Yes	74

Q72

Should the WEM prehospital provider be able to perform field ultrasonography (eFAST protocol), if equipment is available?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

Choice	Total
● No	52
● Yes	25

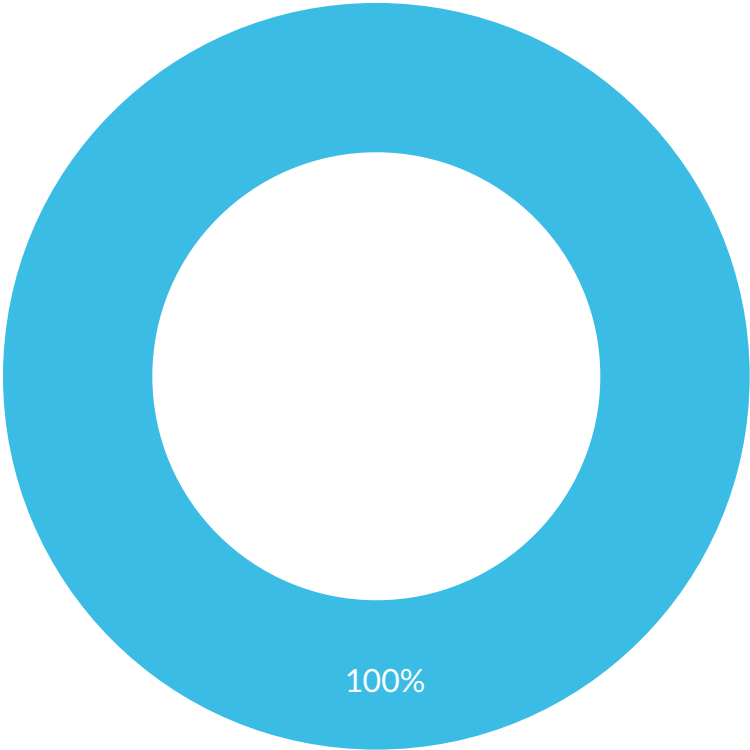
Q73

Should the WEM prehospital provider be able to apply soft tissue bandaging techniques for minor orthopaedic injuries?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

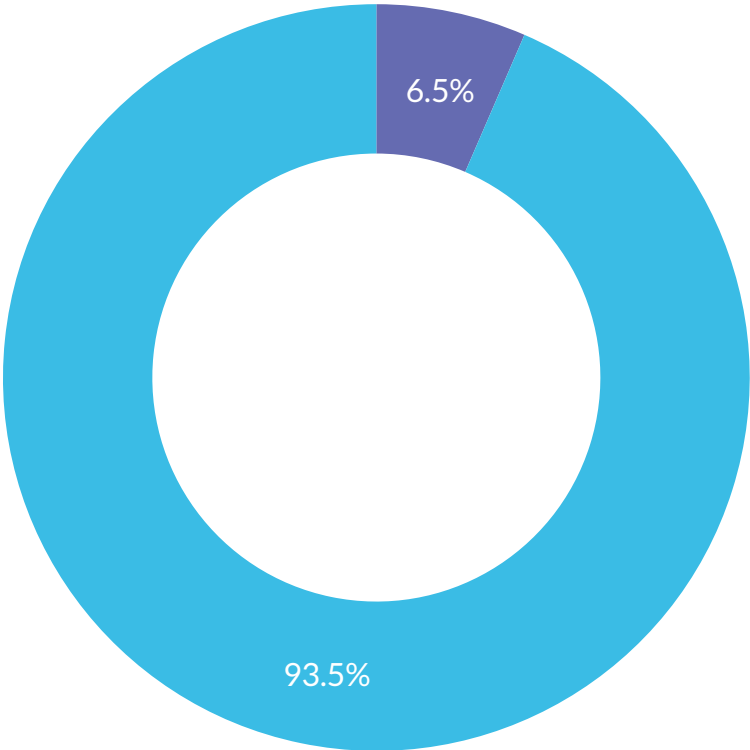


Choice	Total
● No	0
● Yes	77

Q74

Should the WEM prehospital provider be familiar with ski- and snow-rescue techniques?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

Choice	Total
● No	5
● Yes	72

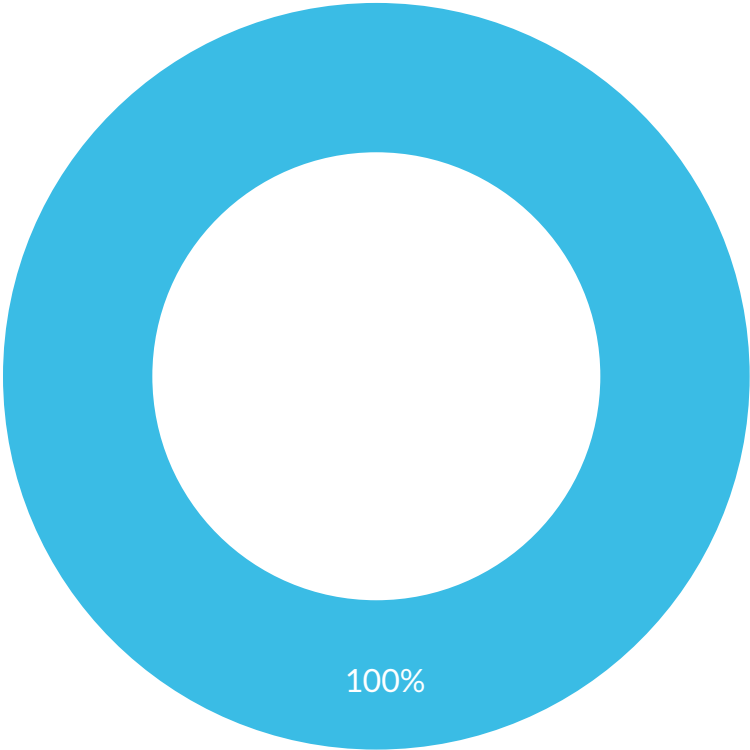
Q75

Should the WEM prehospital provider be competent enough in the mountain environment to conduct mountain rescue operations?*

MULTIPLE CHOICE

Answered
77

Unanswered
0



Choice	Total
● No	0
● Yes	77

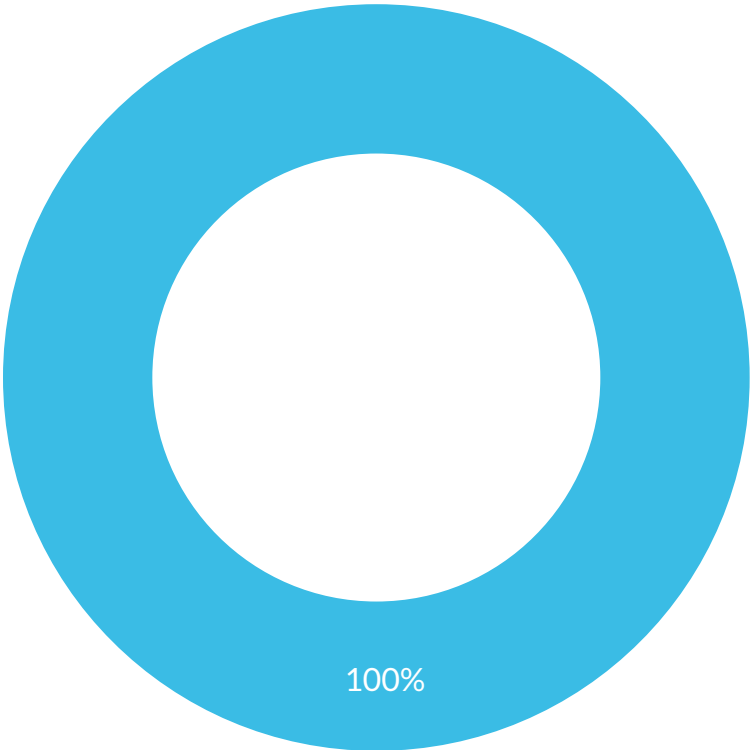
Q76

Should the WEM prehospital provider be familiar with outdoor camp craft?*

MULTIPLE CHOICE

Answered
77

Unanswered
0



Choice	Total
● No	0
● Yes	77

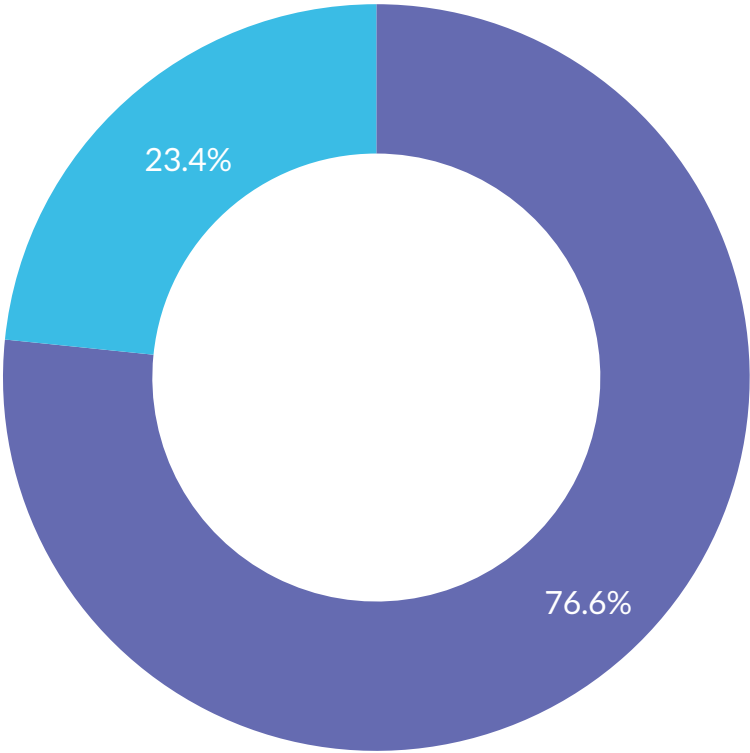
Q77

Should the WEM prehospital provider be able to perform and interpret a urine dipstix test?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

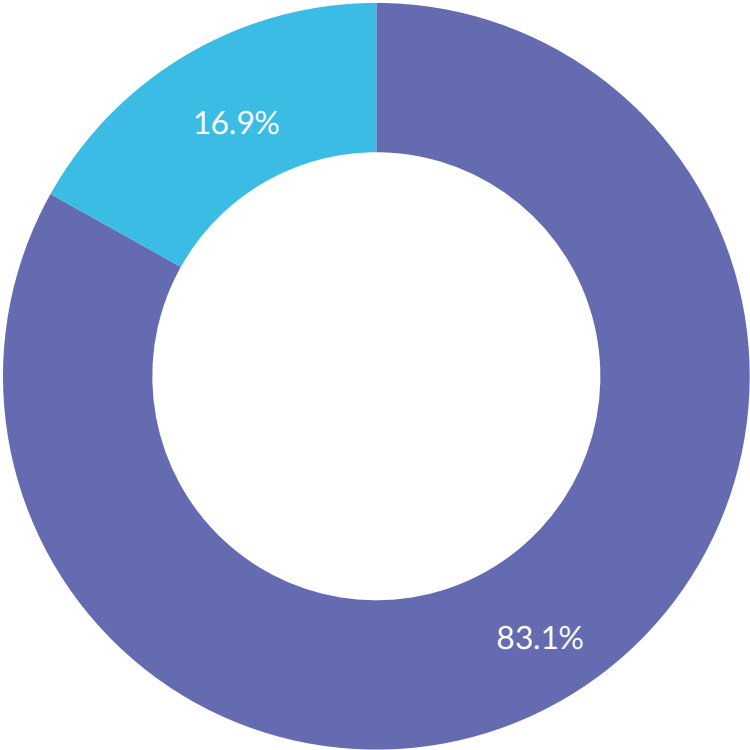


Choice	Total
No	59
Yes	18

Q78

Should the WEM prehospital provider be able to perform and interpret auroscopy (otoscopy or instrumented ear examination)?*

MULTIPLE CHOICE



Answered
77

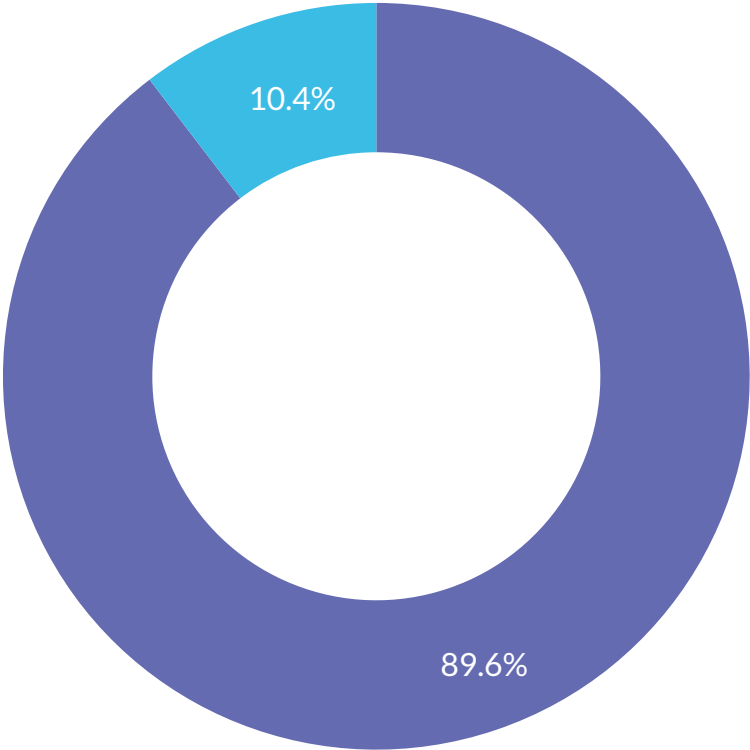
Unanswered
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Choice	Total
● No	64
● Yes	13

Q79

Should the WEM prehospital provider be able to perform and interpret ophthalmoscopy (fundoscopy or instrumented eye examination)?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

Choice	Total
● No	69
● Yes	8

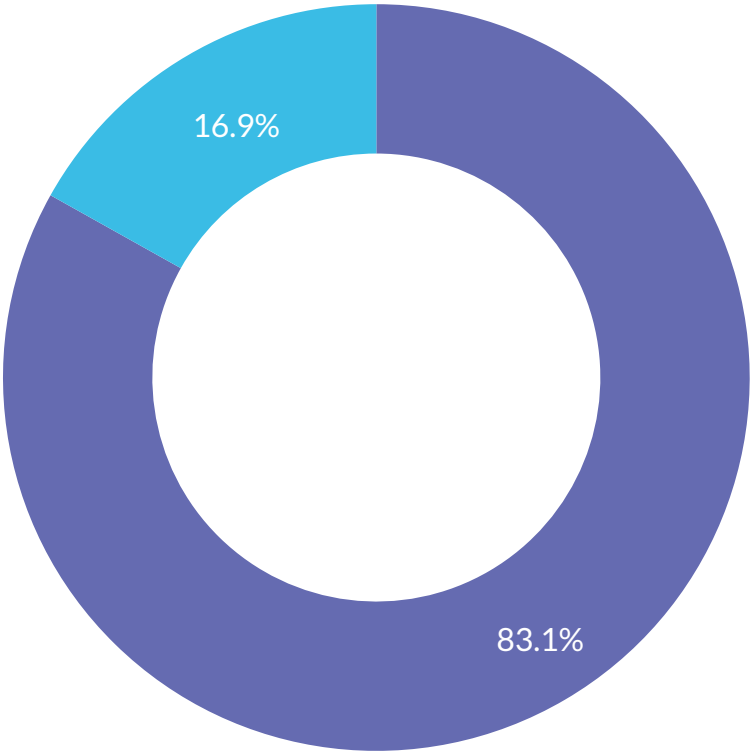
Q80

Should the WEM prehospital provider be able to perform and interpret pharyngoscopy?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

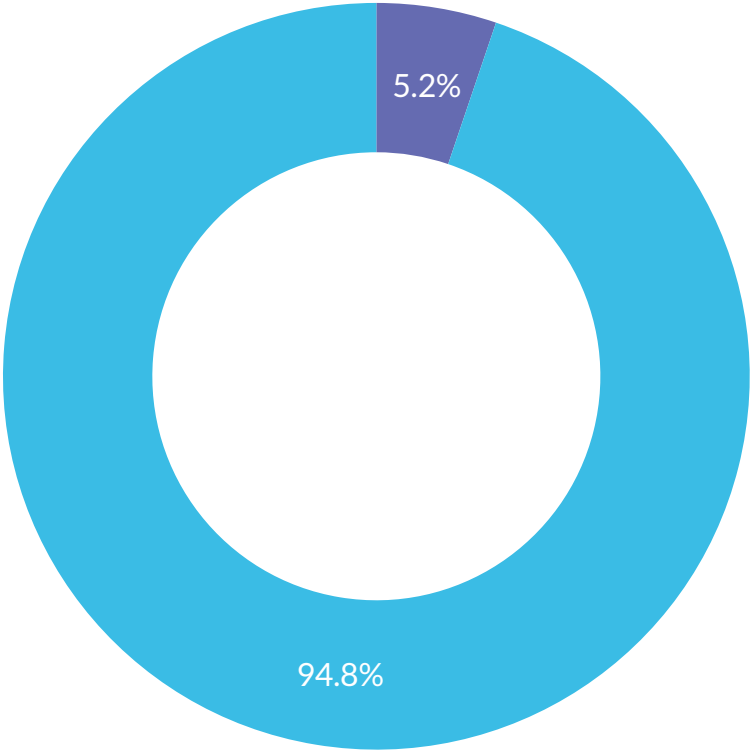


Choice	Total
No	64
Yes	13

Q81

Should the WEM prehospital provider be able to use various commercial or improvised water purification techniques?*

MULTIPLE CHOICE



Answered
77

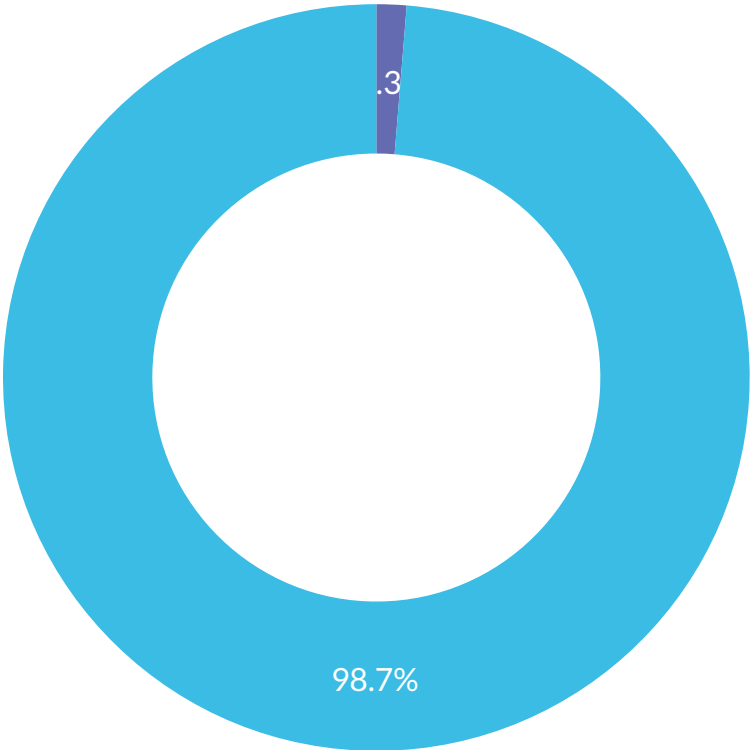
Unanswered
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Choice	Total
No	4
Yes	73

Q82

Should the WEM prehospital provider be able to use improvised water collection techniques?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

Choice	Total
No	1
Yes	76

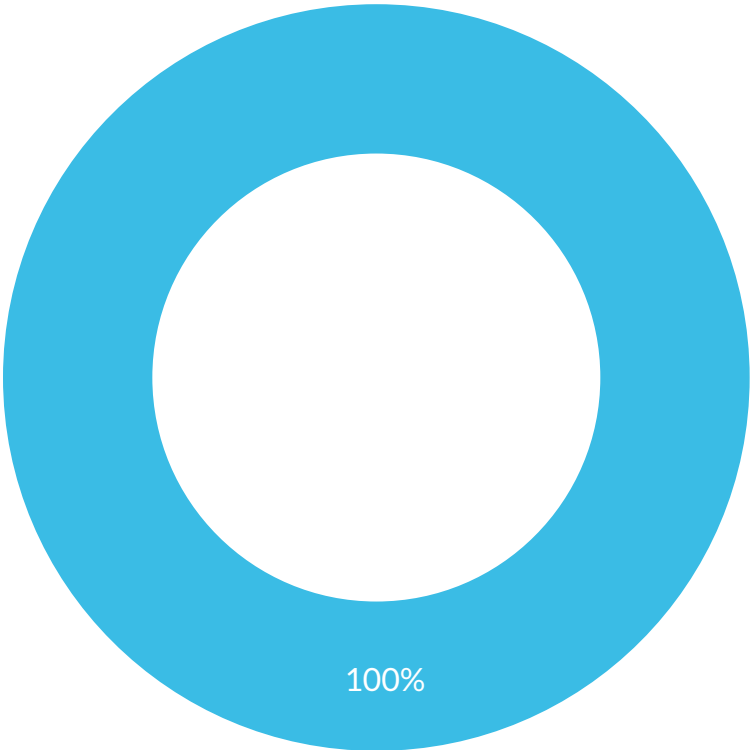
Q83

Should the WEM prehospital provider be able to use layering strategies to survive cold weather?*

MULTIPLE CHOICE

Answered
77

Unanswered
0



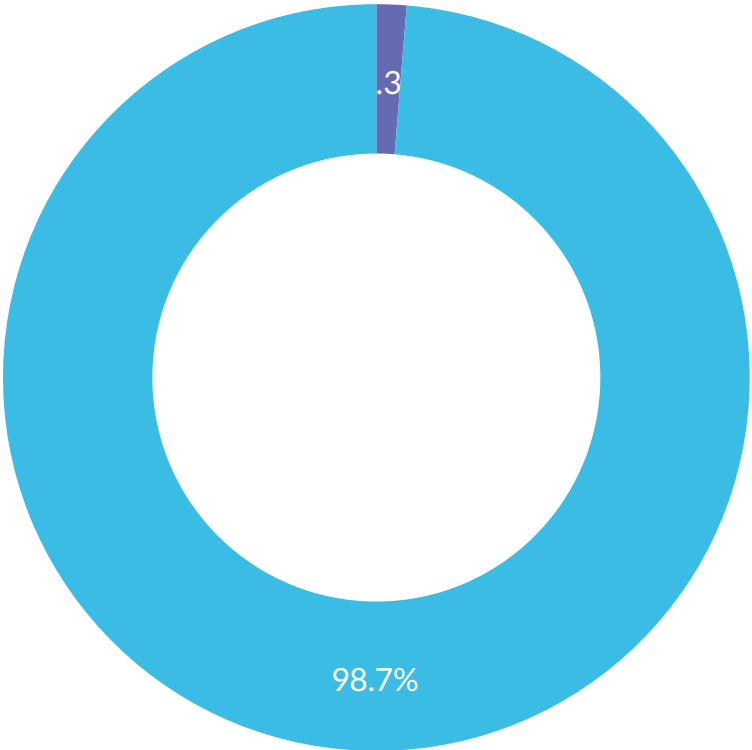
Choice	Total
● No	0
● Yes	77

Q84

Should the WEM prehospital provider be able to conduct swift water rescue techniques?*

MULTIPLE CHOICE

Answered
77
Unanswered
0

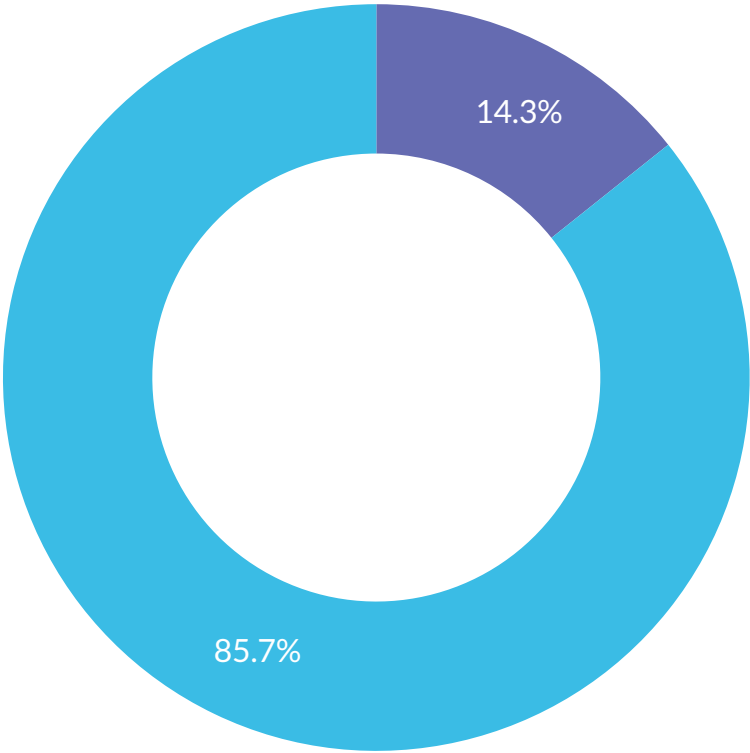


Choice	Total
No	1
Yes	76

Q85

Should the WEM prehospital provider be able to perform local and regional anaesthesia techniques?*

MULTIPLE CHOICE



Answered
77
Unanswered
0

Choice	Total
No	11
Yes	66

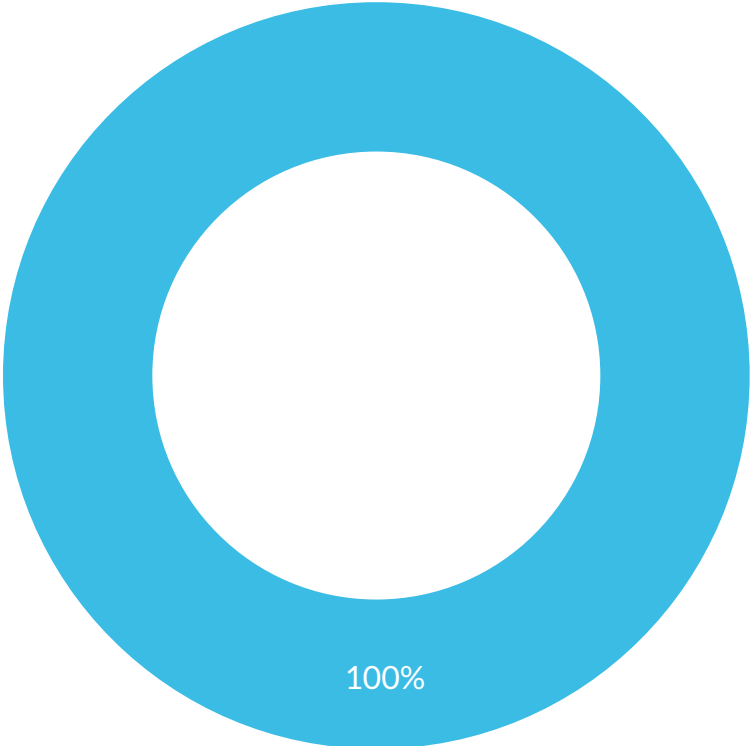
Q86

Should the WEM prehospital provider be able to pack wilderness and expedition medical kits?*

MULTIPLE CHOICE

Answered
77

Unanswered
0



Choice	Total
● No	0
● Yes	77

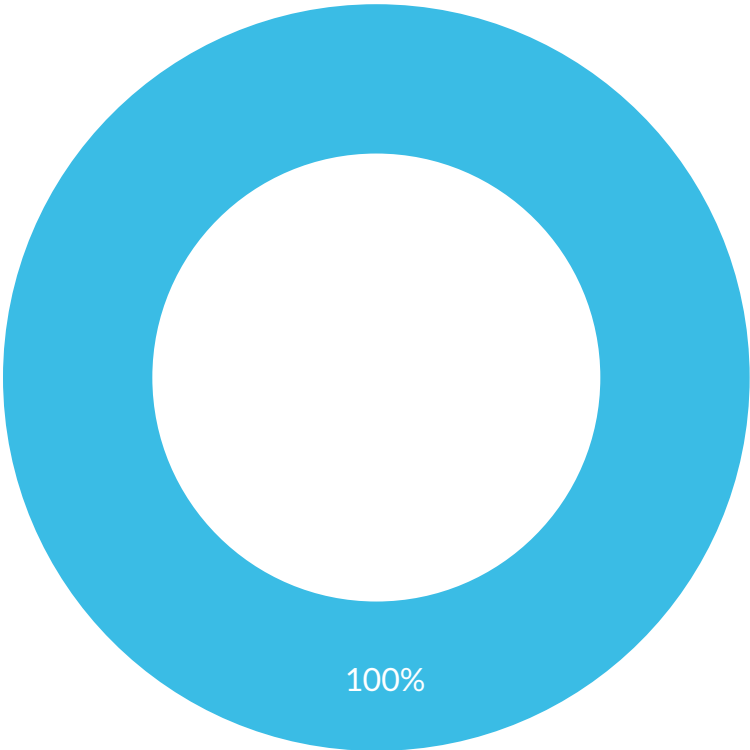
Q87

Should the WEM prehospital provider be competent in radio and other communication techniques?*

MULTIPLE CHOICE

Answered
77

Unanswered
0

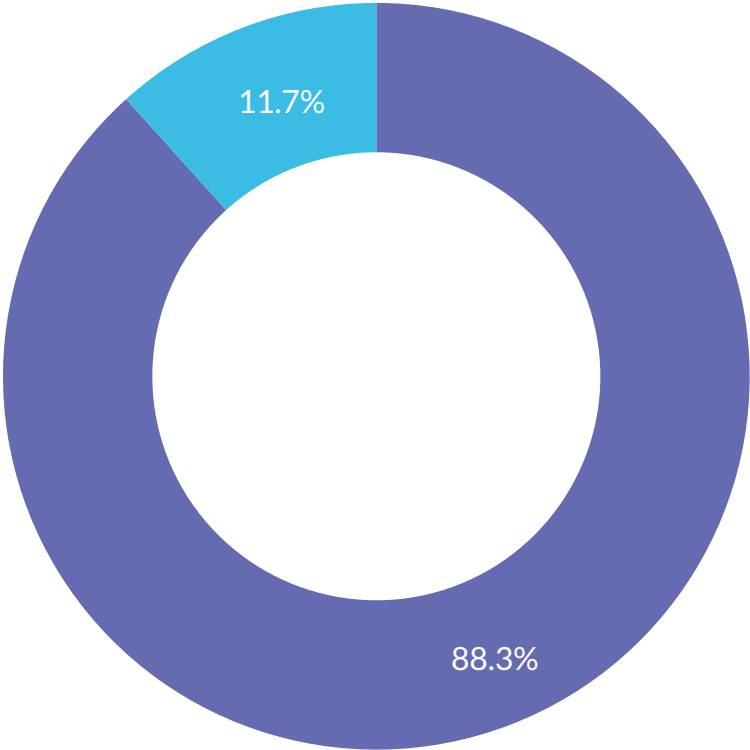


Choice	Total
● No	0
● Yes	77

Q88

Should the WEM prehospital provider be able to perform temporary fillings and teeth extractions, under dental anaesthesia?*

MULTIPLE CHOICE



Answered
77

Unanswered
0

Choice	Total
● No	68
● Yes	9

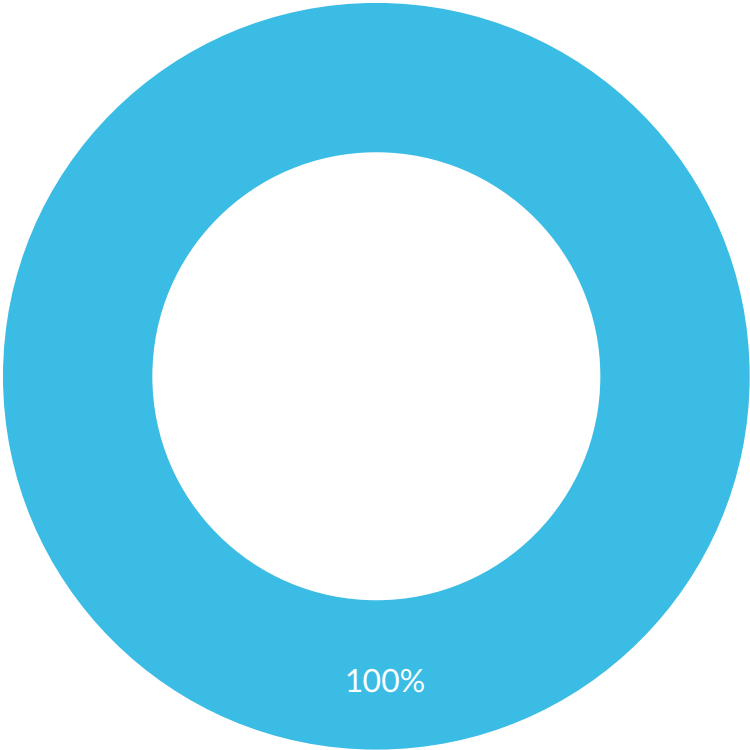
Q89

Should the WEM prehospital provider be able to create litter fabrications and conduct patient transport by litter systems?*

MULTIPLE CHOICE

Answered
77

Unanswered
0



Choice	Total
● No	0
● Yes	77