ECSSA Conference Abstracts

Limb Entrapment in the Wilderness Environment

Traumatic Brain Injury

Death of the Spine Board
EDITORIAL

Keeping the momentum going from the ECSSA conference, this issue of Sanguine showcases some key research presented at the conference. The ECSSA conference was held from the 18th-20th September and signalled another important milestone in emergency care. This local research is likely to shape and guide the future of emergency care for years to come as key questions were asked and answered by both novice and established researchers in emergency care. Is there space for pre-hospital antibiotics for open fractures? What is the role of pre-hospital intercostal drains? What are students exposure to critical emergency care skills? Where are we with regards to pre-hospital response times? These questions among others are answered in this issue’s ECSSA conference abstracts.

Besides the conference abstracts our standard pieces also feature. In our Cochrane Corner we unpack the controversial systematic review questioning the efficacy of advanced life support training for ambulance crews. Key concepts of traumatic brain injury are highlighted and the ‘relevance of the spine board’ is debated in our clinical discussion section. Rescue also features as we present a case study of a field amputation done in Rustenberg. We also keep you updated with recent news including the current status of the emergency care guidelines for South Africa. The research and development special interest group also present their 2015 online CPD program - so be sure to note the dates in your calendar. In en passant you can stay up to date with the latest evidence relevant to emergency care. I hope you enjoy this issue as much as we had compiling it!
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TOWARDS PROGRESSION: THE EMERGENCY CARE RESEARCH AND DEVELOPMENT SPECIAL INTEREST GROUP IS GOING PLACES

Willem Stassen

The Emergency Care Research and Development Special Interest Group (R&D SIG) was formed in March 2014 and has grown significantly, both in activities and ambition. Their aim is to improve the quality and quantity of research within the domain of local Emergency Care. This article will provide a brief summary of their goals, their activities in the year that passed and their projected programme for 2015.

INTRODUCTION TO THE SIG AND OBJECTIVES

The R&D SIG was formed in March 2014 by Michael McCaul and Willem Stassen in order to advance the local emergency care research output and to provide support to young researchers who are looking to advance their careers by putting them into contact with role-players and experts in the field. The R&D SIG has numerous long and short-term goals that they are constantly striving towards achieving. One of their primary aims is the development and expansion of Sanguine. Other objectives are:

- To deliver an emergency care research support and capacity building platform for young and upcoming researchers.
- To establish an emergency care research registry in order to inform a national emergency care research agenda and inform new project researchers of previous research and ongoing research in emergency care.
- To provide research workshops at academic and non-academic institutions across South Africa.
- To aid in the dissemination of emergency care research both nationally and internationally.
- To aid in research knowledge translation from researchers to clinicians or policy makers.
- To take over the administration of the publications division of the ECSSA, including the Sanguine clinical research section.

ONLINE SIG MEETINGS

The R&D SIG uses online platforms to reach individuals interested in getting involved in emergency care research. Regular online lectures will be hosted by the SIG where experts in each field will present on topics relevant to local research. The first of these meetings was held on the 4th of August 2014 and was attended by 21 people. The video lecture (https://www.youtube.com/watch?v=KSTSy8k7uZc) – which described the basics of research methods - has been viewed in excess of 50 times. The lecture was accredited for 6 CEUs. Monthly online sessions using Google Hangouts are planned for 2015. Please keep an eye on your inbox and the ECSSA website for updates and invitations.
PROJECTED PROGRAMME FOR 2015

In 2015 the R&D SIG aims to support young undergraduate and post-graduate researchers with their projects by proving online instruction on different topics within research. Next year we aim to have an online lecture series on descriptive research methods and evidence-based healthcare. The projected programme for next year is summarised in Table 1.

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We would like to invite you to become part of the SIG and our endeavours. If you are interested in joining, please contact Michael McCaul or Willem Stassen on mmccaul@sun.ac.za or stassen88@gmail.com.

NEW CALL FOR EMERGENCY CARE GUIDELINES REVIEW

The Health Professions Council of South Africa Professional Board for Emergency Care has recently put out a second call to review the emergency care protocols for South Africa. Unfortunately the first call, awarded to Wit’s University, was receded for unknown reasons. The second call (application deadline was end September 2014) motivates for evidence based guidelines/protocols to be developed for emergency care in South Africa that is relevant, patient centered and in line with international best practice but also cognisant of the South African context. Evidence based guidelines for emergency care is essential for the development of the profession and effective and efficient treatment of our patients. If the call is awarded soon, hopefully the profession will see updated guidelines/protocols by end 2015.
In order to achieve a patient and practitioner safety culture, the World Health Organisation (WHO) promotes the reporting of adverse events so that other healthcare providers and organisations can learn from these incidents. It is essential that we learn and report our positive, as well as negative experiences, gained within a rescue and emergency care environment. This ensures that other practitioners, involved in similar events, have prior knowledge of possible pitfalls. This article aims to give an overview of an incident which occurred in mountainous terrain in September 2014, and provide meaningful analysis, learning, and dissemination of the lessons learned to improve patient care in the rescue environment.

**An Overview of the Incident**

At around 11h00 on the 19th September 2014, a 26-year old male became wedged between rocks after allegedly falling into a small cave when he was startled by a snake. The victim entrapped by his wedged right lower leg, was able to contact his family and a search was initiated by the South African Police Service (SAPS) and local emergency services. The victim was located later that afternoon by the SAPS air-wing through a small 50cm x 50cm “window” in the cave. The cave was approximately 70m above the floor of a steep-sided ravine and about 50m from the top of a cliff face (Fig. 1).

Due to the complexity of the rescue, a number of technical rescue resources were activated to assist with the access and removal of the victim. These included voluntary mountain search and rescue personnel, members of the commercial mining rescue teams, a South African Airforce helicopter and medical rescue personnel. A voluntary 4x4 rescue unit also responded to assist with remote vehicle access, logistics, communication and the establishment of a mobile command post.

The mountain search and rescue team continued to try to access the victim’s location into the night but the search was halted in the early hours of the following morning as navigation of the cliff face in the dark raised safety concerns. Wind-chill temperatures were recorded at 1°C and although there were concerns of the effect of the environmental exposures on the victim, all members needed to remain at their locations and the search resumed at first light on the 20th September 2014.

At 10h00, the victim was found to be conscious, dehydrated and fatigued (Fig. 2, 3). Fluid and nutritional support were provided to the victim. An Advanced Life Support paramedic accessed the patient and noted that besides a decreased sensation in his lower right limb, the patient was pain-free, and had no other injuries. Rescue personnel attempted to manually manipulate...
and free the limb but due to the limited access, this was difficult. Technical rope rescue systems were established to create a safe passage for the movement of rescue and medical personnel on the cliff face. The patient was made comfortable by placing him in a sit harness, as he had been standing in the same position for a prolonged period of time.

During this time, commercial mining rescue and urban search and rescue specialists assessed the extent of the entrapment and risk of possible rock fall. Collapse of the surrounding rock structures would have either injured or killed the patient and rescue personnel or worsened the degree of entrapment.

A mechanical advantage system was created in an attempt to haul a sling around the patient’s foot. Intravenous access was obtained and analgesia was administered to the patient prior to the hauling of the limb. The mechanical advantage system was terminated as it had no effect. Stitch drilling and rock breakage around the limb was attempted but due to the limited access, this was also ceased. Manipulation of the rocks by the use of pneumatic high pressure bags was considered but it was decided that this would unsettle the stability of the rocks and this may result in a rock fall.

At this stage, in conjunction with the attending medical personnel, the rescue personnel indicated that there was no safe alternative to free the limb, and a decision was made to amputate the entrapped portion. This option was discussed with the victim and consent was obtained to perform the procedure. A surgical team (consisting of a trauma surgeon and two anaesthesiologists), was activated and they were flown by helicopter to the scene at day break on the morning of the 21st September 2014. Items required for the procedure were distributed amongst the rescue personnel to be taken to the patient’s location. The surgical team was lowered down the cliff to where the patient was entrapped.

The surgical team assessed the trapped limb and prepared the patient for the amputation procedure. In both the decision-making process as well as during the preparation of this procedure, it must be mentioned that specialists from both a medical as well as a rescue perspective were cognisant of the risks associated with performing a procedure of this nature in what could be considered an abnormal environment with most eventualities considered. Despite preparation, the procedure and subsequent events proved challenging. After securing the surgical site with a tourniquet, the patient was provided with an adequate level of analgesia and anaesthesia. As a result of the peculiar angles involved, the actual amputation required additional time. During this time, despite restrictive measures being in place, the patient experienced a period of blood loss. After successful amputation and subsequent removal, it appeared as if the patient had experienced an adverse episode in relation to haemodynamic status and ventilatory effort. Positive pressure ventilation was commenced via supraglottic airway placement in addition to aggressive fluid resuscitation. During

Figure 2. The small cave into which the patient fell. The patient can be seen wearing a helmet in the cave

Figure 3. The confined space conditions that the surgical team need to work in

Photos: Courtesy Rob Thomas (Mountain Club of South Africa: Search and Rescue)
positive pressure ventilation the patient’s level of consciousness improved and it was decided that the advanced airway be removed.

The patient was packaged in a basket stretcher, for a vertical hoist, to be moved to a ledge above the cliff where he was to be hoisted into the helicopter (Fig. 4). There was a technical delay in getting the patient to the ledge as there was a pendulum of the rope system and basket stretcher into a wedge. A decision was made to attempt a hoist from the patient’s current position. The helicopter crew withdrew from this attempt as the foliage and position restricted their access and the rotor downwash recirculation had an effect on the helicopter’s stability. The patient was then manually moved to the ledge where the patient and an attending paramedic were safely hoisted into the helicopter (Fig. 5).

The patient was flown to a safer, more stable platform offsite where the patient underwent formal advanced airway intervention and mechanical ventilation. Inotropic support was initiated to improve the haemodynamic state of the patient. The patient was then transferred into a rotor wing air-ambulance and flown to a tertiary level hospital. The surgical team was assisted to the staging area while rescue personnel recovered the rope systems and all other equipment. All personnel and equipment were subsequently recovered.

**Meaningful Analysis, Lessons Learnt and Recommendations for Change**

An “adverse event” is defined by the WHO as: “an injury related to medical management, in contrast to complications of disease. Medical management includes all aspects of care, including diagnosis and treatment, failure to diagnose or treat, and the systems and equipment used to deliver care. Adverse events may be preventable or non-preventable.”

A retrospective analysis of the events by those involved in this incident provided insight into the rescue and could well serve to assist other practitioners and rescuers who may be faced with similar scenarios. Below, certain observations and comments are made.

**Incident Command and Control**

South Africa faces a number of challenges with a burdened public health system (including emergency and rescue services) and this has resulted in the development of private emergency and rescue services. These include specialist voluntary organisations that have identified a need for a specific service, such as mountain search and rescue, and they are often called upon to assist government entities that are tasked with search and rescue activities. At incidents such as these, multiple agencies respond to assist and this can create confusion with regard to the incident management processes (command and control) and which organisation takes overall accountability for the incident. Although the roles within the command and control structures at this incident were clearly defined, there was uncertainty as to who had overall legal or jurisdictional accountability. The National Department of Health’s Directorate: Emergency Medical Services or Disaster Management needs to

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**Figure 4.** The patient packaged in the basket stretcher and being hauled to the ledge in preparation for hoisting into the helicopter

**Figure 5.** The patient and attending emergency care practitioner being hoisted into the helicopter

**Photos:** Courtesy Rob Thomas (Mountain Club of South Africa: Search and Rescue)
identify, agree upon and disseminate an appropriate incident command system that will be adopted by all the agencies involved in these or similar incidents.

**Prolonged Emergency Medical Care and the Continuum of Care**

The term “prolonged entrapment” is often associated with motor vehicle collision and structural collapse incidents. This term, typically, is unfamiliar in the wilderness environment. Anecdotally, this is the second incident in 2014, in South Africa, where members involved in this incident have assisted with a patient that has been entrapped in the same position for in excess of 24 hours. This extended period of time requires practitioners to rotate care of the patient amongst themselves. Consensus needs to be reached by the rescue team’s medical component on accurate documentation of clinical management, and this documentation can be passed onto the next practitioner. This is an essential component of the continuum of care. This will ensure that there is continued care for long durations and should include patient exposure protection, oral hydration and nutritional support. A medical team leader needs to be identified and placed at the command post. This will allow for the recording of clinical findings and management of the patient in a controlled environment. This individual will be able to consult and get advice from other practitioners or specialists as well as manage the logistics such as appropriate receiving facilities, air or road ambulance transport and the delivery of consumables or equipment.

**Extraordinary Staff, Interventions and Procedures**

Field amputations are not routinely required out-of-hospital in order to free an entrapped patient. Considering this, there are however instances where surgical teams will be called to surgically remove an entrapped limb. The idea of establishing a dedicated on-call surgical team list needs to be investigated. Surgical teams that will be responding to these types of incidents need to have an understanding of the command and control structures at rescue incidents to allow for easy integration and expectation. Simulated surgical training in abnormal environments should be considered and will allow the team to identify the limitations of rescue-specific PPE (personal protective equipment) when performing surgical procedures. Creating scenarios and placing simulation manikins in various positions (such as the standing position), will allow for the control of different unanticipated adverse effects of medications and surgical procedures. This training will also identify appropriate and dedicated surgical implements, medical equipment and medical consumables that will be suitably prepared and packaged. The management of biological hazards and contaminated equipment in abnormal environments also needs to be investigated. The dedicated surgical teams should receive training on “self-safety” at rescue incidents to ensure that they are able to operate in these abnormal environments. Training examples could include; edge safety for high angle rescue, airside induction for a variety of aircraft and simple concepts such as food preparation in the wilderness. There will need to be a focus on personal fitness as well as exposure to different weather extremes.

In conclusion, this incident presented logistical, administrative as well as physical challenges for all involved. Considering the fact that these incidents may occur at unpredictable times and locations, national dialogue in relation to the above-mentioned issues needs to be encouraged. Although provincial health authorities can guide this dialogue, it is important that all role-players find nationally implementable solutions to these challenges.

**Reference**


**Acknowledgement**

Rob Thomas, Mountain Club of South Africa

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DEATH OF THE SPINE BOARD

Darren van Zyl

There is no evidence that spine boards immobilise the spine, nor that they contribute to better patient outcomes. The “it can’t be harmful so do it anyway” argument used to justify liberal doses of oxygen in the past surfaces each time the use of the spine board is questioned. As you are about to discover, just like Oxygen, the spine board potentially does more harm than good when used inappropriately and in excess. This article will dispel the fallacy of immobilisation, will demonstrate some of the potential risks of the device, and will look at alternatives and current trends.

The Fallacy of “Immobilisation”

The term immobilisation conjures up images of patients who are rigidly and professionally strapped to the spine board so that their entire spinal column is splinted. In reality, this is not achieved as a Canadian study of healthy volunteers demonstrated: The volunteers were “immobilised” and either towels, wedges, or headbeads were used to restrict their movement on the spine board. The conclusion: “None of the three immobilisation techniques was successful in eliminating head motion or neck rotation. In addition, movement of the trunk contributed substantially to the lateral bending that occurred across the neck.” Even Halo Traction used for patients with unstable cervical spine fractures permits up to 4% movement.

Such is the impossibility of absolute immobilisation that International Trauma Life Support speaks rather of Spinal Motion Restriction (SMR), a term that has practical implications discussed later in this article.

Complications Arising from the use of a Spine Board

Probably the most commonly reported side effect of placing patients on a spine board is pain. Reported in several studies, mostly using healthy volunteers with no pre-existing neck or back problems, pain usually appears immediately and includes areas of the body that are in contact with the devices used during spine board SMR. This includes occipital, scapular, sacral and buttock pain amongst others. It appears that attempts to pad these areas are not successful in relieving the pain.

In addition, patients who are conscious will often attempt to shift themselves to relieve the pain and make themselves more comfortable which counteracts any attempts to prevent movement of the spine. This is especially true since the vast majority of patients are not placed into a neutral and natural position before being strapped down—this often causing unnecessary extension of the cervical spine.

Other concerning complications are the interference with mouth opening, respiratory compromise, and potential for aspiration. Especially when coupled with cervical collars, strapping a patient to a spine board can decrease mouth opening by up to 25% making airway management more difficult and clearing of the airway through reflexive coughing poor—thereby increasing the risk of aspiration (especially if the patient is left supine).

One study into respiratory compromise associated with being strapped to a spine board suggested that Forced Vital Capacity (itself being difficult to compensate for in a seriously injured trauma victim) decreases by more than 500ml.
This makes it necessary for the trauma victim to compensate for this compromise in other ways, primarily by increasing respiratory rate and work of breathing.

Associated more with the use of rigid cervical collars than spine boards it has long been known that there can be a significant increase in intracranial pressure. Many studies on this complication have been reported, one of which demonstrates a mean increase in ICP of 4.5mmHg.[9]

Taking time to “immobilise” a patient with penetrating trauma to the head, neck or torso is associated with an increase in mortality[10] (some studies reporting that the risk is up to 200%). As such, International Trauma Life Support guidelines no longer recommend that such patients receive traditional SMR via the spine board as there is no proof of benefit and definite evidence of harm in the form of increased mortality.

Lastly, there are many reported delayed symptoms lasting several days after being removed from a spine board. These include back pain, headaches, stiffness, nausea and exhaustion[4] all of which have the potential to increase hospital stay and add to medical costs. The risk of developing pressure sores from spending as little as 20 minutes on a spine board has also been documented[1] in addition to problems such as claustrophobia, nausea and panic.[4]

Spinal Cord Injury (SCI) is Uncommon

Another simple truth is that spinal cord injury is uncommon[12] and, when present, it is usually a primary injury meaning that little or no difference is made to patient outcome by strapping a patient to a spine board. Some authors report an incidence of SCI as low as 12-60 per million in both developed and developing countries making this type of injury relatively rare.11 Basing protocols and medical procedures on such low statistics (especially where there is far more evidence of harm than benefit as detailed above) makes no clinical sense and, were the spine board to be considered as a drug it would never make it through clinical trials.[1]

Evidence for the use of a Spine Board

A Cochrane review in both 2001 and 2009 on the topic revealed no randomized controlled trials on the use of the spine board[6,11] and as such, there is no positive level 1 evidence that spine boards are indeed beneficial.

One retrospective analysis[12] compared patients in the United States who received traditional spinal immobilisation onto a backboard versus patients from Malaya where no such intervention were undertaken. It was found that the odds ratio for disability was higher in the United States after the adjustment for the effects of all other independent variables (OR: 2.03; CI: 95%; P=0.04).

Clearly, as more evidence piles up of harm and little of benefit, practitioners need to consider their current practice.

Current Trends and Alternatives

From the outset of this section it must be emphasized that there is NO argument for the discontinuation of appropriate and carefully selected spinal motion restriction. Matching a particular patient to a particular SMR technique is recommended when appropriate. As is applying selected spinal clearance (SSC) protocols to patients who should not receive SMR.

In terms of SSC protocols, the Canadian C-Spine Rule[11] and the Nexus Criteria are often cited as validated tools for this purpose. It would be reasonable for Advanced Life Support practitioners to make use of these tools in deciding which patients to exclude from traditional SMR especially when it comes to the spine board.

Those patients that do not meet SSC protocol criteria should receive SMR that is appropriate and matches their clinical state. To achieve this the practicality of the SMR terminology becomes relevant and applicable. Techniques can include:

- The use of a vacuum mattress;
- The use of a scoop stretcher;
- The temporary use of a spine board that facilitates movement and / or extrication of a patient until another SMR technique can be applied;
- The use controlled self-extrication for conscious and reliable patients with no distracting injuries;
- The use of a normal ambulance stretcher where the patient is directed to lie down and minimize his / her movement (akin to what takes place in hospital. That is to say no hospital trauma unit places patients onto spine boards but rather removes them as soon as possible);
- The appropriate use of cervical collars and head-immobilisation devices as an adjunct to any of the above.

Conclusion

The focus of appropriate management for suspected spinal injuries should be on adequate and detailed spinal assessment as well as appropriate SMR techniques that are matched to clinical presentation. This will require thought and training since simply updating existing practitioner knowledge and skills is inadequate if there is an attitudinal resistance to the change in practice. One thing that is clear from the literature is that this change started several years ago and is gaining momentum- now all that is required is for practitioners to update and embrace.
Darren Van Zyl is an Advanced Life Support Paramedic who is actively working in the clinical environment for a private EMS company in Johannesburg. In addition, Darren is an independent medical training consultant with an Honours Degree in Adult Education and Chapter Coordinator for International Trauma Life Support in Southern Africa.
TRAUMATIC BRAIN INJURY

Simpiwe Sobuwa

The assessment of patients with traumatic brain injury is vital in reducing the high mortality and morbidity associated with this serious condition. We discuss the four key areas of traumatic brain injury monitoring and assessment which include oxygenation, blood pressure, Glasgow Coma Scale and pupil examination. With a thorough understanding of these predictions we can maximize patient survival and neurological outcomes.

Introduction

Traumatic brain injury (TBI) and head injury are often used synonymously but yet these are actually two separate entities. TBI is defined as physical injury to brain tissue that temporarily or permanently impairs brain function. A head injury is simply defined as an injury to the head that is clinically evident upon physical examination and is recognised by the presence of ecchymosis, deformities, lacerations or cerebrospinal otorrhea or rhinorrhea.

Following TBI there is an increase in volume within the cranium largely due to brain tissue oedema. A dramatic upsurge in ICP does not ensue provided the compensatory mechanisms are still functional. These compensatory mechanisms include but are not limited to: displacement of CSF and blood out of the cranium and decreased CSF production. However, further increases in intracranial volume during the compensatory phase will result in an increase in ICP as the compensatory mechanisms provide a finite solution. Further increase in one of the intracranial contents beyond the compensatory ability will result in a steep rise in ICP. This is depicted in Figure 5.

The Brain Trauma Foundation recognised four key areas to the pre-hospital assessment of severe TBI patients. Emphasis is placed on the monitoring and evaluation of the blood pressure, pulse oximetry, GCS score and pupil exam as these have the most impact on the management and outcome of patients with TBI.

Figure 5: Intracranial pressure-volume curve

Volume of Expanding Mass
**Oxygenation**

Hypoxia is a common feature of patients with severe TBI. Cooke et al.\(^1\) established that 27% of 131 patients with severe TBI were hypoxic (SpO\(_2\) <90%) on hospital admission. In Italy, Stocchetti and colleagues\(^2\) discovered that 55% of patients with TBI were hypoxic (SpO\(_2\) <90%) at the scene of the accident. Hypotension was not present in 46% of the patients with hypoxaemia. In the non-hypoxic group, the mortality rate was 14.3% with 4.8% suffering from severe disability. In contrast, the mortality rate was 50% among patients with SpO\(_2\) of <60% and all of the survivors were found to be severely disabled. These aforementioned studies emphasise the importance of airway management, oxygenation and ventilation in the pre-hospital setting to optimise outcome for the patient with TBI as they showed the deleterious effects of decreased oxygenation. The Traumatic Coma Data Bank (TCDB) study prospectively enrolled 717 patients with severe TBI and investigated the detrimental influence of hypotension (defined as a single observation of systolic BP <90 mmHg in the field) and hypoxaemia (defined as cyanosis, apnoea, SpO\(_2\) <90% or PaO\(_2\) < 60 mmHg by arterial blood gas analysis) on these patients. Hypoxaemia occurred in 22.4% of patients and was associated with increased morbidity and mortality.

**Blood Pressure**

The blood pressure should also be frequently measured in the pre-hospital setting and evaluated on a recurrent basis with the most accurate means accessible. Independent of hypoxia, hypotension at any point throughout resuscitation has been shown to have an unfavourable influence on outcome and increases the odds of death following severe TBI\(^5\). The TCDB discovered that pre-hospital hypotension resulted in a 150% increase in mortality in 34.6% of the hypotensive patients. Patients with a single episode of hypotension had increased morbidity and twice the mortality when compared to a matched group of patients without hypotension\(^6\). It was also among the most influential predictors of poor outcome and was statistically independent of the others i.e. age, pupillary status, admission GCS score and specific intracranial pathology. Hypotension is generally defined as a systolic blood pressure of <90 mmHg in adults.

**Glasgow Coma Score**

The Glasgow Coma Score (GCS) was formulated by Teasdale and Jennet\(^7\) in 1974 as an evaluation tool to measure the level of consciousness in acute cerebral disorders. Since then, the GCS has been used universally to categorize severity in traumatic brain injury as mild (GCS 13-15); moderate (GCS 9-12); or severe (GCS 3-8) based on the level of consciousness. It makes use of three indicators i.e. motor response, eye opening and verbal response. It is valuable to measure the first GCS score and then assess it regularly as a decrease in the GCS score can indicate deterioration and an increase in intracranial pressure. However, the Brain Trauma Foundation\(^8\) advises measurement of the GCS after a clear airway has been achieved and after necessary ventilation or circulatory resuscitation has been performed. The justification to the aforementioned recommendation is the reason that the GCS is affected by anything that reduces cerebral function i.e. hypoglycaemia, hypoxia, hypotension and use of pharmacological substances. The Brain Trauma Foundation also recommends the measurement of the GCS to be done preferably prior to the administration of sedatives; paralytic agents or after the drugs have been metabolized. For these reasons, the inter-rater reliability of the GCS score has been called into question. Then again, Gill, Relley and Green\(^9\) found only modest degrees of inter-rater agreement for the GCS and its components after measuring inter-rater reliability of the GCS in 116 patients evaluated by 2 independent blinded observers in the ED setting.\(^8\)

Despite its widespread acceptance and use in TBI, the GCS does not evaluate the exact neurological responsiveness but rather gives a gross estimate. In fact Teasdale and Jennet\(^10\) stated that “we have never recommended using the GCS alone, either as a means of monitoring coma, or to assess the severity of brain damage or predict outcome.” There is no criterion model to measure altered mental status and it is thus impossible to assess the accuracy of the GCS (criterion-related validity). The GCS has in actual fact, been the main criterion standard by default.\(^11\) Nonetheless one would deem it to have construct validity as it has shown statistical associations with outcomes such as mortality\(^12\), Glasgow Outcome Score\(^13\) and the need for neurosurgical interventions\(^14\).

**Pupil Examination**

The pupils should be assessed in the pre-hospital setting to gain valuable information pertaining to diagnosis, treatment and prognosis. The Brain Trauma Foundation\(^6\) recommends measurement of the pupils after the patient has been resuscitated and stabilised. Both pupils should be assessed separately for symmetry, size and reaction to light to specify if it is unilaterally or bilaterally fixed or dilated. Symmetry in normal pupils should be < 1-mm difference and should act in response to bright-light stimulus. A fixed pupil is characterized as < 1mm response to bright light\(^6\). The normal light reflex depends on properly functioning cranial nerves II and III, brainstem, retina and lens.

Increased intracranial pressure may result in uncal herniation which can result in compression of cranial nerve III. This can lead to a decrease in parasympathetic tone to the pupillary constrictor fibres, resulting in a dilated pupil with diminished reactivity. Complete paralysis of the third cranial nerve leads to a fixed and dilated (or blown) pupil. Non-reactive and bilaterally dilated pupils may be caused by direct brain stem injury; distinct elevations of ICP which are predictive of increased mortality or bilateral compression of the third cranial nerve as seen in central trans-tentorial herniation\(^15\). The normal reflex can also be altered by metabolic effects such as hypothermia, hypotension, hypoxia and use of alcohol. It is for these reasons that the resuscitation and stabilisation of the patient is advocated prior to the assessment of pupillary function\(^16\).
**Conclusion**

The prehospital setting is arguably the most important phase in the management of the severe TBI patient. Most of these patients are found to be hypoxaemic and hypotensive in the prehospital setting making the assessment a vital component in the management of severe TBI. The practitioner can ill-afford to miss the hypoxaemia and hypotension as these have the most influence on outcome and can be managed in the prehospital setting. With thorough understanding of the assessment and management of the severe TBI patient, we can hopefully maximize their survival and neurological outcomes.

**References**


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Technical Summary

Section editors: M. McCaul, T. Kredo

The Cochrane Corner highlights Cochrane systematic reviews of relevance to the South African emergency medical care community and aims to provide insightful commentary and emphasize implications for practice in South Africa. In this issue, we feature the Cochrane review on ‘Advanced training in trauma life support for ambulance crews’ by Jayaraman S, Sethi D and Wong R.

Advanced Training in Trauma Life Support for Ambulance Crews

Jayaraman S, Sethi D and Wong R

Trauma related injuries are responsible for more deaths worldwide than HIV/AIDS, Tuberculosis and Malaria combined.¹ According to the World Health Organisation (WHO), road traffic accidents are predicted to increase from the 9th leading cause of death (2004) in the world to the 5th leading cause of death by 2030, overtaking heavily funded conditions such as HIV/AIDS, TB and diabetes. Findings from the Global Burden of Disease Study highlighted the burden of injury in the world and the importance of the prevention and treatment thereof.² Advanced life support (ALS) trained ambulance crews have the potential to reduce this burden of disease and improve trauma outcomes of patients. However, the value of ALS trained pre-hospital providers has been questioned as there is a paucity of systematically collected and reported evidence to evaluate the effect of ALS trained ambulance crews to reduce trauma mortality and morbidity.³

A team from the USA and the World Health Organization have undertaken a Cochrane systematic review to quantify the impact of ALS-trained ambulance crews versus crews without ALS training on reducing mortality and morbidity in trauma patients. The author team carried out a comprehensive search for potential studies (randomised controlled trials (RCT), controlled trials and non-randomised studies, including before and after and interrupted time series studies) on the 16th May 2014. The authors included studies of adult trauma patients over 18 years who received ALS-trained care compared to non-ALS care looking at all-cause mortality and morbidity measures. A total of 1788 records were screened and only three met the inclusion criteria. The included studies differed substantially, and therefore no meta-analysis was possible. The results were described narratively.

Based on results of the three included studies (one RCT (Nicholl 1998), one controlled before and after study (Arreola-Rossa 2004) and one uncontrolled before and after study (Stiell 2008) the authors concluded that there is no benefit of advanced life support training for ambulance crews on patient outcomes. However, let us consider the some key aspects of the included studies to investigate the validity of their findings in low to middle income countries (LMICs).
This was a controlled before-and-after study in three cities in Mexico on mortality from injury (Monterrey San Pedro and Santa Catrina). Monterrey (providers received basic life support equivalent training) was compared to San Pedro (no additional training) and San Pedro (providers received basic and advanced life support training with a local airway course) in 1994, 1995, 2000 and 2001. Data was collected using self-reported ambulance trip sheets. This study showed no statistically significant difference in mortality between groups, however the study did not specify a sample size calculation to detect a difference or evaluate an effect size. Lack of sample size calculations coupled with testing the intervention in only three sites (with only one control) leaves much space for a type II error. Before-and-after studies are not RCTs and are prone to confounding, especially if not controlled for. The authors also reported poor protocol compliance which could affect the results, either for or against the true effect.

Nicoll conducted a small scale RCT (n = 16) comparing outcomes of victims of trauma treated by ALS trained crews compared to those treated by crews without ALS training. Follow-up was performed six months after the incident using the SF-36 questionnaire. Similar to Arrelola Risa 2004, protocol compliance was poor and authors did not recruit sufficient numbers due to practical difficulties. No mortality difference was detected between the two randomised groups. Once again, lack of study power and type II error cannot be excluded depending on the size of the difference hypothesized. To state there is evidence of no difference with a sample size of 16 is not accurate, and could simply be due to random chance. Simply because you flip a coin five times and it lands on heads each time, does not mean there are no tails!

Steill conducted a large scale uncontrolled before-and-after study across 17 cities in Canada. Of the three studies included in the review this study had the largest sample size and potentially the most accurate point estimate of the abovementioned studies. They measured the impact of ALS training on patient mortality and morbidity due to injury. The study population included injured patients over 16 years with an injury severity score greater than 12. The basic life support (BLS) phase included patients treated over a 36 month period compared to the ALS phase (also 36 months). The ALS phase training is described as a “standardised national curriculum on advanced life support and clinical training period programs”. They included 400 paramedics who were trained in endotracheal intubation, intravenous lines and administration of fluids and medication intravenously. A total of 2867 patients were enrolled, 1273 in the BLS phase and 1494 in the ALS phase and followed up for survival to hospital discharge obtained from hospital records. A sample size calculation was pre-determined. Steill reported no substantial difference in overall survival to hospital discharge by phase (81.8% for BLS versus 81.1% for ALS). A pre specified subgroup analysis reported a higher mortality in the ALS group in patients with a Glasgow Coma Scale (GCS) of less than nine.

The review authors recognise a critical limitation of this study is that it is an uncontrolled before-and-after study rather than a RCT. The sub-group analysis result may be a false positive finding (type I error), a chance finding due to the lack of randomisation and an appropriate control group.

Further comments and conclusions

The review authors stated that there is currently a lack of robust evidence for or against the use of ALS training for ambulance crews to care for injury victims. The data substantiating this statement is of low quality and more research is most likely to influence future results. Considering LMICs, two of the three studies were conducted in high income countries (HICs) and may not be generalisable to LMICs. Although conducting RCTs in emergency care is challenging, especially for complex interventions, it is not impossible. Nicoll (1998) is the only RCT included in this review, however reporting of the trial is unclear. The review authors comment that allocation concealment was adequate (low risk of bias) but no mention is made of random sequence generation, incomplete outcome data, selective outcome reporting or other sources of bias. The use of controlled or uncontrolled before-and-after studies is a practical study design to answer the question at hand, but is still at risk of confounding and spurious results and needs to be rigorously designed and implemented.

This review team conducted a comprehensive search of the literature and included all available relevant studies, despite this, there is a lack of evidence currently, and the review authors suggest that additional research is indicated to comprehensively address this question. Considering this, recommendations (by the authors) for further research is appropriate, use of stepped wedge trial designs could address some of the ethical concerns around the perceived lack of equipoise between the two care modalities and provide the needed answers.

South Africa has a unique trauma population distribution and ALS training is extensive and not comparable to the included studies in the review.6,7 The age old mantra of “absence of evidence is not evidence of absence” can be applied here.
ADVANCED TRAINING IN TRAUMA LIFE SUPPORT FOR AMBULANCE CREWS

Jayaraman S, Sethi D and Wong R

ABSTRACT

Background

There is an increasing global burden of injury especially in low- and middle-income countries (LMICs). To address this, models of trauma care initially developed in high income countries are being adopted in LMIC settings. In particular, ambulance crews with advanced life support (ALS) training are being promoted in LMICs as a strategy for improving outcomes for victims of trauma. However, there is controversy as to the effectiveness of this health service intervention and the evidence has yet to be rigorously appraised.

Objectives

To quantify the impact of ALS-trained ambulance crews versus crews without ALS training on reducing mortality and morbidity in trauma patients.

Search methods

The search for studies was run on the 16th May 2014. We searched the Cochrane Injuries Group’s Specialised Register, the Cochrane Central Register of Controlled Trials (CENTRAL, The Cochrane Library), Ovid MEDLINE(R), Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid OLDMEDLINE(R), Embase Classic+Embase (Ovid), ISI WOS (SCI-EXPANDED, SSCI, CPCI-S & CPSI-SSH), CINAHL Plus (EBSCO), PubMed and screened reference lists.

Selection criteria

Randomised controlled trials, controlled trials and non-randomised studies, including before-and-after studies and interrupted time series studies, comparing the impact of ALS-trained ambulance crews versus crews without ALS training on the reduction of mortality and morbidity in trauma patients.

Data collection and analysis

Two review authors assessed study reports against the inclusion criteria, and extracted data.

Main results

We found one controlled before-and-after trial, one uncontrolled before-and-after study, and one randomised controlled trial that met the inclusion criteria. None demonstrated evidence to support ALS training for pre-hospital personnel. In the uncontrolled before-and-after study, ‘a priori’ subgroup analysis showed an increase in mortality among patients who had a Glasgow Coma Scale score of less than nine and received care from ALS trained ambulance crews. Additionally, when the pre-hospital trauma score was taken into account in logistic regression analysis, mortality in the patients receiving care from ALS trained crews increased significantly.

Authors’ conclusions

At this time, the evidence indicates that there is no benefit of advanced life support training for ambulance crews on patient outcomes.

PLAIN LANGUAGE SUMMARY

Injury is one of the top ten causes of death and disability worldwide. It results in an early loss of life for many young people and ongoing high medical care costs among survivors. Advanced life support (ALS) training for ambulance crews with emphasis on trauma is believed to have contributed to a reduction in the number of deaths from injury in predominantly high-income countries where this service is available. ALS services are also being adapted for low- and middle-income countries. This review of trials found there is no evidence to suggest that ALS training for ambulance personnel improves the outcomes for injured people.

References

OFFICE WORKER’S KNOWLEDGE OF ACUTE CORONARY SYNDROME

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Current guidelines for the management of acute coronary syndrome (ACS) emphasise the importance of early detection of ACS symptoms in the community or workplace, followed by early access to the Emergency Medical Services (EMS). This survey assessed the knowledge of ACS and related symptoms, in addition to basic management of ACS by lay persons, amongst a group of office workers in Johannesburg by means of a directly administered survey questionnaire.

A total of 41 complete responses were obtained from a sampled population of 48 (85% response rate) comprising office workers of a single company of whom 63% were female. All of the participants had at least a matric certificate, with a further 56% having a Bachelor’s degree or higher qualification. Only two participants had previously undergone first aid training and one had personally experienced a form of ACS, while 61% had either friends or family members who had experienced a form of ACS.

When asked for an open-ended description of a “heart attack”, 83% of participants gave either a good or reasonable description when compared to the American Heart Association description of ACS. Just more than half of participants indicated that males are most at risk for ACS, while a further 15% indicated that they thought both genders were equally affected. When asked where “heart attacks” are most likely to occur, only 27% of participants indicated that they most often occur at home while 32% indicated that they did not know.

Participants were also asked about ACS risk factors and common presenting symptoms. Seventy-eight percent of participants were able to correctly identify three common risk factors (hypercholesterolaemia, obesity and stress). A total of 23 different signs and symptoms were listed, of which 15 were appropriate. The most commonly mentioned symptoms were shortness of breath, chest pain, left arm pain, discomfort and sweating. When asked what their first response would be to a fellow worker or family member presenting with ACS symptoms most said that they would contact the EMS.

Participants in this study generally had a good understanding of ACS and its presenting symptoms and risk factors. They also displayed reasonable understanding of what to do in the event of a co-worker or family member experiencing ACS. The small sample was a limitation of this study, as was the fact that many of the participants had a relatively high educational level.
AN EVALUATION OF EMERGENCY MEDICAL SERVICE DISINFECTION PRACTICES FOR MANUAL ARTIFICIAL VENTILATORS

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In the prehospital environment, emergency care providers, often come in contact with patients requiring assisted ventilation for airway maintenance, respiratory failure or circulatory failure. Manual artificial ventilators (MAV) or bag valve reservoir (with or without mask) are used in these instances and come in direct contact with skin and indirect contact with airway passages. As such, these devices are potential vectors for cross-contamination and infection. Using Spaulding’s classification of equipment, MAVs fall into the semi-critical group and should be cleaned of visible dirt then disinfected with a high level disinfecting agent as minimal cleaning requirement. Sterilisation is optional.

The aim of this descriptive research was to determine the current cleaning, use and storage practices of emergency care providers with regards to MAV use. Swabs were taken from 16 MAVs (8 Advanced Life Support and 8 Intermediate Life Support Practitioners – two swabs per MAV) and plated on growth mediums to assess effectiveness of current practices. The swabs were placed on Plate Count Agar medium for 48 hours after which it was placed on MacConkey Agar (gram negative specific) for another 48 hours. The results indicated that 9 of the 32 (28%) MAV’s showed growth and 2 swabs were positive for gram negative microorganisms. Due to study limitations fungal and viral screening was not performed.

Although the study was not powered to determine cause/effect, it does indicate bacterial growth is present in MAV’s. Multiple other studies have shown that inadequate cleaning of medical equipment causes infection. A standardised protocol for cleaning MAV is lacking, and requires urgent attention to minimise the risk of cross-contamination and prolonged hospital stay.
PRE-HOSPITAL THROMBOLYSIS: THE FORGOTTEN CURE

Student: Ryan Turner | Supervisors: Connor Hartnady and Christopher Stein
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Pre-hospital thrombolysis (PHT) was introduced into Emergency Care Practitioner (ECP) scope of practice in 2009, along with a number of requirements and recommendations for implementation from the Health Professions Council of South Africa. This online survey aimed to establish how often a sample (n = 21) of ECPs had practiced PHT, to what extent they are equipped to do so and what their perceptions were regarding the practice of PHT. Survey invitations were circulated by email to a list of ECPs obtained from a privately maintained ECP mailing list and mailing lists from two Universities offering Emergency Medical Care degree programmes. Email recipients who wished to participate in the survey followed a hyperlink to the survey website to complete the questionnaire.

Roughly half of participants worked in the private sector and had more than two years of experience, with almost two-thirds resident in Gauteng Province. Only a single participant indicated that they had performed PHT once or more. Participants appeared to be ill-equipped for PHT with only 57% having an ECG device capable of telemetry on all shifts and a quarter of participants not having any access to such devices. Thrombolytic drugs (streptokinase or tenecteplase and enoxaparin or heparin) were not available to 85% of participants.

Participants acknowledged that PHT is underutilised and attributed this mostly to proximity to hospitals (where percutaneous interventions may be performed) in urban areas, lack of drugs and equipment and lack of a cardiac care network (a network of hospital-based specialists to be utilised for consultation as part of the PHT process). Almost three-quarters of participants felt that the lack of a cardiac care network severely limited their ability to carry out PHT (even if they had the required drugs and equipment) as specialist consultation with a receiving clinician is a required part of the PHT process. Most participants believed that these kind of networks would be feasible to establish with more effort.

The small and geographically confined sample utilised in this study is a limitation, however it appears that in this particular group of ECPs PHT is almost never performed. This seems to be mostly due to services not supplying the required equipment and drugs and the lack of specialist consultation. Given the established evidence supporting PHT, it seems counterintuitive that this treatment has not been embraced.
IDENTIFYING THE ROLE OF PRE-HOSPITAL INTERCOSTAL CHEST DRAINS IN SOUTH AFRICA

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BACKGROUND
Thoracic injury accounts for approximately one quarter of all traumatic deaths. Immediate life-threatening chest injuries include tension pneumothorax and haemothorax. These conditions can be treated in a definitive manner by appropriately trained and skilled practitioners within hospital emergency centres. Pre-hospital emergency care in South Africa only provides for therapeutic and temporary relief of a tension pneumothorax. Definitive care for both conditions, through an intercostal chest drain, remains limited to the hospital environment.

AIM
To highlight relevant issues by determining the current opinion amongst emergency care experts, and identifying key components regarding the placement of intercostal chest drains in the pre-hospital South African environment.

METHODS
This is a qualitative descriptive study. A modified Delphi technique was utilised throughout South Africa, followed by a Focus Group Interview within the Cape Town Metropole. Expansion of relevant issues was done from seven specific headings and their respective subheadings.

RESULTS
22 experts (doctors and paramedics) within the emergency care field participated in the national Delphi study. 25 (20%) of the initial 123 statements obtained overall expert panel consensus, with a further 37 (30%) of the initial 123 statements revealing a majority agreement or disagreement pattern. A Focus Group Interview of 17 emergency medicine registrars generated a further 30 statements complimenting and validating the Delphi findings.

CONCLUSION
The role of pre-hospital intercostal chest drains in South Africa is positively described, and is supported by expert insight. Patient condition and time to definitive care are the most important factors driving the need for this procedure. Further investigation is required for the potential inclusion of intercostal chest drains in South African pre-hospital emergency medical care.
THE PREVALENCE OF HYPOTENSION AND HYPOXAEMIA IN BLUNT TRAUMATIC BRAIN INJURY IN THE PREHOSPITAL SETTING

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BACKGROUND
Each year, ~89 000 (180/100 000) new cases of head injury are reported in South Africa (SA), with the majority of patients being in the economically active population. Hypotension and hypoxaemia significantly increase the morbidity and mortality in patients who have suffered a traumatic brain injury (TBI). Cerebral tissue is particularly vulnerable to these secondary insults in the period immediately following a TBI, emphasising the importance of prehospital care in TBI.

AIM
To establish the prevalence of prehospital hypotension and hypoxaemia in moderate to severe blunt TBI in greater Johannesburg, Gauteng, SA.

METHODS
The records of adult patients who sustained a moderate to severe TBI between 1 January and 31 December 2011 were retrospectively reviewed for hypotension (systolic blood pressure <90 mmHg) and hypoxaemia (oxygen saturation <90%) during their prehospital phase of care. These results were subject to descriptive analysis.

RESULTS
A total of 299 records were identified, 66 of which met the inclusion criteria. The prevalence of prehospital hypotension and hypoxaemia were 33.3% (n=22) and 37.9% (n=25), respectively, while 21.2% (n=14) of patients suffered double insults of hypotension and hypoxaemia. Hypotension and hypoxaemia were associated with haemorrhage (p=0.011) and chest injuries (p=0.001), respectively.

CONCLUSION
The prevalence of hypotension in this study was similar to that observed in international studies, but the prevalence of hypoxaemia was much higher. There is a need for local guidelines to be developed to inform the quality of TBI care in the context of the developing world.

UTILISATION OF PRE-HOSPITAL INTRAVENOUS ACCESS

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AIM
The study aimed to determine the proportion of pre-hospital intravenous cannulations considered unnecessary when graded against the South African Triage Score (SATS) chart as well as the relationship between practitioner qualification and prophylactic IV access establishment.

METHODS
A descriptive research design was conducted in the pre-hospital emergency medical care setting of South Africa and specifically looked at the patient report forms of patients treated and transported by personnel currently employed in the public sector, serving Paarl and associated areas stipulated by the municipality boundaries. All medical and trauma cases in which IV access establishment was documented for the month of April were included in this study. Inter-hospital transfers, unsuccessful attempts at IV access, and intraosseous cannulation were excluded.

RESULTS
The data suggested that a total of 42.3% of the total prophylactic IV access (n=149) were not justified when weighed against the SATS and therefore added no direct benefit to the continuum of patient care. It is worth noting that 18.8% (n=39) of the IV’s were utilised for fluid administration compared with the 9.2% (n=19) of IV’s utilised for the administration of IV medications.

CONCLUSION
Owing to the paucity of studies indicating direct benefit of out-of-hospital intravenous intervention, the practice of precautionary, protocol-driven prophylactic establishment of IV access should be evaluated. Current data suggest that in the absence of scientific evidence, intravenous access should only be initiated when it would benefit the patient immediately, and thus precautionary intravenous access, especially in non-injured patients, should be re-evaluated.
IS THERE A ROLE FOR PRE-HOSPITAL EMERGENCY ULTRASOUND IN SOUTH AFRICA

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BACKGROUND

Emergency ultrasound use has been expanded to that of non-physicians and non-radiologists in the pre-hospital environment in Germany, France, Italy, the USA, Australia and the Military in a number of countries. Its use in South Africa is limited to the Emergency Department. The usefulness of Pre-hospital Emergency Ultrasound (PEUS) in the South African pre-hospital environment has not yet been established. Investigating PEUS’s feasibility may assist in decision-making regarding implementation and training.

AIM

To establish consensus amongst a panel of experts regarding the feasibility of PEUS in South Africa, using a modified Delphi approach.

METHODS

A panel of experts was identified, consisting of registered medical practitioners with experience in emergency medicine who were accredited emergency ultrasound providers or trainers. Participants who consented to taking part in the study were asked to complete an anonymous online survey comprising a set of Delphi statements on PEUS indications, clinical application and training. Answers for each statement were collected, and interpreted quantitatively to determine the degree of similarity among answers. Statements with a similarity of 75% or more were considered to have achieved consensus. A minimum of six participants was required to complete at least two rounds of the survey.

RESULTS

The minimum number of participants (six) completed both rounds of the survey, constituting 26% of the group of 23 initially approached by email for participation. None of the 19 statements in the first round achieved consensus. After the second round, eight statements related to the use of PEUS for abdominal injuries, abdominal aortic aneurysm identification, cardiac arrest and decision support for inter-hospital transfers achieved consensus. Additionally, consensus was reached regarding the feasibility of training pre-hospital emergency care providers to perform PEUS and at which qualification levels this could be taught at. Due to very limited agreement on the clinical usefulness of PEUS by the participants, as indicated by the small number of feasible indications for its pre-hospital use, it does not seem appropriate to introduce PEUS in South Africa at this stage without further research.
A CROSS-SECTIONAL DESCRIPTIVE SURVEY OF PRE-HOSPITAL ON-SCENE TIME INVOLVING CRITICALLY ILL PATIENTS

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BACKGROUND

Prehospital response and on-scene times are often used as a measure of the effectiveness of emergency medical systems (Pons et al. 2005) (Blackwell & Kellam, 2003) however no published works are known to the authors of this study regarding the duration of response times, on-scene time, and transport times in the South African pre-hospital setting. Even when these skills are performed, they do not necessarily improve the outcome of patients (Eckstein et al., 2000) (Pons et al., 2005). A prospective, observational registry study by Birk & Henriksen (2002) concluded that there was a clear association between longer prehospital on-scene time and prehospital interventions. In addition, Swaroop et al. (2013) and Báez et al. (2006) have shown direct correlations between the out of hospital time, complications and length of hospital stay by critically ill patients. Despite these recent reports there has been little emphasis, even in developed countries, to identify the current prehospital time intervals, particularly for trauma patients (Carr, Caplan, Pryor, & Branas, 2006).

AIM

The aim of this research was to investigate the current on-scene times of critically ill patients in the Western Division of the Provincial Government of the Western Cape EMS system in the City of Cape Town.

METHODS

This retrospective study followed a descriptive cross sectional survey design using the data from the PGWC EMS Western Division. A cluster randomized sample method was used to select Patient Report Forms (PRF) of red code (as defined by SATS) patients between June and December 2012. A total of 222 PRF’s were met the criteria for inclusion.

RESULTS

The mean on scene time for all red patients was reported at 25.43 minutes (CI 0.95; 23.5 – 27.4). It is observed that ILS providers spent the least amount of time on-scene with a mean on-scene time of 23 minutes (95% CI of 20.92 – 25.85), followed by BLS 26 minutes (CI 0.95; 20.52 – 31.38) while ALS providers spent a mean of 28 minutes (CI 0.95; 24.56 – 31.71) on-scene with red code patients. No significant difference in on-scene times was observed between the medical and trauma calls.

CONCLUSION

This study found that the mean on-scene time for red code patients by international and even local standards could be considered excessive. It also showed that BLS and ILS providers are spending similar amounts of time on-scene treating red code patients as ALS providers even though they have a limited scope of practice.
THE EFFECT OF PHYSICAL EXERTION ON VOLUNTEERS WEARING SELF-CONTAINED BREATHING APPARATUS DURING A SIMULATED RESCUE EXERCISE

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BACKGROUND

Studies conducted in the past that assessed the effects of using a self-contained breathing apparatus (SCBA) during rescue operations were done through treadmill exercises and they mostly focused on participant’s fitness rather than rescue operation intensity. The primary objective of this research was to evaluate the effects that physical exertion has on rescuers during a simulated rescue exercise when they are using SCBA. This was compared with an identical physical exertion exercise without the use of SCBA.

AIM

The aim of this study was to evaluate the effects of SCBA by observing four physiological variables: (1) heart rate, (2) oxygen saturation (SpO2), (3) tympanic membrane temperature and (4) capillary blood lactate during a simulated rescue exercise.

METHODS

Eighteen volunteers participated in the study. Subjects were required to complete a simulated rescue exercise whilst wearing a standard issue flight suit uniform and boots with SCBA (experimental) and also to complete the same exercise whilst wearing the standard issue uniform and boots only (control). The physiological variables were measured before the start of the exercise, during the exercise and after the exercise in both groups.

RESULTS

The results obtained showed that there was no significant difference when the subjects were performing the rescue exercise with and without the use of SCBA (p=0.392). Heart rate and capillary blood lactate resulted in a significant increase for both groups when values from before were compared with values from after the exercise (p<0.001). Significant difference was found in SpO2 when values taken before were compared with values taken after the exercise (p=0.018). Tympanic membrane temperature in the experimental group was observed to decrease, but there were no significant differences found between values measured before, during and after the exercise. Overall there was a significant difference within the subjects in both groups when values taken before, during and after the exercise were compared (p=0.022).

CONCLUSION

The differences in physiological variables observed between both groups may be as a result of the SCBA weight and the restrictive properties of the SCBA mask. The benefit with the reduction of the SCBA weight in the control group was reflected at the speed that the group completed the exercise.
STUDENT EXPOSURE TO CRITICAL EMERGENCY CARE SKILLS IN THE CITY OF CAPE TOWN

Ryan Matthews, Benjamin De Waal
Cape Peninsula University of Technology

BACKGROUND

The Professional Board of Emergency Care (PBEC) of the HPCSA requires students to complete a prerequisite number of skills to be eligible for professional registration (HPCSA, 2011) which entitles a student to transition to a newly qualified practitioner. This places a great deal of emphasis on the competencies gained during WIL as these novice practitioners are held to the same standards as their more experienced colleagues. In relation to this Stein (2009) has shown that students have limited exposure to critically ill patients such as cardiac arrest, placing into question the adequacy of WIL exposure alone to provide these learning opportunities.

AIM

The presentation aims to present data from the CPUT FISDAP database to describe the frequency and nature of exposure of students to critically ill patients and critical care skills in the City of Cape Town.

METHODS

WIL Data was collected from the CPUT FISDAP database for the period 1 January 2013 to 31 December 2013 for all registered BEMC and ECT learners (n=156) at CPUT. Descriptive statistics was used to evaluate the frequency of and nature of exposure to critical care skills.

RESULTS

It was noted that the levels of exposure to ALS skills was less than anticipated (10,265 patient contacts). The exposure of students to ALS calls was not normally distributed (Poisson’s distribution), implying that the random nature of emergencies (Goldberg, 2004) may influence the probability of individual students attending emergency incidents. The levels of exposure to orotracheal intubation was notably low, with only 281 procedures being recorded and only 53% (n=148) being performed by students. Other critical skills such as needle thoracentesis followed a similar trend, 157 procedures where recorded, however 66% (n=104) was performed in the skills lab using simulators. Of the 53 performed on live patients only 23 (43%) where performed by students. The most common patient chief complaint seen by students was pain (30%, n=3080)

CONCLUSION

The value of lived experience in emergency care cannot be underestimated, however the current level and erratic nature of exposure of students to critically ill patients and the skills they are expected to perform post qualification is lower than what may be considered optimal. In this light it may be necessary to reconsider the role of high fidelity simulation to ensure adequate exposure.
PRE-HOSPITAL ANTIBIOTICS FOR OPEN FRACTURES: IS THERE TIME?

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BACKGROUND
Infection is a complication of open fractures. Early administration of intravenous (IV) antibiotics providing cover against gram positive and negative organisms has been shown to be the single most important factor in reducing infection rate in patients with open (compound) fractures. A delay of more than three hours from injury (open fractures or war wounds including fractures) to antibiotic administration is associated with a significantly higher infection rate.

AIM
The purpose of this study is to identify the proportion of patients in a suburban sample that experience delay of more than 3 hours in antibiotic administration after open fracture. The authors hope to clarify if there would be opportunity and value in pre-hospital antibiotic administration in significantly shortening the delay.

METHODS
A retrospective and prospective descriptive study was conducted of all patients with open fractures of the limbs or girdles arriving via ambulance at a single district hospital in a suburban area in Kwa-Zulu Natal, South Africa from May to December 2012. Data analysed with descriptive statistics using STATA 11.

RESULTS
38 patients were identified from May to December 2012. The median total time from injury to antibiotics was 465 minutes (7.5 hours) (Q1 = 230 minutes, Q3 = 615). Administration of antibiotics was delayed beyond 3 hours in 78.9% (95% confidence interval (CI) 65.3 – 92.52) of patients and beyond 6 hours in 60.5% (95% CI 44.2 – 76.8). A median of 164 minutes (Q1 = 115, Q3 = 222) was spent out of hospital with emergency medical care practitioners (EMCPs) being in attendance for a median of 56 minutes (Q1 = 37, Q3 = 64). The longest delay occurred after arrival at the hospital with a median of 363 minutes (Q1 = 171, Q3 = 505) until antibiotic administration. 26.3% of patients were transported directly from scene of injury to the hospital, while the remainder first presented to a clinic.

CONCLUSION
There is much room for improvement within the study hospital and its drainage clinics in preventing delay in antibiotic administration. However, although much of the delay occurred due to clinic and in-hospital delays, there is also a hypothetical window available to pre-hospital healthcare providers where antibiotics may be administered which would dramatically decrease the time interval and bypass many of the difficulties encountered in-hospital. It would be safer to consider introducing IV antibiotics to the advanced scope of EMCP practise only; due to need to manage complications of antibiotics. Before considering introducing antibiotics to EMCP spectrum of care, efficacy, safety and cost-effectiveness studies would need to be undertaken. Randomised controlled trials are also recommended to determine the effect on reducing delay, infection and occurrence of adverse events.
IDENTIFYING COMMUNICATION FACILITATORS AND BARRIERS IN EMERGENCY MEDICAL CALLS IN THE SOUTH AFRICAN SETTING

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BACKGROUND

Emergency medical service (EMS) systems are complex by nature. Communication factors are essential for efficiency of the system and misunderstandings in emergency calls may have implications for patient survival. Studies of communication variables in calls has proven useful in other contexts but little is known about these issues in South Africa with its unique linguistic, cultural and disease profile.

AIMS

We conducted a large study at an emergency call centre in the Western Cape, aiming to identify communication processes and needs. Projects focused on: (1) opening sequences in calls and results from an on-site communication experiment aimed at improving call efficiency; (2) how language mismatches are managed in calls; (3) routinisation and responsiveness in calls; and (4) emergency medical workers’ (EMW) perspectives and experiences of communication in the EMS system.

METHODS

Qualitative methods included ethnographic observations at the call centre; focus groups with 14 paramedics, analysed via thematic analysis; and conversation analysis of over 100 emergency calls. Quantitative methods included measurement of average call length and response time after implementation of a modified opening sequence.

RESULTS

The results of each part of the study will be presented separately and will collectively demonstrate the close relationship between communication, call efficiency and the perceptions of the participants in the call centre and EMWs. Some typical barriers to efficiency will be highlighted as well as good practices which facilitated the services. Using call examples as well as information from observations and focus groups, the presentation will include an example of an active floor experiment which improved response time as well as some recommendations for managing communication challenges.

CONCLUSION

Findings demonstrate the value of careful examination of interactional variables and tailored communication interventions in EMS systems. Promisingly, our research suggests that relatively small modifications to current protocols can impact positively on system efficiency. Implications for training call takers in multilingual contexts and improving system efficiency will be discussed.
A selection of articles published in the last six months, of relevance to pre-hospital emergency care. These studies are briefly extracted “in passing”.

ANTICONVULSANT THERAPY FOR STATUS EPILEPTICUS (SYSTEMATIC REVIEW)

These Cochrane review authors sought to determine whether a particular anticonvulsant is more effective or safer to use in status epilepticus compared to another or compared to placebo. Eighteen studies with 2755 participants were included in the review. Meta-analysis indicated intravenous lorazepam was better than intravenous diazepam reducing the risk of non-cessation of seizures by 36% (RR 0.64, 95%CI 0.45 to 0.90) and had a lower risk for continuation of status epilepticus requiring a different drug or general anaesthesia (RR 0.63, 95% CI 0.45 to 0.88). For pre-hospital treatment, intramuscular (IM) midazolam is at least as effective (probably more effective than) as intravenous lorazepam in control of seizures (RR 1.16, 95% CI 1.06 to 1.27) and frequency of hospitalisation (RR 0.88, 95% CI 0.79 to 0.97) or intensive care admissions (RR 0.79, 95% CI 0.65 to 0.96). It is unclear whether IM midazolam is better than IV lorazepam for cessation of seizures in pre-hospital use.


HYPOGLYCAEMIA IN SEIZURES: CHECK FIRST OR TREAT FIRST?

This study investigated two hypotheses; that hypoglycaemia is rare when associated with a primary complaint of seizure in the pre-hospital environment and that time to benzodiazepine administration is shorter when no glucose check is done before administration, compared to when such testing is done. Using blood glucose of < 60mg/dl (3.33 mmol/l) to define hypoglycaemia, 76,584 patient care records from a database spanning...
40 states in the USA that were associated with a final assessment of seizure were identified. Of these, blood glucose was tested in 53,505 and blood glucose was not tested in 23,079. Hypoglycaemia was identified in 1.2% of patients in whom blood glucose was tested. A benzodiazepine was administered to 8.3% of patients and glucose to 1.3%. Benzodiazepine administration was delayed by a median time of 5.9 minutes when blood glucose testing preceded its administration, compared to when blood glucose testing was done after administration of the drug. Given the importance of administering benzodiazepines rapidly in cases of prolonged seizure (most cases of seizures in progress on EMS arrival are prolonged by definition), the current practice of always checking blood glucose before administering a benzodiazepine does not seem to be supported.


KETAMINE, MORPHINE AND LONG-TERM PAIN

This was a follow-up study of a prehospital randomised controlled trial that looked at whether there was a difference in the prevalence if persistent pain at 6 and 12 months between patients who initially received Morphine or Ketamine following traumatic injuries. The RCT found that Ketamine lowered the pain scores at hospital handover. A telephonic questionnaire was administered that included a health-related quality of life survey and a verbal numerical pain rating scale. 97/135 patients were followed up, yielding a loss-to-follow-up of 28%. 45% of patients reported having persistent pain, 3% of which rated this pain as severe. The prevalence of persistent pain was similar in the Morphine and Ketamine groups (22/47 (46%) vs. 22/50 (44%)). The authors conclude that there is still a high incidence of persistent pain following traumatic injury. This prevalence does not seem to be influenced by whether prehospital analgesia was achieved by Ketamine or Morphine.


EMERGENCY DEPARTMENT SPINAL IMMOBILISATION: NO VALUE, MUCH COST, MUCH RADIATION.

Ever decided not to immobilise a trauma patient only to arrive in the emergency department (ED) and have that decision overruled and the patient immobilised? This US study assessed the outcomes of 101 patient who were not immobilised in the field but were subsequently immobilised by ED staff and then underwent imaging in order to further investigate the possibility of cervical spinal injury. None of these patients turned out to have acute cervical spinal injuries, with 94 having CT scans and nine having cervical spine x-rays (two patients had both). The estimated cost of the 94 unnecessary CT scans was $147,580 (approximately R1,617,344) and these interventions also involved unnecessary radiation exposure and time delays.

Tello RR, Braude D, Fullerton L, Froman P. Outcome of trauma patients immobilized by emergency department staff, but not by emergency medical services providers: A quality assurance initiative. Prehospital Emergency Care 2014;18:544–549.

PRE-HOSPITAL VERSUS IN-HOSPITAL THROMBOLYSIS FOR ST-ELEVATION MYOCARDIAL INFARCTION (SYSTEMATIC REVIEW)

In this review authors assessed the morbidity and mortality of pre-hospital versus in-hospital thrombolysis for STEMI. Three trials totaling 538 patients were included. The authors indicated there is inconclusive evidence whether pre-hospital thrombolysis reduces death in people with STEMI compared to in-hospital thrombolysis (risk ratio 0.73, 95% confidence interval 0.37 to 1.41). Pre-hospital thrombolysis reduces time to receipt of thrombolytic treatment, based on studies conducted in higher income countries (MD -37.95 minutes, 95% CI -61.12 to -14.77). The authors urged further pragmatic trial research in low-to-middle-income countries to develop pre-hospital thrombolysis networks.
