INTRODUCTION

A1 London Trauma Conference 2014

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Introduction: The London Trauma Conference (LT2014) & London Cardiac Arrest Symposium (LACS2014) have become an extraordinary international showcase for the innovation, research, talent and passion that is dedicated to the medical care of major trauma and critically ill patients. The 8th London Trauma Conference did not disappoint and, in a reversal of the Royal Geographical Society’s history of global exploration, it has now become the focus of an expanding annual pilgrimage of the trauma faithful from across the world. This year, 1,113 delegates representing a wide range of countries enjoyed a programme designed to challenge, inform and, true to the ethos of the hallowed corridors of the venue, pioneer new medical frontiers.

The opening two days of the Main Conference centered upon key trauma issues, day three focused upon Air Ambulance and Pre-Hospital Care, with the London Cardiac Arrest Symposium returning as a two-day event on the third and fourth days. Concurrently with the main conference, Master classes in Thoracotomy / REBOA and Cardiac Arrest, as well as Breakaway Sessions covering topics as diverse as Trauma Research, Remote Critical Care and Motorsport Medicine, provided lots of choice and difficult decisions.

Whilst there were many memorable and fascinating elements to the 2014 London Trauma Conference, if there was a theme building at this year’s conference it was that we may be witnessing the beginning of an endovascular revolution in resuscitation. Extraordinary talks on REBOA in London, Pre-Hospital ECMO in Paris and the prospect of Selective Aortic Arch Perfusion (SAAP) could herald new approaches to treating the previously unsalvageable patient.

The article that follows describes highlights from the Main Conference programme and introduces the outstanding range of research abstracts that were presented at the London Trauma Conference 2014. However it would be impossible to comprehensively cover the depth and insight of the talks in this supplement but if you want to hear what you missed in 2014 and whet your appetite for December 8th-11th 2015 (http://ltc2015.com) then session highlights, interviews with speakers, talk overviews and great conference summaries are available as links from the article below, with London Trauma Conference Podcasts published on sites including St. Emlyn’s, Life in the fast lane and RCEM FOAMed.

Major trauma: The two day Major Trauma programme (http://www.londontraumaconference.com/downloads2014/LTC14_programme.pdf) reads like a Who’s Who of international trauma care: Professor Karim Brohi, Dr Gareth Davies, Professor Chris Moran, Professor James Manning, Professor Mauro Oddo, Professor Ben Bobrow … the list goes on. Podcast summaries of the days are available at (http://stemlynsblog.org/ltc-day-1/) (http://stemlynsblog.org/ltc-day-2/), interviews with some individual speakers are linked from the text and more detailed talk summaries can be found by clicking on the speaker names.

Clinical concepts: Professor Karim Brohi opened the conference with a characteristically fascinating and dynamic talk on the recognition and management of traumatic arterial dissection, best summarized in his own words in his podcast (http://www.stemlynsblog.org/e/karim-brohi-at-ltc-with-stemlyns/). Mr Doug West’s podcast follows a fascinating talk discussing the improved outcomes associated with surgical fixation of flail chest (http://www.rcemfoamed.co.uk/portfolio/ltc-podcast-1-chest-trauma/) and his less heart-warming experience of the consequences of injudicious chest drain insertion! Dr Bob Winter made a racing visit from his responsibilities at the concurrently running Intensive Care Society Meeting to regale the audience with stories of glamour models at his Excel Centre conference before providing a reassuringly pragmatic view on the equally heady subject of inflammation in trauma. The Peter Baskett Memorial lecture this year was given by Dr Stephen Leadbetter, Director of the Wales Institute of Forensic Medicine, who gave a charismatic and fascinating insight into what could be learnt from trauma deaths.

Dr Jerry Nolan addressed the controversial issue of cervical spine control during intubation and provided extensive evidence that all airway interventions result in some cervical spine movement, with videolaryngoscopy causing less movement but also less success when studied in the pre-hospital environment. The perennial problems of assessing haemorrhagic shock and its complex cascade of physiological sequelae were eloquently discussed by Professors James Manning and Tim Harris (http://www.stemlynsblog.org/e/prof-tim-harris-joins-stemlyns-on-shock-assessment/), both of who spoke with authority on several subjects during the conference.

This year there was a strong focus on CNS trauma with a series of talks delivering novel concepts and expert reviews of our current state of knowledge. Dr Mauro Oddo provided a comprehensive update on multimodality brain monitoring following traumatic brain injury, Challenging dogma as ever. Dr Gareth Davies (http://www.stemlynsblog.org/e/impat-brain-apnoea-with-gareth-davies-from-london-hems/) shone a spotlight onto the long-recognized mammalian phenomenon of impact apnoea and proposed that respiratory arrest following head injury may account for an unrecognized burden of extremely early hypoxic brain injury perhaps established before even the most rapid of pre-hospital providers can attend. This concept not only alters conventional thinking on the aetiology of traumatic neurological injury but dovetails beautifully into Mr Mark Wilson’s (http://www.stemlynsblog.org/e/mark-wilson-joins-stemlyns-to-discuss-the-goodsam-app-ian-beardsell-interviews-from-the-ltc/) important and revolutionary global GoodSAM app (https://www.goodsamapp.org). This App alerts and deploys registered medical responders who are in the locality of an incident within seconds of an event and all readers of this article should consider registering. Mark Wilson’s entertaining review of the advances and deficits in the understanding of traumatic brain injury was not only scientifically revealing but was delivered...
to what must be the most creatively accomplished slide set ever given at a medical conference! This technological tour de force rounded off an excellent session where Dr Andrew Jackson discussed the current and future therapeutic options following spinal cord injury and Mr Nick Haden provided some clarity for the non-surgical audience members on the troublesome area of cervical spine fracture stability.

**Special populations:** Talks on trauma in the elderly, paediatrics, pregnant and those foolhardy enough to participate in motorsports, provided some fascinating examples of how conventional systems and trauma management may be inadequate in these patient groups. Dr Marius Rehn warned of the ‘grey tsunami’ of our global ageing population and how altered physiology, anatomy, comorbidity and medications can dramatically influence the response to trauma and its medical management. Mr. Ross Fisher made a familiar but coherently argued plea: *Kids are not small adults!* (http://www.stemlynspodcast.org/e/ross-fisher-and-natalie-may-discuss-paediatric-major-trauma-at-the-london-trauma-conference/). Dr Tim Draycott entertainingly addressed trauma in pregnancy with a key central message: What is best for the baby, is best for the baby with maternal lateral tilt and early definitive airway management practical take-home lessons. Dr Tim Moll’s astonishing experience of trauma in motorsports described the injury patterns associated with an eye watering range of ways that a motorbike can eject its fragile rider at extreme high speed. This subject was also covered in great detail in the *Motorsports Medicine* Breakaway session that highlighted the technological innovation being applied to personal protection and injury prevention – however at no point was it suggested that not riding a motorbike at 200 mph may be a solution to some of these issues.

**Trauma systems:** It has been a dramatic few years in the UK with the implementation of Major Trauma Networks and Professor Chris Moran, the UK National Director for Major Trauma, gave his unique perspective on the best elements of trauma performance. He proposed that enhanced pre-hospital approaches, excellent leadership, military discipline, standardised care, and governance, are but some of the many reasons one is 30% more likely to survive major trauma today than 2 years ago in the UK. Expanding on one element of this service delivery, Mr Ian Bailey drew on his experience of developing one of the UK Major Trauma Centres to give an insight into ensuring the training and competence of trauma surgeons. Introducing technology to remotely deliver expertise, Dr Conan Deasy passionately proposed the benefits in clinical leadership provided by telemedicine in trauma care.

**Education and training:** Dr Matthew Wiles took on the heretical but popular position that ATLS has had its day. He exploded false principles that similarly emphasized the technological innovation being applied to personal protection and injury prevention – however at no point was it suggested that not riding a motorbike at 200 mph may be a solution to some of these issues. Dr Doug Wilkinson described the development of the Primary Trauma Care (PTC) Foundation. To date the PTC Foundation has trained an extraordinary 60,000 medical professionals in 60 countries. The key messages of empowering, devolving and standing back that have contributed to the success of this phenomenal initiative are fascinatingly at odds with the increasingly governed and micro-analysed teaching methods being pursued in the developed world. An extreme example of the ramified environment being developed in trauma care is illustrated by the insights of Dr. Tom Evans who combines a medical career with the coaching of elite level athletes. He draws close and illuminating comparisons between the psychological and training tools required to consistently perform at the highest standard in medicine and sport.

**Quickfire controversies:** One of the recent format innovations at the London Trauma Conference has been to challenge a panel of trauma specialists to deliver succinct ten minute answers to thorny clinical dilemmas. Dr Ross Davenport, Mr Mark Wilson, Dr Julian Thompson, Dr Dan Ellis, Professor Tim Harris and Dr Conan Deasy each took their turn on the soapbox to deliver entertaining and highly opinionated quickfire thoughts on contentious issues.

**Air ambulance and pre-hospital care:** The Norwegian Air Ambulance kindly sponsored the excellent, thought provoking and hugely inspiring programme on the third day of this year’s London Trauma Conference. A podcast summary of the day is available (http://stemlynsblog.org/ltc-day-3/).

**Learning from tragedy:** Undoubtedly the most harrowing lectures of the conference were the 2 brave accounts of recent air ambulance crashes, with the victims known to many of the audience. The Chief Executive of the Norwegian Air Ambulance (NAA), Mr Syver Leivestad, and Press Officer, Ms Siv Tonje Solfjeld, described the crash on 14th January 2014 where an NAA helicopter collided with power lines 90 feet above ground, tragically resulted in two crew fatalities and one severely injured crew member. They movingly described the impact on NAA colleagues and the challenges in managing such an incident, including those involving the press. Dr Stephen Herns, then gave a first-hand account of the helicopter crash that killed 10 people in Glasgow during November 2013. He described the emotional stress of attending to an incident involving friends and colleagues, and the benefits that have been gained from using the military TRIM services, detailed reflection on events and informal debriefs in the pub with colleagues.

**Innovations:** A patient group with a historically terrible prognosis is the patient exsanguinating from uncompressible pelvic haemorrhage. This group is the focus of one of the real highlights of this year’s conference – the rise of endovascular resuscitation techniques - in this case the world’s first pre-hospital deployments of Resuscitative Endovascular Ballooning of the Aorta (REBOA). Dr Sam Sadek helped lead the training programme at London’s Air Ambulance that has allowed the deployment of the technique and by chance has twice already been filmed on TV successfully inserting REBOA. Despite his gathering media fame, Dr Sadek humbly proposed REBOA as a rapid, lifesaving but temporary, bridge to damage control surgery or interventional radiology.

In addition to the keynote speeches there were a series of brief and thought-provoking talks that the session chair amusingly referred to as ‘the London Trauma Conference’s answer to speed dating’. Innovations presented included Dr Stefan Candefjord explaining how new microwave technology could non-invasively diagnose haemorrhagic stroke and traumatic brain injury and Dr Nils Ooverland, giving a convincing argument for point of care ultrasound to detect pneumothoraces. He further described a recent study using new microwave technology to assess pneumothoraces on CT and the benefits that have demonstrated a sensitivity and specificity of 100%. A larger study is planned for 2015.

**Clinical insights:** Giving a characteristically entertaining and astute view from a highly governed Australian system, Dr Stefan Mazur irreverently discussed the transport of psychiatric, obese, and infectious patients (http://www.rcemfoamed.co.uk/portfolio/ltc-podcast-2-prehospital-uss-transfer-of-difficult-patient-prehospital-txa/). Experienced pre-hospital practitioners need to reinforce the value of evidence in ‘leading the way’, but the talk by the forensic pathologist Professor Guy Rutty took this to a completely new level. Scene analysis to reconstruct events, determine causality, predict injury patterns and focus further investigation, together with startling imaging and forensic techniques at his disposal gave extraordinary insight into just how much it is possible to determine post mortem. Pre-hospital practitioners really need to be collaborating to learn whether there is anything else we can be doing to stop our patients dying.

In the fast and furious quickfire sessions, Dr Per Kristian Hyldmo challenged the value of routine C spine collar use, Dr Jostein Hagemo questioned whether we should be giving units of packed red blood cells without the support of other blood products, Dr Dan Ellis tried to find the correct time to use arterial blood gases, Dr Stefan Mazur declared himself a tranexamic acid heretic until further studies have reported and Associate Professor Clifford Reid convincingly advocated apneic oxygenation during intubation; a goldmine of high opinions and evidence.

**Pre hospitals systems:** Professor Wolfgang Voelckel spoke passionately about high quality trauma care but expressed concern at the national and international variability in care and advocated collaborative research, meta-analyses and international consensus to drive up universal standards. It was exactly this approach of evidence based care that Dr Andreas Kruger presented to support the expansion of physician manned pre-hospital care. His data sought to identify exactly when advanced care can make a difference and provided compelling arguments for far higher physician: population ratios than delivered in many systems. In addition to the appropriate number of enhanced care teams, in the UK there remains a debate on the best way to deliver the enhanced care team to the patient. Captain Neil Jeffers took us right up this theme by discussing the issues involved in UK night helicopter missions.
The difficulties in ensuring high quality care and the paucity of governance used to be criticisms levelled at Pre-Hospital Care in the UK. However in recent years it seems that the rigor and standard of training and governance in Pre-Hospital systems across the world now exceeds that which exists in hospitals. Associate Professor Cliff Reid is a convincing evangelist for extremely high quality education in pre-hospital care and he spoke compellingly of the Sydney HEMS training programme, concluding with the aphorism ‘Under pressure you don’t rise to the occasion, but you sink to your level of training’. However some would argue that this constant oversight has gone too far and that it is less necessary if a system retains their experienced doctors rather than recruit a constant stream of new juniors. This provided a fascinating context for a head to head debate between Dr. Dan Ellis and Professor Marten Sandberg on the subject of: ‘Clinical governance in pre-hospital care: tight systems are best’. A robust and entertaining discussion followed with the audience voting overwhelmingly for tight clinical governance but the speakers agreeing that that clinical autonomy backed by extensive experience and system structure to guarantee a minimal standard of replicable care are vital to delivering high quality care.

London Cardiac Arrest Symposium: If there was any concern that the science and challenge of managing cardiac arrest had disappeared into algorithms and protocols then the London Cardiac Arrest Symposium thrillingly rejected the notion. The two day programme (http://www.londoncardiacarrestsymposium.com/programme.html) was packed with innovation and novel approaches to improve survival in this group and highlights of the second day, held in the Main Conference venue, are discussed below.

Innovative resuscitation techniques: The French are again demonstrating their prowess at revolution with an extraordinary and thought provoking talk by Dr. Lionel Lamaut about pre-hospital ECMO in Paris. Part scientific innovation, part Paris tourist guide, the talk discussed the challenge of pre-hospital ECMO with images of it being performed in various locations around the city, including in Le Louvre Museum (http://www.rcemfoamed.co.uk/portfolio/ttc-podcast-6-prehospital-ecmo/). Refining the in hospital application of this technology, Dr Tomasso Mauri outlined key factors determining when to start ECMO including time, age, co-morbidities, and efficiency of CPR. Continuing the endovascular revolution, the Douglas Chamberlain Lecture was delivered this year by Professor James Manning, on Selective Aortic Arch Perfusion (SAAP). He outlined this exciting resuscitation technique; inflating a balloon in the descending thoracic aorta to divert blood to supply the heart and brain, maximizing coronary perfusion and minimising neurological injury.

Cardiopulmonary Resuscitation (CPR): A considerably more invasive alternative to these endovascular techniques was discussed by Professor Tim Commerford demonstrating how much more effective open chest cardiac massage is than conventional compressions and proposed that it delivers improved coronary perfusion pressures and return of spontaneous circulation rates. At the opposite end of the invasive spectrum, Professor Bob Bobrow argued that, if early bystander CPR can more than double the odds ratio for survival in out-of-hospital cardiac arrest and that studies are ambiguous on the benefit of rescue breaths, minimizing the barrier to commencing CPR by non-medical professionals by training Compression Only CPR may improve outcome. Although Professor Niklas Nielsen proposed that enthusiasm for therapeutic hypothermia has undoubtedly cooled in the light of recent evidence, Dr. Peter Paal discussed the contributory role of accidental hypothermia in survival following prolonged burial and cardiac arrest in avalanche. Professor Charles Deakin addressed the controversies of the optimal airway in cardiac arrest and, whilst concluding that the literature was inconclusive, did advocate that mechanical ventilators avoid the risks of hyperinflation that adrenaline-primed resuscitators are prone to deliver manually.

Dr Peter Paal spoke a second time to discuss the use of monitoring in cardiac arrest including the range of non-invasive techniques such as ETCO₂, NIRS (near infra-red spectroscopy) and ultrasound.

In a subject that is increasingly dominated by technology, it was refreshing to hear Professor Richard Schilling advocating the importance of an old friend in VF cardiac arrest – the beta blocker. He suggested that beta blockers have a myocardial protective effect, are the only anti arrhythmic to have any prognostic benefit after MI, and as a result, their use may translate to benefit in early management of cardiac arrest.

Post resuscitation care: Dr Narbeh Melikian tackled the thorny question of which patients in arrest or post ROSC should go directly to PCA and Professor Mauro Oddo reviewed the extensive and conflicting literature on prognostication post cardiac arrest before presenting a recent trial of a multimodal prognostication tool using biomarker testing, early EEG, and neuron specific enolase which achieved 0.89 specificity.

London Trauma Conference masterclasses and breakaways: Concurrent with the Main Conference Programme there were an excellent range of smaller sessions covering specialist topics over the 4-day conference. The delegate feedback scores for these sessions were outstanding and, in response to requests from previous years, several new masterclass programmes were added this year. (http://www.londontraumaconference.com/breakaways.html). Masterclass days were organized for professional groups including Trauma researchers, junior doctors, surgeons, nurses and advanced paramedics. (http://www.rcemfoamed.co.uk/portfolio/ttc-podcast-4-trauma-nursing-research/) and for specific clinical topics such as Thoracotomy/REBOA and Cardiac Arrest. Enthusiasts of dangerous sports and wild places were extremely positive about two new sessions added this year: Remote Critical Care and Motorsport Medicine (http://www.rcemfoamed.co.uk/portfolio/ttc-podcast-3-25-years-between-through-and-over-the-hedges-of-ireland/).

Research and prizes: In addition to new research presented by the invited speakers, close to 50 abstracts were submitted for presentation at the London Trauma Conference 2014. The 44 selected abstracts are published in this supplement, with 35 posters on display for the four days of the conference. 9 authors bravely took up the challenge to make an oral abstract presentation in the unconventionally informal ‘Stand up science’ session.

**MEETING ABSTRACTS**

**A2**

**Bleeding air ambulance patients: an audit of tranexamic acid use**

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Background: Essex and Herts Air Ambulance Trust (EHAAT) teams have carried tranexamic acid (TXA) on all missions since 2012. The CRASH-2 trial demonstrated a reduction in all-cause mortality in trauma patients thought to have significant haemorrhage.

Methods: A retrospective audit was undertaken of all EHAAT missions during 2013. All cases where the patient was classed as ‘positive’ by the Regional Major Trauma Network triage tool (MT+ve) were included. The primary outcome was the administration of the first bolus dose of 1g TXA (or paediatric appropriate dose). Compliance was defined as ‘patients thought to have significant haemorrhage received TXA’. Compliance with the local ambulance service guidelines (trauma patients with hypotension or tachycardia) was also reviewed.

Results: 84 patients were identified as MT+ve, and of these 15 received TXA. There were 8 patients documented as having significant haemorrhage. All of these patients received TXA. Blunt trauma accounted for all but 2 of the patients. The mean initial pulse rate of those patients who received TXA was 107 beats per minute (95% CI +/- 19.9) and the mean pulse rate of those patients who did not receive TXA was 87 beats per minute (95% CI +/- 6.2) (p <0.01). The mean first recorded systolic blood pressure was 101 mmHg (95% CI +/- 15.3) for those patients receiving TXA vs. 128 mmHg (95% CI +/- 6.6) for those who did not (p <0.01).

Conclusions: We have demonstrated that 100% of patients received TXA if attended by our service and thought to be significantly bleeding following trauma. We have also demonstrated alignment with the local ambulance service guidelines pertaining to the use of TXA. Further clarification is required around the indications for TXA in all trauma patients, and EHAAT requires a specific standard operating procedure to ensure that practice is evidence-based and effective.
A3
Trauma research at the scene of injury – proof of concept through collaboration
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Introduction: In the United Kingdom (UK), major trauma networks became operational in April 2012. Based at Queen Elizabeth Hospital Birmingham (QEHB), supported by the Ministry of Defence and University of Birmingham, the National Institute of Health Research Surgical Reconstruction and Microbiological Research Centre (SRMRC) is one of the few 24/7 UK trauma research centres. Having demonstrated success in delivering time critical studies, collaboration with West Midlands Ambulance Service (WMAS) has resulted in transferring research to the scene of injury, demonstrated by the success of The Brain Biomarker After Trauma Study, Golden-Hour.

Methods: Specialist WMAS staff supported by the Midlands Air Ambulance were trained for ‘Golden-Hour’ enrolling patients with a traumatic brain injury (TBI) or an Injury Severity Score (ISS) >8. Operating Procedures and consumable packs were developed allowing sampling without delaying patient care. Blood samples obtained by WMAS within one hour of injury are passed at handover to QEHB for processing. A 24/7 research team based at QEHB ensure support and sample transfer from WMAS and are responsible for consequent sampling and consenting.

Results: Introducing a 24/7 SRMRC team into both pre-hospital and hospital settings has swiftly embedded research into routine trauma care. Whilst ‘Golden-Hour’ continues, enrolment remains ahead of predicted target with over 500 samples collected and recruitment continues to improve rapidly as WMAS staff become familiar with the protocol. The study has proved the concept allowing future collaboration and grant applications, potentially resulting in further innovations for the under-researched trauma population.

Conclusion: Delivering research pre-hospital within one hour of injury requires a highly motivated team but is achievable. Effective integration between pre-hospital and research teams are paramount for any study to succeed. As trauma care evolves and research infrastructures within trauma networks improve, there is vast potential for further engagement with the goal of delivering evidence based pre-hospital trauma care.

A4
‘Silver’ trauma: predicting mortality in elderly major trauma based on place of injury
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Background: Elderly trauma now accounts for more than 20% of UK major trauma [1]. Clearly, elderly trauma patients are at increased risk of morbidity and mortality, but outcome can be difficult to predict. Current evidence is limited to correlations between poor outcome and complex, difficult-to-calculate pre-morbid frailty indices [2]. A simple, evidence-based prognostic marker is needed to guide early management. We hypothesised that elderly patients suffering severe injury at home indoors are frailer, and therefore more likely to succumb to their injuries, than those injured outdoors.

Method: All patients admitted to a London major trauma centre in 2013 aged ≥65 years old with an Injury Severity Score (ISS) >15 were identified using Trauma Audit & Research Network data. Patient demographics, date of death, and injury location (‘at home indoors’ or ‘outside the home’) were recorded and mortality rates compared.

Results: 124 patients were included (M:F = 1.4:1). 58 patients (46.8%) were injured at home indoors; 66 patients (53.2%) outside the home. The groups were equivalent in age (p=0.44) and ISS (p=0.52). 6-month mortality among patients injured at home indoors was 36.2%, nearly double that of patients injured outside of the home (18.2%) (p=0.0267).

Conclusion: Our study found significant correlation between injury location and mortality, suggesting that severe injury inside the home could represent a rough marker of frailty, and therefore, outcome. This could have important implications for prognosticating elderly patients in the resuscitation room, where quick management decisions need to be made by clinicians, patients and relatives. Further studies are needed to evaluate pre-morbid frailty of both groups and to assess functional outcome of survivors.

References

A5
The MOTHER (Major Obstetric Trauma or Haemorrhage EmeRgency) guideline: development of an algorithm for emergency department management of trauma in pregnancy
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Introduction: Trauma is now the leading cause of non-obstetric death in pregnancy. Emergency department (ED) management of trauma in pregnancy may be complicated by physiological compensation for concealed haemorrhage, reduced accuracy of diagnostic examination, a need to coordinate multiple teams, worries about imaging radiation and difficult decisions regarding emergent fetal delivery. Time constraints and emotive circumstances contribute to the challenge. We aimed to develop an evidence-based guideline for early management of trauma or significant haemorrhage concern in pregnant patients presenting to the ED.

Methods: We conducted a non-systematic literature review of publications pertaining to key components of management of trauma in pregnancy. Based on this, as well as experience from within a major trauma centre in London, an algorithm was developed. A multidisciplinary team involving emergency, obstetric, anaesthetic, radiology and neonatal departments contributed. Existing local guidelines were reviewed for incorporation, as well as nationally published recommendations taught within the MOET (Managing Obstetric Emergencies and Trauma) course.

Results: The MOTHER algorithm was created to include pregnant females of ≥20 weeks gestation. It was reproduced in a clear visual format, identifying key resuscitation principles and adopting a stepwise systematic approach. Subsections provided guidance on peri-mortem caesarean as well as management of patients with minimal trauma. Specialty-specific appendices provided individualised team guidance. A decision making tool was developed to aid surgical decisions in abdominal trauma.

Discussion: MOTHER is a simple evidence-based algorithm that aids decisions in the ED, enhances understanding of important physiological principles, incorporates existing resuscitation recommendations and promotes collaboration between teams. As a result MOTHER may reduce adverse events and improve both maternal and fetal outcome. We believe the evidence reviewed is sufficient to recommend adoption of MOTHER at a national level.
A6
Management of drowning and accidental hypothermia: a national survey of the Major Trauma Centres in England

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Background: Unintentional drowning and accidental hypothermia are important causes of death worldwide, and may occur simultaneously. In the case of severe accidental hypothermia with cardiac arrest, recent guidelines recognised extracorporeal membrane oxygenation (ECMO) and cardiopulmonary bypass as safe and effective rewarming techniques, with survival rates of approximately 50%. We assessed whether the Major Trauma Centres (MTCs) in the UK had protocols for the management of hypothermia and drowning, and whether they had access to ECMO and/or bypass.

Methods: We conducted a telephone survey during June 2014, asking the on call trauma consultant or clinical director for trauma 4 simple questions. We established whether they had protocols for the management of drowning and/or hypothermia in their Emergency Department, and whether there was access to ECMO and/or bypass. We also contacted a random selection of Air Ambulances for comparison.

Results: Responses were obtained from 28 of the 30 MTCs (93%), 2 of these had a protocol for drowning (7%), 4 had a protocol for hypothermia (14%), 9 had access to ECMO (32%) and 19 (68%) had access to bypass. Of the 7 Air Ambulances contacted, 6 (86%) had both protocols for drowning and hypothermia and all of those 6 had access to ECMO and bypass.

Discussion: The relatively infrequent yet serious nature of hypothermia and drowning mean that there has been limited data to establish evidence-based guidelines in managing these conditions. This survey shows that less than 20% of MTCs are currently using protocols, with varying access to ECMO and bypass. The recent evidence in this area highlights the need for a clear and recognised pathway from pre-hospital care to centres that can provide this necessary equipment in order to maximise successful outcomes in these patients.

A7
Autologous blood transfusion in trauma: a literature review

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Background: Autologous blood transfusion encompasses a variety of techniques used to recycle and reinfuse shed blood, typically lost during elective surgery. Trauma patients often experience large volume blood loss and have high requirements for allogeneic blood; autologous blood could satisfy these requirements. Despite the theoretical advantages, the technique of autologous blood transfusion has not been widely adopted for trauma patients.

Method: A literature search between January 2000 to March 2014 of PubMed, Embase and the Cochrane collection was performed to examine the current evidence regarding the use of autologous blood transfusion in trauma.

Results: 97 full text articles were assessed. A total of 17 papers were included in the review. The quality of the evidence was generally weak. A number of themes appeared in the literature. 11 papers examined the use of cell salvage in relation to trauma surgery, orthopaedic trauma and Jehovah’s Witness patients. The remaining 6 papers examined the use of autologous blood for traumatic haemothorax, paediatrics and burns.

Discussion: There were few papers published on autologous blood transfusion in trauma. There is evidence that certain injury patterns yield higher volumes of salvageable blood, that transfusion of autologous blood reduces the requirement of allogeneic blood and that autologous blood may be the only source of transfused blood in certain environments. The evidence was not sufficiently strong to make definitive statements regarding the safety or cost effectiveness of autologous transfusion. Further study should focus on the composition of salvaged blood, clinical consequences of autologous transfusion and injury patterns that yield the greatest volume salvageable blood.

A8
Mild, moderate or severe lung injury after trauma: what are the early predictors?

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Background: Lung injury is a common complication following major trauma. Large volume transfusions, thoracic injury, pulmonary contusion, and hyp perfusion have previously been associated with its development [1]. However, early predictors of differing grades of lung injury following trauma are yet to be described. The objective of this study was to characterise the admission risk factors associated with differing severity of lung injury in trauma patients.

Method: This study took place in an urban Major Trauma Centre. We performed a retrospective analysis of prospectively collected data from adult trauma patients (>15 years) enrolled to the ACIT2 study over a five-year period. ACIT2 is an on-going prospective study of 2,800 patients evaluating coagulation and inflammation in trauma [2]. Lung injury was defined using the Murray Lung Injury (MLI) criteria [3]. Mild-moderate lung injury (MMILI) was defined as an MLI score of 0.1-2.5, and severe lung injury (SLI) as a score of >2.5. Multivariate analysis was used to identify independent predictors of lung injury, using SPSS.

Results: Of 812 patients enrolled into the ACIT2 study, 311 were admitted to critical care. Of these 145 (47%) developed MMLI, and 47 (15%) developed SLI. Time period to SLI was longer (Days 6 vs 4, p<0.01). Patients who developed SLI were more severely injured (ISS 33 vs 29, p<0.01), (AIS thorax 4 vs 3, p<0.01) and more shocked on admission (base deficit 4.9 vs 3, p<0.01). The transfusion requirements didn’t influence the severity of lung injury. Independent risk factors associated with SLI were older age (OR 1.07, p<0.01) and injury severity (OR 1.14, p<0.01). The severity of lung injury was not associated with increased mortality rates.

Conclusion: Older age and increased injury severity were independent predictors of severe lung injury in this cohort of patients. Severity of lung injury was not associated with mortality in this study.

References

A9
Management of penetrating abdominal trauma in St Mary’s Hospital Major Trauma Centre

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Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A9

Background: There continues to be a debate into the management of penetrating abdominal injury. The use of CT has improved the safety of conservative management and laparoscopy in trauma has been postulated as an alternative to trauma laparotomy [1].

Method: A retrospective review was undertaken of all patients admitted as a trauma call to St Mary’s Hospital between January 1st 2012 to 30th April 2014 with penetrating abdominal trauma. Information was obtained regarding their mechanism of injury and management through the A+E symphony database, PACS system and the discharge letter database.
Results: 145 patients were identified, 135 males and 10 females, average age 29. Stabbing was the mechanism of injury most frequently accounting for 77% (111/145) of presentations. In total 36% of injuries were managed conservatively, with 64% undergoing operative management. The median length of stay for isolated abdominal injuries, irrespective of pathology found, ranged from 1 day in those conservatively managed; 1.5 days in those undergoing laparotomy; to 6 days for those undergoing a laparotomy.

In patients who had negative intraabdominal pathology the median length of stay was 1 day for both conservatively managed and laparoscoped patients compared to 2 days if they underwent an exploratory laparotomy. Notably 50% of all laparoscoped patients had negative operative findings.

Discussion: Our data shows laparoscopy as a safe alternative to laparotomy in penetrating abdominal trauma, halving the median length of stay. Although laparoscopy has a lower risk profile, 50% of laparoscoped patients had negative findings, potentially suitable for conservative management.

Laparoscopy may be an option for equivocal findings, however the combination of advancing imaging techniques and accuracy of reporting suggest operative management could be reserved for haemodynamically unstable and radiologically proven injuries.

Reference

A10 Identifying the barriers and facilitators to transforming a university hospital into a Major Trauma Centre: a qualitative case study using the Theoretical Domains Framework
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Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A10

Background: Scotland is currently implementing a trauma network with four Major Trauma Centres (MTCs). Transforming successful teaching hospitals in to MTCs is likely to generate various beliefs amongst staff. The Theoretical Domains Framework (TDF) is a tool to elicit and analyse beliefs [1]. This study applied the TDF to explore barriers/facilitators to MTC establishment.

Method: Semi-structured interviews were conducted with 10 participants from a single hospital prior to MTC designation including clinicians, nursing and management staff. A topic guide was designed using the TDF. Interview transcripts were analysed following a framework analysis approach and coded according to TDF domains. Themes were analysed for relevance according to prevalence, expressed importance, discordance and underlying evidence base.

Results: 1728 utterances were coded into 98 themes, of which 57 were classified as relevant barriers/facilitators. Themes addressed 6 key areas: Beliefs towards becoming a MTC (e.g. My optimism/pessimism is conditional upon availability of necessary resources), resource demands (e.g. Recruitment is difficult, and may be affected by (not) becoming a MTC), current capability (e.g. Motivation for trauma varies between departments/individuals), knowledge/skill development (e.g. Maintaining skills is important, as is developing them), trauma teams and a structured trauma pathway (e.g. Someone should lead/coordinate care of trauma patients), and performance improvement processes (e.g. The organisational culture is (not) supportive and geared towards performance improvement).

Conclusions: This study identified a range of barriers and facilitators likely to influence the transition of this hospital into a MTC. Findings highlight a need for clear systems, processes, communication and teamwork, and delineate the complexity of participants’ motivation and optimism/pessimism. This provides a basis for developing targeted interventions to facilitate the implementation process. This is a replicable method of evidence-based service-improvement, which can be applied elsewhere throughout acute care.

Reference

A11 Management of Traumatic Cardiac Arrest from hypovolaemia: is there a consensus?
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Background: The survival rates of Traumatic Cardiac Arrest (TCA) from hypovolaemia remain poor. The underlying pathology differs from medical cardiac arrest and therefore necessitates different management. This has been described in the pre-hospital and resuscitation room setting.

Our hypothesis was that response to cardiac arrest from exsanguinating haemorrhage varied widely when it occurred downstream of the emergency department. We gleaned national opinion on how to manage this pathology when it occurred in transit to, or in, the operating theatre.

Method: A telephone/email survey of all English major trauma centres (MTCs) asked two questions: 1) Did their MTC have an algorithm for in-hospital TCA differing from the ALS cardiac arrest algorithm? 2) If a patient arrested from presumed ongoing haemorrhage, would they receive cardiopulmonary resuscitation (CPR), Adrenaline or just continued filling?

Results: 14 out of 22 MTCs responded. 3 have protocols specifically for in-hospital TCA, all differing significantly.

Responses from the other 10 MTCs varied. 5 centres follow ALS medical protocols and commence CPR. 1 centre would start CPR, but stop for thoracotomy in the case of penetrating trauma. Of those centres not starting CPR, 3 undertake thoracotomy to achieve aortic compression. 2 centres decide on a case to case basis.

ALS protocol followers use 1mg Adrenaline. Some centres give ‘some’ Adrenaline, 7 centres don’t give Adrenaline. 1 centre didn’t know if they would or not. Nowhere favoured just filling and no other action.

Conclusion: There is no consensus on in-hospital treatment of TCA caused by hypovolaemia.

Wide variations in staff training and experience influences TCA management nationally. While much training has been invested in emergency physicians, this training has not extended to anaesthetists who are the team leaders downstream of the emergency department. Confusion regarding the resuscitation from haemorrhage/hypovolaemia may contribute to its high mortality.

A12 Profile of cyclists with head injury admitted to a London Major Trauma Centre
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Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A12

Background: As the number of cyclists in Britain continues to grow [1], interest in cycle safety has increased. The aim of this study was to identify patient characteristics, mechanisms of injury and injury patterns in cyclists with head injury admitted to a London Major Trauma Centre with a view to identifying factors which could increase cycle safety.

Methods: Cyclists with any head injury requiring admission to hospital between January 1st 2011 and December 31st 2013 were identified from...
Intensive Care admissions, Emergency Department records, the Trauma Audit and Research Network and patient lists for the Trauma Ward. After identification of the patient group, data was collected from emergency department and pre-hospital documentation, imaging, toxicology and Intensive Care documentation where relevant.

**Results:** 93 patients were identified with an average age of 37.89% were male. 54% were not wearing helmets. 20% were wearing helmets and helmet use was not recorded for 26%. The most common mechanisms of injury were cyclists vs car (41%) and falls (38%).

There was no pattern of laterality in terms of intracranial or extracranial injuries. In those with intracranial injury 53% sustained contusions, 49% Subarachnoid haemorrhage, 38% subdural haematoma (SDH) and 23% extradural haematoma (EDH). Where helmet use was recorded no patients wearing a helmet sustained an EDH and only 1 had a SDH.

25% of patients had a significant alcohol history or positive alcohol level where 27% had negative alcohol levels, the remainder had no levels sent. 62% of those not wearing a helmet suffered intracranial injuries compared to 32% of those who did.

**Conclusions:** Although numbers in this study are small these results suggest that helmet use is protective against intracranial injury. Additionally 25% of those admitted to hospital with head injury were intoxicated, suggesting that this a risk factor in serious cycling accidents.

**Reference:**

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**A13**

**Could the implementation of a trauma checklist improve quality of care?**

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**Background:** Medical error in trauma care remains common [1]. Checklists are a cognitive aid that can be employed to standardise practice and minimise error. Their usage is ubiquitous in other high-intensity professions, such as aviation. Following the success of the World Health Organisation’s surgical safety checklist they are now in the process of developing a trauma care checklist. My aim was to evaluate whether a checklist could be applied to the trauma setting to facilitate high quality, standardised care.

**Method:** 1. Audit the prevalence of human factors during trauma calls in a major trauma centre in the UK.
2. Literature review of the use of checklists in medicine.

**Results:**
- At least one incidence of negative human factors affecting trauma team performance was observed during each trauma call with the average incidence being three times per resuscitation.
- Evidence suggests that poor communication is the leading cause of medical error. This was corroborated by my audit findings.
- A review of literature shows that checklists in are effective tools for standardising care by reducing error and improving compliance with guidelines [2].

**Conclusion:** It is essential that organisational safety culture is addressed and the subject of human error is acknowledged to improve care provision and enhance patient safety. Checklists represent a promising method of tackling this issue that should be used synergistically with existing management strategies.

**References**
Objective: Intraosseous access (IO) is becoming increasingly accepted in adult populations as an alternative to peripheral vascular access; however there is still insufficient evidence in large patient groups supporting its use.

Methods: Retrospective review. This paper reports on the use of IO devices over a 7 year period from August 2006 to August 2013 during combat operations in Afghanistan. A database search of the Joint Theatre Trauma Registry (JTR) was carried out looking for all the incidences of IO access use during this time. Excel® (Microsoft) was used to manage the dataset and perform descriptive statistics on the patient demographics, injuries, treatments and complications that were retrieved.

Results: 1014 IO devices were used in 830 adult patients with no major complications. The rate of minor complications, the majority of which were device failure, was 1.38%. 5124 separate infusions of blood products or fluids occurred via IO access, with 36% being packed red cells. On average each casualty received 6.95 different infusions of blood products and fluids, and 3.28 separate infusions of drugs through IO access. 32 different drugs were infused to 367 patients via IO, the most frequent being anaesthetic agents. IO access was used in the pre-hospital environment during medical emergency evacuation and within hospitals.

Conclusion: IO access can be used to administer a wide variety of life saving medications quickly, easily and with low complication rates. This highlights its valuable role as an alternative method of obtaining vascular access, vital when resuscitating the critically injured trauma patient.

A16
A standardised approach to pre-hospital RSI in the UK: utility, governance and content of current pre-induction checklists

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Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A16

Background: Pre-hospital Rapid Sequence Induction (RSI) is often performed on patients nearing physiological exhaustion in a complex, challenging environment [1]. Standard Operating Procedures (SOPs) and checklists can be used to improve patient safety [2]. The UK incidence of pre-hospital RSI and the utility and content of these safety constructs are unknown.

Methods: A piloted survey was sent to the lead clinicians for all UK pre-hospital services with potential to be able to deliver RSI. Data was compared for high volume (>50 RSIs per annum) and low volume (≤50 RSIs per annum). Another piloted survey was sent to UK clinicians who themselves perform pre-hospital RSI. Current pre-induction checklists were compared and contrasted in terms of length, content and format.

Results: 58 individual services were identified with 76.8% responding. 69.8% of services have RSI capabilities, 26.7% of which throughout a 24-hour period. 1564 RSIs are performed per annum. SOPs for RSI are used by 80% and checklists by 76.8% of services, (> commonly in high volume services). 78% of these teams have a separate ‘crash-induction’ checklist. Review and revision of checklist content with involvement of clinicians is more common in high volume vs. low volume services. The majority of all clinicians surveyed responded that they both prefer a standardized approach to RSI and that it is safer than allowing absolute autonomy.

There was a large variation in length, content, style and format between the checklists analysed.

Discussion: Despite the availability of pre-hospital RSI being sporadic, it is performed commonly in the UK. SOPs and safety checklists are used more commonly by high volume teams. In the challenging setting of pre-hospital care, these safety constructs may liberate spare bandwidth for utilization on other tasks, although care must be taken to limit the length and simplify the language as much as possible.

References


A17
Analysis of pre-hospital consultations with Crowd Medical Services at Premier League Football Club Fulham (2004-2013): planning for the future

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Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A17

Background: Craven Cottage has seen plans approved for a new riverside stand, raising capacity to 30,000 seats.

Aims and method: The aim of this study was to examine the usage of Crowd Medical Services to plan for increased capacity. We completed a retrospective data analysis (2004-2013) to assess whether the number or type of injuries requiring medical assistance has any correlation to crowd numbers.

Results: Over 9 seasons, there were 830 presentations to medical services, 512 new injuries/trauma and 318 medical presentations. There was one fatal non-traumatic cardiac arrest and 19 assaults.

A18
Ultrasound use in Kent, Surrey and Sussex Air Ambulance: a survey

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Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A18

Introduction: Kent Surrey and Sussex (KSS) air ambulance utilize a portable ultrasound (US) scanning machine with a high frequency linear probe. Current standard operating procedure (SOP) states it should be used as an adjunct to chest assessment. Formal indications for pre-hospital US use are not yet established despite many theoretical uses in the literature.

Aims: This study aimed firstly to assess the use of ultrasound in the unit. Secondly, to survey views on indications for pre-hospital US and finally to audit training and confidence levels within the unit.

Methods: A survey of 17 air ambulance practitioners who attended clinical governance days was undertaken. This consisted of 9 doctors and
8 paramedics/critical care paramedics. The questionnaire was drafted with assistance from the KSS research and audit lead. Results: 69% of clinicians estimated US use in <25% of thoracostomies and 53% estimated use of US in <50% of polytrauma cases. Reasons for not using US varied significantly; the most common being that it would not change management (39%) and a need for thoracotomy regardless (28%). Opinions varied about indications for US, the most popular being thoracic, FAST, cardiac and surgical airway. Training level varied widely; 77.8% doctors undertook the Level 1 course and 87.5% paramedics had HEMS crew course training. Doctors had a mean confidence in performing thoracic US of 77.8% and paramedics 67.5%.

Discussion: Use of US is inconsistent despite inclusion in the SOP. The reason is multifactorial and it is clear from this survey that use and opinion of utility of US varies widely. However, increased formal training, support and supervision could increase use, improve confidence and aid decision making. Despite several possible applications, well designed clinical trials are needed to help define the role of pre-hospital US and courses specific to this may aid uptake of the skill.

A19 Is there still a role for ultrasound in trauma? Jamie Moran, Tim Harris, Jeremy Purdill-Lewis Emergency Department, Royal London Hospital Barts Health NHS Trust, London, UK E-mail: james.moran@nhs.net Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A19

Background: The UK College of Emergency Medicine recommends that level 1 ultrasound competency is a basic standard for EM doctors and is now mandatory for career progression. Focused Assessment with Sonography in Trauma to include the detection of pleural fluid and pneumothorax (the Extended-FAST scan) forms part of this competency. We compare the diagnostic accuracy of E-FAST with the “gold standard” of CT or operative intervention. Trauma team leaders were asked to evaluate point-of-care ultrasound in their decision-making and patient management.

Methods: Setting: Royal London Hospital. The Major Trauma Centre for North East London and base for London’s Air Ambulance. Approximately 2500 adult trauma cases seen per year. Study design: Prospective observational study, comprising convenience sample of adult major trauma presenting to Royal London between October 2012-March 2013 leading to activation of a “trauma call”.

Primary outcome: To assess the diagnostic accuracy of E-FAST in the detection of haemorrhage (free fluid) and pneumothorax in major trauma. Secondary outcome: To assess the impact of E-FAST on trauma team leader’s decision-making process in major trauma care.

Reference Standard: Free fluid or pneumothorax formally reported on CT or found at time of surgical intervention.

Results: 117 patients initially recruited, 45 allowed comparison to reference standard. Sensitivity, Specificity, Positive and Negative Predictive Values for E-FAST (with 95% confidence intervals) were 68.4% (43.5-97.4), 96.3% (81-99.4), 92.9% (66.1-98.8) and 81.3% (63.6-92.8) respectively. 58% of team leaders stated that ultrasound guided their decision-making.

Conclusion: E-FAST has limited sensitivity but high specificity when used in isolation. It influenced trauma team leader’s decision-making 58% of the time, despite reported low sensitivity. The major role of ultrasound is the rapid triage of unstable patients and localization of major haemorrhage to help guide immediate life-saving intervention in this subgroup of patients. May reduce CT load in selected patients but further research needed.

A20 A wearable microwave detector for diagnosing thoracic injuries-test on a porcine pneumothorax model Nils Petter Overland,2,3,5 Ruben Buendia,4,5 Bengt Arne Sjöqvist,4,5,6 Marianne Orpo-Peza-Moe,2 Nina Gjerde Andersen,4 Andreas Frager,4,5 Mikael Persson,4,5,6 Mikael Elam,4,5 Stefan Candeford4,5,6 1Department of Health Studies, Network for Medical Sciences, University of Stavanger, Stavanger, Norway; 2Department of Anaesthesiology and Intensive Care, Stavanger University Hospital, Stavanger, Norway; 3Department of Research and Development, Norwegian Air Ambulance Foundation, Droebak, Norway; 4Chalmers University of Technology, Gothenburg, Sweden; 5MedTech West, Gothenburg, Sweden; 6SAFER Vehicle and Traffic Safety Centre at Chalmers University of Technology, Gothenburg, Sweden; 7Department of Production Animal Clinical Sciences, Faculty of Vetbio, Norwegian University of Life Sciences, Sandnes, Norway; 8Sahlgrenska University Hospital, Gothenburg, Sweden E-mail: nils.petter.overland@me.com Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A20

Background: In the prehospital setting, a point-of-care diagnostic test is needed to diagnose pneumothorax (PTX) and monitor its progression to prevent unnecessary patient morbidity and mortality. Ultrasoundography is more sensitive than supine chest x-ray for diagnosing PTX, but the accuracy depends on the experience of the operator. Therefore, a non-operator dependent instrument would be valuable for detection and continuous monitoring of an evolving PTX.

Study objective: To evaluate the potential of a new microwave technology for diagnosing PTX.

Methods: An experimental PTX model was set up in two anesthetized pigs. A belt with eight microwave antennas was strapped around the pig’s chest. Air was insufflated into a cather in the right pleural space in twelve incremental steps (PTX volumes: 50, 100, 150, 200, 250, 300, 400, 500, 750, 1000, 1500, 2000 mL). Each injection was followed by a measurement with the microwave detector. A computer-based classification algorithm was used to distinguish between the measurements using a leave-one-out approach (i.e. the sample to be classified was not included in the training data matrix), where each PTX volume was treated as an individual class.

Results: The microwave belt was able to differentiate between normal lungs and PTX in both animals with an overall diagnostic accuracy of 100% (i.e. a sensitivity and specificity of 100%). Furthermore, the classification accuracy for predicting the size of PTX was 100% and 98% for each pig, respectively.

Conclusion: The microwave technology proved promising in diagnosing and predicting size of PTX ranging from 50 mL to 2000 mL. This within-model experiment only differentiated PTX and normal lungs in individual pigs and not between different animals. A larger validation study needs to be done to further evaluate the diagnostic accuracy of the microwave detector.

Conflict of interest: The authors state no conflicts of interest. Institution: This preliminary study was conducted at Sandnes Education and Research Center Høyland (SEARCH), Sandnes, Norway.

A21 Observation and rating HEMS Crew in Non-Technical Skills, CRM Medical Simulation in Norwegian Air Ambulance Jan Martinsen Norwegian Air Ambulance Foundation, Drøbak, Norway E-mail: jan.martinsen@norskulftambulanse.no Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A21

Introduction: “Camp Torpomoen” is an annual training camp for HEMS crew in Norwegian Air Ambulance. The main goal is to improve medical treatment of the sick and injured patient. To obtain this, the crew practice in Medical Simulation, team training in a patient scenario, creating realistic environments. The objective for this study was to observe and rate the non-technical skills of the crew in a medical trauma scenario. The results give an implication on the status of the crew performance on CRM.

Method: The method is a behavioral marker system developed by psychologists and anesthetists through a research project in Scotland. The system rates skills in non-technical elements for anesthetists in teams, for psychologists and anesthetists through a research project in Scotland. The results give an implication on the status of the crew performance on CRM.

Method: The method is a behavioral marker system developed by psychologists and anesthetists through a research project in Scotland. The system rates skills in non-technical elements for anesthetists in teams, for psychologists and anesthetists through a research project in Scotland. The results give an implication on the status of the crew performance on CRM.
In total, 28 crews were observed and rated. The training scenario had two learning goals: a clinical (technical) goal and a social/cognitive (non-technical) goal. This observational study only comprises the latter.

Individual skills and performance were included in the overall assessment of the crew. A 4-point scale was used to describe the level of performance demonstrated, 4 being the best. Four categories were observed and given scores: Task management, Team work, Situation awareness and Decision-making. In addition, 15 elements under these categories were rated.

For rating criteria, see the link above. Each crew consisted of an anesthetist as the team leader, a HCM, and a pilot, which is the normal crew concept in the air ambulance service.

**Results:** In total, 28 crews were observed and rated. The results showed that the non-technical skills for the 28 crews ranged between 3.37 and 3.57, with an average value of 3.51. Rating for the 15 elements varied between 2.0 and 4.0 for all crews.

**Conclusion:** The results show that the skills are based on a combination of knowledge in ORBA and understanding their role as a team-member. Rates in the range of 3+ indicate that the performance was of an acceptable standard but could be improved.

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### A22

**Anaesthesiologist-provided pre-hospital advanced airway management in children**

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*Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A22*

**Background:** Pre-hospital advanced airway management has been named one of the top-five research priorities in physician-provided pre-hospital critical care [1]. Few studies have been made on paediatric pre-hospital advanced airway management. The aim of this study was to investigate first-pass success rates and complications related to pre-hospital advanced airway management in patients younger than 16 years of age treated by pre-hospital critical care teams in the Central Denmark Region (1.3 million inhabitants).

**Method:** A prospective descriptive study based on data collected from eight anaesthesiologist-staffed pre-hospital critical care teams between February 1st 2011 and November 1st 2012.

**Results:** Of a total of 25,000 pre-hospital critical care missions, the pre-hospital critical care anaesthesiologists attempted endotracheal intubation in 25 children, 13 of which were less than 2 years old. In one patient, a neonate (600g birth weight), endotracheal intubation failed. The patient was managed by uneventful bag-mask ventilation. All other children had their tracheas successfully intubated by the pre-hospital critical care anaesthesiologists.

**Conclusion:** Over-all first pass success-rate was 75.0%. In the group of patients younger than 2 years old, first pass success-rate was 53.8%. The overall rate of airway management related complications was 20% in children younger than 16 years of age and 38% in children younger than 2 years of age (n=13). No deaths, cardiac arrests or severe bradycardia (heart rate <60) occurred in relation to pre-hospital advanced airway management.

**Discussion:** Compared to the adult population [2] the overall first-pass success rate is low. The complication rates (hypoxia, hypotension, aspiration and oesophageal intubations) in the paediatric population are higher than previously described in our pre-hospital advanced airway management patient population as a whole [2]. This illustrates that young children may represent a substantial pre-hospital airway management challenge even for experienced pre-hospital critical care anaesthesiologists.

**References**


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### A23

**Weekly simulation for an on call helicopter emergency medical crew: feasible or impossible?**

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*Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A23*

**Background:** In-situ training can be a time-effective way to give pre-hospital personnel an opportunity to train procedures and interventions as a team. We describe the feasibility of weekly simulation training for on-duty crews at Oslo, Norway, helicopter emergency medical service (HEMS).

**Methods:** HEMS crews (doctor, HEMS crew member and pilot) were given the opportunity to do in-situ simulation during on call hours once a week. A simple mannequin and training equipment similar to equipment used in daily practice in the service were used. All training took place locally, either indoors or outdoors near the base. A single facilitator conducted all training during daytime. Scenarios were changed to allow all doctors to go through a set of themes during one year, and to give variability for the rest of the crews. We recorded data on the number of simulations that were carried out and time consumption, and collected data from the participating crews on a feedback form.

**Results:** During one year 52% of the planned simulations were completed. The major reasons for not performing training were missions. The median total time (and interquartile range (IQR)) for a complete simulation training episode was 65 min (58,74). The median score from the participants regarding “attitude to this kind of training” was 1 on a 7 pt Likert scale (1=most positive score possible).

**Discussion:** Weekly simulation provided a unique opportunity to train the whole crew in medical matters, team matters and decision-making. This form of training is cost effective because it takes place during working hours for the on-call crew. By training on-site with familiar operational equipment the HEMS rescue man and the pilot also get hands-on training and familiarisation with procedures and equipment.

**Conclusion:** In situ simulation training during on-call hours is feasible in a busy HEMS service with no additional costs than for a facilitator.

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### A24

**Liga do trauma – the structure of student societies as teaching method of trauma in brazil**

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*Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):A24*

**Introduction:** “Liga do Trauma” (translated as “Trauma Leagues”) are Student Societies dedicated to learn Trauma as an extracurricular subject within Medical School. Students ranging years 1 to 6 participate in the society being stimulated to give lectures, write papers and clinical reviews, organize events to educate healthcare workers (reaching nurses, Rescue Team volunteers, Firemen, etc.), and also spread information to lay community. Brazil is a massive country with an equally gigantic incidence of Trauma Injuries, thus the professional must be trained to identify and treat Trauma regardless the future choice of specialization. This structure of societies is spreading with more than 50 “Leagues” installed in different Brazilian Universities.

**Objectives:** Using “Liga do Trauma da UFCSPA” as a model, we want to expose our inner structure and discuss the applicability of our projects and interventions.

**Methods:** Presentation of the Society. Expose the projects: 1. Present weekly lectures on First Aid, Pre-Hospital and Intra-Hospital Care to all Health Faculties of UFCSPA; 2. Host biannual courses on Practical Immobilization in Trauma, Clinical Emergencies, Suture and Surgical Knots, all open to public; 3. Schedule visits to Primary and High Schools with campaigns and teaching material on Prevention of Domestic Injuries and Basic Life Support (BLS); 4. Join...
work with “Ligas” in national impact projects, such as the “National CPR Day”; S. Collaboration with the Pre-hospital Care System in Brazil (SAMU – Servicio de Atendimento de Urgencia) with active participation on FIFA World Cup 2014, among many others.

Conclusions: Student Societies are growing in Brazil with similar structures and very effective measures of teaching Trauma. The student is seen as capable of getting involved with the subject before reaching higher Surgical or Emergency levels in the Medical Career. Being part of a “League” can subjectively lead the student to follow a career path in Trauma.

A25
Ebola virus: from in-situ simulation to SOP development
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Pre-hospital care (PHC) personnel can be exposed to patients with infections at any time. The recent epidemic of Ebola hemorrhagic fever has highlighted the need for guidelines (SOPs) and competence in handling patients with infectious diseases in a safe manner, for both patient and PHC crew. Low fidelity in situ simulation can be an effective tool for training crews and developing SOPs.

Methods: Three on call Helicopter Emergency Medical Service (HEMS) crews (HEMS physician, HEMS crew member and pilot) participated in a simulation exercise on management of a patient with potential symptoms of Ebola virus disease. A HEMS physician trained as a simulation training facilitator facilitated the simulation. Goals for the simulation exercises were: correct management of the patient, correct use of personal protection equipment (PPE), and team safety on scene. The HEMS crew provided feedback after the training on a standardised feedback form with closed questions using a 7 point Likert scale. During the debriefing the facilitator recorded important learning points that could be used to improve SOPs.

Results: All crewmembers provided feedback after the training. All reported high degrees of satisfaction and realism within the simulation on a 7-pt. Likert scale. A total of 12 points of potential danger and the need for focused training were identified. This resulted in the development of an improved SOP in the department. The teams involved agreed that simulation was a more efficient training method than traditional “PPE on/PPE off” training.

Conclusion: Low fidelity simulation with the on call HEMS crew is an effective way to combine relevant training with the development and improvement of SOPs in an area where there is little clinical experience.

A26
Pre-hospital diagnosis for stroke and trauma patients using microwave technology
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Background: For stroke and traumatic brain injury (TBI) patients minimizing the time from stroke onset/accident to treatment is fundamental to increase the chances of achieving good clinical outcome. For patients with ischemic stroke thrombolytic treatment may be effective, but only 1–8% receive this treatment due to delays in seeking medical attention and late diagnosis. TBI patients with severe injury require immediate transportation to a trauma center. Microwave technology (MWT) has potential to be used for prehospital diagnosis of stroke and TBI patients by detecting intracranial bleedings and thereby make prehospital thrombolysis for stroke patients possible and increase triage accuracy for TBI patients.

Methods: Two clinical trials enrolling 20 + 25 stroke patients performed with research prototype systems (Brain Alfa and Stroke finderR10, Medfield Diagnostics AB, Göteborg, Sweden) have been completed. Two further studies are ongoing.

Regarding TBI laboratory experiments using a human cranium phantom and numerical simulations of subdural hematomas (SDH) have been performed. The first clinical study assessing the potential for MWT to detect SDH has recently started.

Conclusions: MWT has potential to improve the acute care for stroke and trauma patients by making a prehospital diagnosis. This would lead to decreased human suffering and large societal economic savings.

Reference

A27
Endotracheal intubation with and without night vision goggles in a helicopter and emergency room setting – a manikin study
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Background: Securing the airway by endotracheal intubation (ETI) is a key issue in civilian and military pre-hospital critical care. Night vision goggles (NVG) are used by personnel operating in low-light tactical environments. We examined the feasibility of an anaesthesiologist performing ETI using binocular NVG in a helicopter setting.

Methods: Twelve anaesthesiologists performed ETI on a manikin in an emergency room (ER) setting and two helicopter-settings, with randomization to either rotary wing daylight (RW-D) or rotary wing in total darkness using binocular NVG (RW-NVG). Primary endpoint was intubation time. Secondary endpoints included success rate, Cormack-Lehane (CL) score and subjective difficulty according to the Visual Analogue Scale (VAS).

Results: The median intubation time was shorter for the RW-D compared to the RW-NVG setting (16.5 s vs 30.0 s; p=0.03). We found no difference in median intubation time for the ER and RW-D settings (16.8 s vs 16.5 s; p=0.91). For all scenarios success rate was 100%. CL and VAS varied between the ER setting (CL 1.8, VAS 2.8), RW-D setting (CL 2.0, VAS 3.0) and RW-NVG setting (CL 3.0, VAS 6.5).

Conclusion: This study suggests that anaesthesiologists successfully and quickly can perform ETI in a helicopter setting both in daylight and in darkness using binocular NVG, but with shorter intubation times in daylight.

Conflicts of Interest: The authors have no conflicts of interests.
Background: Crew configuration in helicopter emergency medical service (HEMS) is a long debated topic. Different systems have seemingly good arguments for their choice of crew concept, but there is no solid scientific evidence available to support the benefit of any crew concept, especially in terms of medical benefit for the patient. To evaluate the rationale behind different crew compositions we invited international HEMS systems to participate in a survey to document crew concepts, crew competence and perceived benefit or disadvantage of the different crew concepts; the HEMS medical crew survey. We here present preliminary data from the survey.

Method: Medical directors of HEMS-services in Europe, North America, Australia, New Zealand and Japan were invited to complete a web based questionnaire (SurveyXact®) with five parts: “Basic information of your service”, “Mission data from 2013”, “Regular crew”, “Additional personnel by demand” and “Evaluation of crew configuration”. The survey was open between June 1st and October 15th, 2014. All respondents were blinded to the researcher. The study was approved by the Data Protection Official in Norway and exempted from ethical approval.

Results: The survey received 111 submissions. Forty-four submissions did not contain sufficient data regarding crew and were excluded. The remaining 67 submissions had the following geographical distribution: Australia 3, Austria 1, Czech Republic 7, Finland 9, France 2, Greece 1, Hungary 1, Ireland 1, Japan 1, Netherlands 4, Norway 5, Poland 1, Spain 4, Sweden 3, Switzerland 2, United Arab Emirates 1, United Kingdom 4 and USA 17. Of all systems 73.1% had a 3-crew system, 23.9% a 4-crew system and 3.0% had a regular crew with 5 or 6 on board. Most services operated single pilot (85.1%), whereas the rest operated with two pilots (14.9%). In six (9.0%) services other non-medical crew such as hoist operator, mechanic or rescuer were part of the regular crew.

Medical staffing in HEMS was reported as a combination of two or more of the following categories: physician (73.1%), nurse (52.2%), emergency medical technician (EMT)/paramedic (40.3%), hems crew member (HCM) (38.8%) and respiratory therapist (RT) (6.0%). The HCMs in this survey are all trained as a nurse or EMT-paramedic, but in addition also act as a pilot assistant and often rescue specialist.

There was a large variety of medical staffing models reported in the survey. The three most common medical staffing models were physician and HCM (26.9%), physician and nurse (23.9%) and nurse and EMT/paramedic (16.4%).

One third (34.9%) of the respondents wanted to change the medical crew composition if allowed; 84.1% wanted a physician in the crew, 52.4% a nurse, 41.3% a HCM, 38.1% an EMT-paramedic and 15.9% a RT.

Conclusion/discussion: Because we could not get access to databases of the medical directors in all the countries surveyed we cannot evaluate the response rate of our survey. Based on the systems we do know the number of HEMS systems in we know that the response rate for individual countries varies from 0 to 100%. This implies that our results cannot be fully representative of the countries surveyed. They do however provide an impression of the diversity in crew concepts and the rational behind the different crew concepts.

The survey data shows that there is no standard medical staffing, but that a combination of a physician and HCM or nurse is often found in the countries surveyed. Many HEMS systems believe that a physician must be part of the crew, but there is little consensus on the competence of the additional medical crewmember. Further studies must explore the impact of different medical crew models on patient care and patient safety to clarify which model is the best.
is needed. Using airway skills is one way to do this for paramedics and emergency medical technicians.

**Reference**


**ORAL PRESENTATIONS**

**O1**

Changing landscapes for plastic surgery: the effect of the Major Trauma Network on emergency operative workload

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*Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2015, 23(Suppl 2):O1

**Background:** The advent of major trauma centres (MTCs) in the UK in 2010 has led to a concentration of complex, polytrauma cases in these centres. The role plastic surgeons play in trauma has increased and evolved over time [1], and currently plastic surgeons input into a wide variety of trauma [2]. Our study aimed to analyse the effect of MTC status on plastic surgery activity at our centre.

**Method:** All trauma patients admitted to a London MTC in 2013 who underwent an operation were identified using Trauma Audit & Research Network data. Operative procedure(s) and operating specialty were recorded. This was compared to local historical data from pre-MTC go-live (2008–2010).

**Results:** Of the 2060 trauma calls in 2013, 416 patients required surgical intervention. 29.3% of these patients (n = 122) were operated on by plastic surgeons (either as sole operating team or part of multi-specialty team). 76.2% (n = 93) involved lower limb trauma and 30.3% (n = 37) upper limb trauma. Emergency general extremity referrals increased from an average of 65/year to 484/year in the period 2011 to 2013, whilst plastics operative workload increased from an average of 53 cases/year to 407/year in the same period. This represents a more than sevenfold increase in the plastic surgery operative workload at our centre.

**Conclusion:** There has been a dramatic increase in emergency plastic surgery activity following designation of major trauma centre status at our centre. Understanding the epidemiology of plastic surgery is vital to improve service design, postgraduate training in the specialty, and workforce provision [1].

**References**


**O2**

The utility of animal models in high fidelity trauma simulation

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**Background:** Simulation is a well-established method of training trauma teams. The use of animal models within simulation has been described by the military [1], but is less common in civilian practice. As part of the Queen Mary Masters of Trauma Sciences summer school, trauma simulation has been run with and without animal models.

**Method:** Two courses were run incorporating animal models and two without. Feedback forms were reviewed. Free text learning points were mapped to the Crisis Resource Management framework [2] or recorded as technical or unclassified statements. Feedback was compared between courses to see if animal models altered the educational focus. The faculty experience of using animal models is discussed.

**Results:** 60 feedback forms were reviewed, 34 from courses with animal models and 26 from courses without. There were similar ratings of satisfaction in both groups. There were 167 learning points, 94 from courses with animal models and 73 from courses without. Both groups reported communication as the most common learning point. In the animal model group more candidates commented on fixation and attention errors. There were more technical learning points in the non-animal model group.

**Specific comments regarding the use of animal models were generally positive.**

**Discussion:** Animal models provide a method of simulating specific trauma skills (e.g. thoracotomy) in real time. They provide a good example of task focus and fixation. However animal models are expensive, alter scenario fidelity and provide an uneven experience for all candidates.

**References**


**O3**

A retrospective cohort analysis of ionised calcium levels in major trauma patients who have received early blood product transfusion in the Emergency Department

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**Background:** Exsanguination and coagulopathy remain one of the leading causes of preventable trauma related death [1]. Low ionised calcium levels have been associated with hypotension and increased mortality [2]. Blood product contains citrate that acts as a calcium chelating agent. We hypothesized that trauma patients are at risk of hypocalcaemia and blood products given to resuscitate them would reduce serum Calcium concentration, and therefore affect 30-day mortality.

**Methods:** A retrospective cohort analysis was performed on all major trauma patients who had received early blood product in the Emergency Department of a single London Major Trauma Centre over a one year period (January 2013 – January 2014). Ionised calcium levels were taken from venous blood gases from before and after blood product had been transfused. Excel was used to analyse the data.

**Results:** The study included 60 patients aged between 10 and 92 (mean 40), 46 male (77%) and 14 female (23%). Mechanism of injury was predominantly blunt 48 (80%) and penetrating 12 (20%). Patients received between 1 and 16 units of blood product (mode 2). Mean ISS was 26 (5-50) and overall 30 day mortality was 12%.

60% were hypocalcaemic on arrival before receiving any blood product (Mean [Ca] 1.1 mmol/L 95% CI 1.08 – 1.13) 89% of patients were hypocalcaemic after receiving blood product (Mean [Ca] 0.95 mmol/L 95% CI 0.9 – 1.01). There was a statistically significant difference between ionized calcium levels pre and post blood transfusion. A drop in calcium was seen after receiving just one unit of packed red blood cells, with the average drop being 0.05 mmol/L per unit of blood product received.

**Conclusion:** Trauma patients that have sustained blood loss are at risk of hypocalcaemia. Receiving just one unit of blood product further compounds their hypocalcaemic state and the more units that are given the greater the fall that is seen.

**References**


O4 Characteristic of intoxicated cyclists compared to sober cyclists admitted to a London Major Trauma Centre
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Background: Studies have suggested that alcohol is an independent risk factor for cycling accidents [1]. This study aimed to compare mechanisms of injury, injury patterns and helmet use in intoxicated and sober cyclists.

Methods: Cyclists admitted to a London Major Trauma Centre were identified from Emergency Department Records, the Trauma audit and research network, Major Trauma Ward Lists and intensive care admission documents. Admission toxicology and prehospital and emergency department documentation were analysed to identify patients who had negative alcohol tests and those who had elevated blood alcohol levels or a history of recent alcohol ingestion. Lack of a history of alcohol use was not used to identify sober cyclists. These patient groups were then analysed to assess helmet use and injury pattern.

Results: Initially 186 cyclists were identified (152 males and 28 females) and of these 80 had blood alcohol levels or positive history recorded. Of the 186 cyclists 10% of female cyclists were intoxicated compared to 20% of males. In the intoxicated group (n=32) fall was the most common mechanism of injury (53%) whereas in the sober group (n=46) collision with a car was the most common (52%). In those for whom helmet wearing data was available (17 intoxicated, 36 sober) 82% of drunk cyclists weren’t wearing a helmet compared to 55% of sober cyclists. Injury patterns were similar in both drunk and sober groups.

Discussion: This study was limited by the lack of toxicology data available. However it showed that intoxication was present in at least 18% of those admitted to a major trauma centre following cycling accidents. It was also identified that intoxicated cyclists were less likely to protect themselves with a helmet and in contrast to sober cyclists were less likely to have accidents involving other road users.


O5 MicroRNA-mediated regulation of IL-10, IL-12 and TNFα gene expression in severely injured trauma patients
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Background: Severe trauma induces a blunted immune response associated with an enhanced susceptibility to nosocomial infections [1]. Within 2 hours of injury, expression of the prototypical anti-inflammatory cytokine, IL-10, increases whilst expression of the pro-inflammatory cytokines, TNFα and IL-12, decreases [1]. We hypothesise that microRNAs (miRs) may exacerbate this immunosuppressive gene expression pattern.

Methods: Following ethical approval and consent, 30 ICU patients admitted following trauma and 16 healthy age and sex-matched controls were recruited. Blood samples were obtained within 2 hours of injury and at 24 hours. miRs were isolated using PAXGene (Qiagen). miRs were selected on the basis of their miRBase target prediction scores for the promoters of IL-10, IL-12 and TNFα. Six miRs selected for analysis were miR34ab, -202 and 125asp (IL-10), -410 and -21 (-12) and -454 (TNFα). qPCR was used to quantify candidate miRs and the results were normalised relative to small nuclear RNAs U6/RNU44. Infections were assessed using predefined criteria [2].

Results: Twenty three patients (77%) developed an infection, 15 (50%) were shocked (base deficit ≥ 6 meq/L) on admission and 6 (20%) died. Within 2 hours, expressions of miR-202, -125as3p, -21 and -454 were reduced (all p<0.03) in patients compared to healthy controls. This reduction was maintained (all p<0.01) 24 hours after injury. At 24 hours, miR-202 was down-regulated (2.4-fold, p<0.01) in shocked compared to non-shocked patients. Decreased miR-34ab expression on admission was associated with subsequent development of pneumonia (p=0.009).

Conclusion: Expression of miRs complementary to cytokine promoters varies significantly following severe traumatic injury and is associated with clinical outcomes. Reduction in inhibitory miRs could partly explain increased IL-10 expression and provide a mechanistic link between severe trauma, the observed immunosuppressive phenotype and an increased incidence of nosocomial infections. In vitro studies are now needed to invoke causation.

References

O6 An exploration of the views of paramedics regarding airway and resuscitation research
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Introduction and aims: Paramedics are a skilled group of clinicians with expertise in cardiac arrest. Our research group has complete a trial to compare two supraglottic airway devices with current practice during cardiac arrest (REVIVE-Airways). This is a highly contentious topic amongst UK paramedics, The study aimed to explore the existing customs and beliefs surrounding intubation and resuscitation by UK paramedics.

Method: We used a two level qualitative approach, conducting interviews and focus groups with paramedics. Focus groups discussed the themes arising from the interview data, developing a deeper understanding and providing insight and recommendations for future research and policy development.

Setting: The study took place within Great Western Ambulance Service NHS Trust (GWAS). The University of the West of England, Bristol, provided sponsorship and governance. As the trial was on NHS staff ethical committee approval was not required.

Selection & data collection: Paramedics were sampled purposefully to account for differing training and subsequently customs and beliefs and participation or not in the large trial. Supplementary snowballing was used to further identify interested/eligible paramedics. There were 34 study participants, with 17 paramedic interviews; followed by 5 focus groups with a further 17 participants. Data saturation was reached.

Results: Thematic analysis was conducted. This was done in 2 stages: after interviews as a guide for focus groups, and after the focus groups. Early analysis suggests that this group of paramedics were pro-research even though some had not taken part in the earlier trial. They described four aspects of paramedic identity (figure 1). Specific discussion regarding intubation was focussed upon patient safety, with debate regarding the necessity of intubation in comparison to the use and success of other techniques. This stimulated concern regarding lack of training and subsequent skill fade through lack of rehearsal and competency testing. This invigorated debate about whether all paramedics should perform this task. Views differed with some vehemently protective of this skill, while others were more sanguine about this in relation to...
other recent skills. Frequent reference was made to the difficult situations paramedics find themselves in, specific injuries or illnesses and co-morbidities and the difficulty in retrieval of patients as a rationale for retaining the skill.

Conclusion: Future trials in prehospital care must involve paramedics and ensure their professionalism is understood and respected.

**O7** Dyspnea is a dangerous symptom in the pre-hospital setting
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**Background:** Electrocardiogram (ECG) based telemedicine is a cornerstone in pre-hospital triage of patients with suspected ST-elevation myocardial infarction (STEMI). An ECG transmitted from the ambulance is reviewed by a cardiologist on-call in case of ongoing or recent chest pain, resuscitation from cardiac arrest, acute dyspnea of unknown origin and other suspicion of STEMI. We hypothesize that unresolved dyspnea is an independent predictor of mortality in this prehospital setting and that the mortality is higher in patients with acute dyspnea of unknown origin than in patients with chest pain.

**Methods:** Population based follow-up study. We included patients triaged using ECG based telemedicine in the Central Denmark Region from June 1, 2008 to January 1, 2013 in our analyses. Mortality-data was obtained from the Danish Civil Registration System. Since survival curves did not fulfill the proportional hazards assumption, Cox proportional hazards regression was waived. Instead, to determine relative risks, we used a generalized linear regression model using pseudo-observations.

**Results:** A total of 17,361 patients were triaged by use of ECG based telemedicine. The indication was chest pain in 12,204 (70%) of the patients, acute dyspnea of unknown origin in 1,461 (8%), resuscitated from cardiac arrest in 163 (1%) and other suspicion of STEMI in 3,533 (20%). When adjusting for age, sex, systolic blood pressure and Charlson Comorbidity Index (p<0.001), 30-day mortality was higher in patients with unresolved dyspnea than in patients with chest pain with a RR 2.55 (CI 2.09-3.10). This difference remained significant at 4 years with a RR of 1.34 (CI 1.24-1.45).

**Conclusion:** Acute dyspnea of unknown origin in the pre-hospital setting is an independent predictor of mortality and the mortality is higher than in patients with chest pain. Future research should focus on possibilities for improving early diagnosis and treatment of these patients.

**O8** Implementing videolaryngoscopy in anaesthetist-staffed pre-hospital critical care
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**Background:** Pre-hospital endotracheal intubation may be challenging, even in expert hands [1,2]. Difficult or failed endotracheal intubations are associated with complications that can be life threatening [1] and the risk of complications increases when the first endotracheal intubation attempt is not successful[2]. The McGrath® MAC videolaryngoscope may have the potential to improve first-pass success rates [3] and reduce complication rates and we therefore introduced this as the standard primary device for endotracheal intubation in our anaesthetist-staffed pre-hospital critical care services. As part of the quality insurance program, we investigated the attending anaesthetists’ adherence to this new standard and their reasons for non-adherence.

**Method:** The attending pre-hospital critical care anaesthetists prospectively reported data from all pre-hospital endotracheal intubations according to the recommendations made by Sollid et al. together with additional information about their use of the videolaryngoscope. We excluded patients younger than 15 years of age. Study period: The first nine months following implementation of the videolaryngoscope; December 15th 2013 to September 15th 2014.

**Results:** Out of 229 consecutive pre-hospital endotracheal intubations, 211 (92.1%) were performed using the videolaryngoscope as the primary device. The overall pre-hospital endotracheal intubation success rate...
using the videolaryngoscope was 91% (n=192) and the first-pass success rate was 80.1% (n=165).

The most common reason for not using the videolaryngoscope (n=18) was expected poor visualisation (n=10) most often due to either blood, water or stomach contents in the airways (n=5) or sunlight on the screen (n=3).

**Conclusion:** Our results show a high degree of adherence to the new standard of using the videolaryngoscope as the primary device for pre-hospital endotracheal intubation. The results indicates that the pre-hospital critical care anaesthetists were not confident in using the McGrath® MAC videolaryngoscope as a primary device for pre-hospital endotracheal intubations in patients with secretions, blood or gastric content in their airways.

**References**


**O9**

Severe traumatic brain injury- physician provided pre-hospital care and early neurosurgical treatment are associated with improved survival

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**Background:** Worldwide, traumatic brain injury (TBI) is a leading cause of death and permanent disability [1]. Early and appropriate management of TBI is critical to the survival of these patients [1]. The aim of this study was to compare the outcome of TBI patients in two emergency medical service (EMS) systems.

**Method:** A 6-year period observational data on pre-hospital TBI management in physician versus paramedic staffed EMS systems were retrospectively analysed. Inclusion criteria were isolated TBI with Glasgow coma scale (GCS) ≤ 8 on-scene or during transportation. Patients with life-threatening multiple trauma, secondary transfers and patients deceased on-scene were excluded. Evaluation was based on patient records one year after the incident. For assessment of neurological outcome, modified Glasgow Outcome Score (GOS) was used. The time and cause of death were recorded.

**Results:** The physician (n = 275) and paramedic (n = 183) EMS patient groups were similar regarding demographic variables, mechanism of injury, time to reach the patient and first recorded on-scene GCS. Airway was secured in physician EMS group in 98 % and paramedic EMS group in 16 % of the patients (p < 0.001). Emergency neurosurgery was performed on 45 % and 30 % of the patients after hospital admission (p < 0.001). A statistically non-significant trend towards better neurological outcome was observed favouring physician provided pre-hospital care - 38 % of the physician and 31 % of the paramedic treated EMS patients had a good neurological recovery (GOS 4-5) with independent life one year after the event. Correspondingly, the overall one-year mortality rate was lower in the physician staffed EMS group: 43 % vs. 57 % (p < 0.01).

**Conclusion:** TBI patient mortality was significantly lower and good neurological outcome higher in patients treated by the physician EMS group compared to the paramedic EMS group.

**Reference**