Clinical trials and systematic reviews


Aim: We aimed to compare the relative efficacy of tropisetron and metoclopramide in treating nausea/vomiting in undifferentiated ED patients.

Methods: We undertook a randomized, double-blinded, clinical trial. Adult patients requiring treatment for nausea/vomiting were randomly assigned to either tropisetron (5 mg) or metoclopramide (10 mg), by i.v. bolus. The primary end-point was incidence of vomiting. Secondary end-points were decrease in nausea score from baseline (0–100 VAS), the requirement of ‘rescue’ anti-emetics, ongoing nausea over 48 h and side-effects. Results: Fifty patients were enrolled in each group. The demographic variables, presenting complaints and nausea scores at baseline did not differ (P > 0.05). By 180 min, two (4.0%) and nine (18.0%) patients had vomited in the tropisetron and metoclopramide groups respectively (difference 14.0%, 95% CI 0.1–28.0, P = 0.05). Also, there were two and 20 episodes of vomiting respectively. Vomiting rates were 0.02 and 0.16 episodes/person-hour (difference 0.14 episodes/person-hour, 95% CI 0.07–0.21, P < 0.001) respectively. By 60 min and thereafter, the decrease in nausea score from baseline was greater (although not significantly so) in the tropisetron group. At 180 min, the decreases were 47.9 mm and 37.0 mm respectively (difference 10.9 mm, 95% CI −0.7–22.6). Five (10.0%) and 13 (26.0%) patients required a rescue anti-emetic respectively (difference 16.0%, 95% CI −7.7–34.0, P = 0.25). Conclusions: Tropisetron was associated with a significantly lower vomiting rate and shows promise as an alternative anti-emetic in the ED.


The acute administration of high-dose erythropoietin (EPO) on reperfusing ischaemic myocardium has been reported to halve myocardial infarct (MI) size in preclinical studies, but its effect in ST elevation myocardial infarction patients undergoing primary percutaneous coronary intervention (PPCI) remains unknown. We investigated whether high-dose EPO administered as an adjunct to PPCI reduces MI size. Design: Double-blinded, randomised, placebo-controlled. Setting: Single tertiary cardiac centre. Patients: Fifty-one ST elevation myocardial infarction patients undergoing PPCI. Interventions: Patients were randomly assigned to receive either a single intravenous bolus of EPO (50,000 IU) prior to PPCI with a further bolus given 24h later (n=26) or placebo (n=25). Main outcome measures: MI size measured by 24h area under the curve troponin T and cardiac magnetic resonance imaging performed on day 2 and at 4 months. Results: EPO treatment failed to reduce MI size (troponin T area under the curve: 114.6±78 ug/ml EPO vs 100.8±68 ug/ml placebo; infarct mass by cardiac magnetic resonance: 33 ±16g EPO vs 25 ±16g placebo; both p>0.05). Unexpectedly, EPO treatment doubled the incidence of microvascular obstruction (82% EPO vs 47%...
placebo; p=0.02) and significantly increased indexed left ventricular (LV) end-diastolic volumes (84±10 ml/m² EPO vs 73±13 ml/m² placebo; p=0.003), indexed LV end-systolic volumes (41±9 ml/m² EPO vs 35±11 ml/m² placebo; p=0.035) and indexed myocardial mass (89±16 g/m² EPO vs 79±11 g/m² placebo; p=0.03). At 4 months, there were no significant differences between groups. Conclusions: High-dose EPO administered as an adjunct to PPCI failed to reduce MI size. In fact, EPO treatment was associated with an increased incidence of microvascular obstruction, LV dilatation and increased LV mass.

Guideline 14: Acute coronary syndromes


The purpose of this study was to compare 600- and 300-mg clopidogrel loading doses in patients with ST-segment elevation myocardial infarction (STEMI). Background: Given the high thrombotic risk of patients with STEMI, greater platelet inhibition may improve outcome in those patients receiving percutaneous coronary intervention (PCI). Although observational data suggest that pretreatment with a 600-mg clopidogrel loading dose may be more effective than the 300-mg regimen in primary PCI, this hypothesis has never been tested in a randomized study.

Methods: A total of 201 patients undergoing primary PCI for STEMI randomly received a 600-mg (n = 103) or 300-mg (n = 98) clopidogrel loading dose before the procedure. The primary endpoint was the evaluation of the infarct size, defined as the area under the curve of cardiac markers. Results: Infarct size was significantly lower in the high-dose regimen: median creatine kinase-myocardial band 2,070 ng/ml (interquartile range [IQR]: 815 to 2,847 ng/ml) versus 3,049 ng/ml (IQR: 1,050 to 7,031 ng/ml) in the 300-mg group, p = 0.0001; troponin-I 255 ng/ml (IQR: 130 to 461 ng/ml) versus 380 ng/ml (IQR: 134 to 1,406 ng/ml), p < 0.0001. In the 600-mg arm, Thrombolysis In Myocardial Infarction flow grade < 3 after PCI was less frequent (5.8% vs. 16.3%, p = 0.031), left ventricular ejection fraction at discharge was improved (52.1 ± 9.5% vs. 48.8 ± 11.3%, p = 0.026), 30-day major adverse cardiovascular events were fewer (5.8% vs. 15%, p = 0.049), and bleeding/entry site complications were not increased (secondary endpoints). Conclusions: In STEMI patients, pre-treatment with a 600-mg clopidogrel loading dose before primary PCI was associated with a reduction of the infarct size compared with a 300-mg loading dose, as well as with improvement of angiographic results, residual cardiac function, and 30-day major adverse cardiovascular events; further studies are warranted to evaluate impact of such strategy on survival.

Guideline 14: Acute coronary syndromes


Objectives: The ability to auscultate during air medical transport is compromised by high ambient noise levels. The aim of this study was to
assess the capabilities of a traditional and an amplified stethoscope (which is expected to reduce background and ambient noise) to assess heart and breath sounds during medical transport in a Falcon 50 plane. Methods: A prospective, double-blind, randomized study was performed. We tested 1 model of traditional stethoscope (Littman cardiology III) and 1 model of amplified stethoscope (Littman 3100). We studied heart and lung auscultation during real medical evacuations aboard Falcon 50 (medically configured). For each, the quality of auscultation was described using a numeric rating scale (ranging from 0 to 10, with 0 corresponding to ‘hear nothing’ and 10 corresponding to ‘hear perfectly’). Comparisons were accomplished using a t test for paired values. Results: A total of 32 comparative evaluations were performed. For cardiac auscultation, the value of the rating scale was 5.8 ± 1.5 and 6.4 ± 1.9, respectively, for the traditional and amplified stethoscope (P = .018). For lung sounds, quality of auscultation was estimated at 3.3 ± 2.4 for traditional stethoscope and at 3.7 ± 2.9 for amplified stethoscope (P = .15). Conclusions: Practitioners in Falcon 50 are more able to hear cardiac sounds with an amplified than with a traditional stethoscope, whereas there is no significant difference concerning breath sounds auscultation.

The impact of a coronary revascularization strategy (early or deferred) on clinical outcomes of non ST-segment elevation acute coronary syndrome (NSTE-ACS) has not been well established. The goal of this study was to systematically review randomized trials comparing early to deferred revascularization for NSTE-ACS. A systematic literature search of MEDLINE, ISI Web of Science, and Cochrane databases was conducted. Two reviewers independently determined the eligibility of clinical trials. Five trials with 4,155 patients were included for analysis. Meta-analysis showed that early revascularization produced no significant differences in the incidence of death (risk ratio [RR] 0.88, p = 0.47), recurrent myocardial infarction (RR 0.92, p = 0.58), and repeat revascularization compared to a deferred intervention. However, a significant decrease in refractory ischemia was observed in the early intervention group (RR 0.47, p <0.01), and the procedure also showed a tendency toward decreasing major bleeding events (RR 0.77, p = 0.08). According to stratification based on intervention era, extent of revascularization, and time of revascularization, subgroup analysis did not show between-group differences in all-cause mortality, recurrent myocardial infarction, and major bleeding events. Also, sensitivity analysis by alternatively using a random-effects model did not find any relevant influence on overall results in direction and magnitude. In conclusion, meta-analysis demonstrated that early coronary revascularization is feasible and safe for patients with NSTE-ACS, might markedly decrease the incidence of refractory ischemia, and appears to produce less bleeding.

Guideline 14: Acute coronary syndromes

Observational studies

Aim: To evaluate an SMS service (SMS = short message service text message) with which laypersons are alerted to go to patients with suspected out-of-hospital cardiac arrest and perform early cardiopulmonary resuscitation (CPR) and use an Automated External Defibrillator (AED). This study is the first to report on a program in which an emergency medical service (EMS) is able to alert citizens by sending them SMS messages on their mobile phone.

Methods: Web-based questionnaires were completed by laypersons who were sent an alert by the AED-Alert system between February 1, 2010 and April 30, 2010. Questions concerned the process of training, receiving alerts, actions taken and follow-up care.

Results: AED-Alert was activated for 52 patients suspected of cardiac arrest, sending 3227 alerts to 2287 laypersons. Out of 2168 eligible laypersons 1679 (77%) completed 2098 questionnaires, one for each alert. Action was taken in only 579 alerts. Laypersons were not in the patient's vicinity (41%), noticed alerts too late (35%), or other reasons (24%). In 298 alerts laypersons faced problems with retrieving AEDs (51%), finding addresses (29%), traffic (5%), or other (15%). Aid was provided in 75 alerts, involving 47 patients. Laypersons started early CPR and defibrillation (49%), assisted EMS personnel (52%), or took care of family (39%). Laypersons arrived before EMS personnel in 21 patients, started CPR and defibrillation in 18, and assisted EMS personnel in 9 patients. Conclusion: Improvements of the SMS alert service by laypersons, the EMS, and through technical adjustments, could increase the number of laypersons who provide early aid.


Objective: To prospectively determine the percentage of cases of acute myocardial infarction (AMI) resulting in sudden death outside the hospital. Methods: Two groups of patients were defined by the emergency medical services. Group A comprised all out-of-hospital sudden deaths in 2004 meeting the criteria for possible or probable AMI (n=395 among 1072 sudden death patients, i.e. 37%). Group B comprised all in-hospital AMI in the district during the same year according to hospital registry records (n=731). Results The out-of-hospital sudden death rate due to AMI was determined by the ratio of the number of patients in group A over the total number of patients (A + B), and was found to be 35% (95% CI 32% to 38%). Conclusion: The estimated mortality of AMI appears to be 35% in this population. This figure suggests that significant improvement in the treatment of out-of-hospital cardiac arrest is still necessary.


Background: There have been few studies on the effectiveness of bystander automated external defibrillator (AED) use in out-of-hospital cardiac arrest. The objective of this study was to determine whether actual use of onsite or dispatched AED reduces the time to first shock compared with no AED use and thereby improves survival. Methods and Results: We performed a population-based cohort study of 2833 consecutive patients with a nontraumatic out-of-hospital cardiac arrest before emergency medical system arrival between 2006 and 2009. The primary outcome, neurologically intact survival to discharge, was compared by use of multivariable logistic regression analysis. An onsite AED had been applied in 128 of the 2833 cases, a dispatched AED in 478, and no AED in 2227. Onsite AED use reduced the time to first shock from 11 to 4.1
minute. Neurologically intact survival was 49.6% for patients treated with an onsite AED compared with 14.3% without an AED (unadjusted odds ratio, 5.63; 95% confidence interval, 3.91, 8.10). The odds ratio remained statistically significant after adjustment for confounding (odds ratio, 2.72; 95% confidence interval, 1.77, 4.18). Dispatched AED use reduced the time from call to first shock to 8.5 minutes. Neurologically intact survival was 17.2% for patients treated with a dispatched AED (unadjusted odds ratio, 1.07; 95% confidence interval, 0.82, 1.39). Every year, onsite AEDs saved 3.6 lives per 1 million inhabitants; dispatched AEDs saved 1.2 lives. Conclusions: The use of an onsite AED leads to a doubling of neurologically intact survival. In our system, the survival benefit of dispatched AED use was much smaller than that of onsite AED use.

Guideline 7: External automated defibrillation in BLS

In a military setting, pre-hospital times may be extended due to geographical or operational issues. Helicopter casevac enables patients to be transported expeditiously across all terrains. The skill-mix of the pre-hospital team can vary. Aim: To quantify the doctors' contribution to the Medical Emergency Response Team Enhanced (MERT-E). Methods: A prospective log of missions recorded urgency category, patient nationality, mechanism of injury, medical interventions and whether, in the crew's opinion, the presence of the doctor made a positive contribution. Results: Between July and November 2008, MERT-E flew 324 missions for 429 patients. 56% of patients carried were local nationals, 35% were UK forces. 22% of patients were T1, 52% were T2, 21.5% were T3 and 4% were dead. 48% patients had blast injuries, 25% had gunshot wounds, 6 patients had been exposed to blast and gunshot wounds. Median time from take-off to ED arrival was 44 min. A doctor flew on 88% of missions. It was thought that a doctor's presence was not clinically beneficial in 77% of missions. There were 62 recorded physician's interventions: the most common intervention was rapid sequence induction (45%); other interventions included provision of analgesia, sedation or blood products (34%), chest drain or thoracostomy (5%), and pronouncing life extinct (6%). Conclusion: MERT-E is a high value asset which makes an important contribution to patient care. A relatively small proportion of missions require interventions beyond the capability of well-trained military paramedics; the indirect benefits of a physician are more difficult to quantify.

This study aimed to assess the diagnostic accuracy and timeliness of using tracheal ultrasound to examine endotracheal tube placement during emergency intubation. Methods: This was a prospective, observational study, conducted at the emergency department of a national university teaching hospital. Patients received emergency intubation because of impending respiratory failure, cardiac arrest, or severe trauma. The tracheal rapid ultrasound exam (T.R.U.E.) was performed during emergency intubation with the transducer placed transversely at the trachea over the suprasternal notch. Quantitative waveform capnography was used as the criterion standard for confirmation of tracheal intubation. The main outcome was the concordance between the T.R.U.E. and the capnography. Results A total of 112 patients were included in the analysis, and 17 (15.2%) had esophageal intubations. The overall accuracy of the T.R.U.E. was 98.2% (95% confidence interval [CI]: 93.7, 99.5%). The kappa (κ) value was 0.93 (95% CI: 0.84, 1.00), indicating a high degree of agreement between the T.R.U.E. and capnography. The sensitivity,
specificity, positive predictive value, and negative predictive value of the T.R.U.E. were 98.9% (95% CI: 94.3, 99.8%), 94.1% (95% CI: 73.0 99.0%), 98.9% (95% CI: 94.3, 99.8%) and 94.1% (95% CI: 73.0, 99.0%). The median operating time of the T.R.U.E. was 9.0 s (interquartile range [IQR]: 6.0, 14.0).

Conclusions: The application of the tracheal rapid ultrasound exam (T.R.U.E.) to examine endotracheal tube placement during emergency intubation is feasible, and can be rapidly performed.


Objective: Hypothermia impairs blood glucose homeostasis and insulin sensitivity. However, the impact of therapeutic hypothermia on blood glucose levels and insulin requirements is unknown. We analyzed blood glucose variability during therapeutic hypothermia in patients with coma after cardiac arrest and examined its impact on outcome.

Design: Prospective observational study.

Setting: Two university hospital medical/surgical intensive care units. Patients: Comatose cardiac arrest patients treated with therapeutic hypothermia (33°C, 24 hrs).

Interventions: Insulin therapy (blood glucose target 6 mmol/L [110, 150 mg/dL]), according to a written algorithm, with nurse-driven adjustment of insulin dose.

Measurements and Main Results: Two-hundred and twenty patients (median age 61 yrs, median time to return of spontaneous circulation 20 min) were studied. Two time periods, comparable in duration, were categorized: therapeutic hypothermia (stable maintenance phase) and normothermia (after rewarming). Blood glucose variability was defined as the difference between maximum and minimum blood glucose concentration during each time period. Mean blood glucose (8.3 ± 2.3 vs. 7.1 ± 1.3 mmol/L), blood glucose variability (5.7 ± 3.9 vs. 3.7 ± 3.6 mmol/L), and insulin dose (2 ± 2 vs. 1 ± 1 U/h) were higher during therapeutic hypothermia compared to normothermia (all p < .001). Higher mean blood glucose (7.9 ± 1.8 mmol/L in survivors vs. 8.7 ± 2.6 mmol/L in nonsurvivors, p = .02) and increased blood glucose variability (4.9 ± 3.5 vs. 6.5 ± 4.1 mmol/L, p = .003) during therapeutic hypothermia were associated with mortality. After adjusting for time to return of spontaneous circulation, initial arrest rhythm, and cardiac arrest etiology, increased blood glucose variability during therapeutic hypothermia, but not mean blood glucose level, was an independent predictor of inhospital mortality (odds ratio for death 1.10 [confidence interval 1.02, 1.19], p = .016). Conclusions: Mild therapeutic hypothermia is associated with higher blood glucose levels, increased blood glucose variability, and greater insulin requirements compared to the post rewarming normothermic phase. Increased blood glucose variability during therapeutic hypothermia is a predictor of inhospital mortality after cardiac arrest, independent of injury severity and mean blood glucose levels.

Guideline 11.8 Therapeutic Hypothermia after Cardiac Arrest


Aim: We aim to describe the coronial findings of young adults where the out-of-hospital cardiac arrest (OHCA) aetiology was 'presumed cardiac'.

Methods: Presumed cardiac aetiology OHCAs occurring in young adults aged 16 - 39 years were identified using the Victorian Ambulance Cardiac Arrest Registry (VACAR) and available coronial findings reviewed. Results: We identified 841 young adult OHCAs where the Utstein aetiology was presumed cardiac. Of these 740 died and 572 (77%) OHCAs were matched to coroner’s findings. On review of the coroner’s cause of death, 230 (40.2%) had a confirmed cardiac aetiology, 221 (38.6%) were proven non-cardiac, 97 (17%) were inconclusive and 24 (4.2%) cases remained ‘open’. Confirmed cardiac causes of OHCA were ischemic heart disease (n = 126, 55%), cardiomegaly (n = 26, 11.3%), cardiomyopathy (n = 25, 11%), congenital heart disease (n = 15, 6.5%), cardiac tamponade due to dissecting thoracic aorta aneurysm (n = 10,
4.3%), myocarditis (n = 8, 3.5%), arrhythmia (n = 7, 3%), others (n = 13, 5.7%). Non-cardiac causes of OHCA were epilepsy/sudden unexplained death in epilepsy (SUDEP) (n = 56, 25%), pulmonary embolism (n = 29, 13%), subarachnoid haemorrhage (n = 17, 7.7%), other intracranial bleed (n = 7, 3.2%), pneumonia (n = 17, 7.7%), DKA (n = 16, 7.2%), other complications of diabetes mellitus (n = 8, 3.6%), complications of obesity (n = 9, 4%), haemorrhage (n = 12, 5.4%), sepsis (n = 8, 3.6%), peritonitis (n = 6, 2.7%), aspiration (n = 6, 2.7%), renal failure (n = 5, 2.3%), asthma (n = 5, 2.3%), complications of anorexia (n = 3) and alcohol abuse (n = 2), thyrotoxicosis (n = 2), meningitis (n = 1) and others (n = 12). Compared with coroner's diagnosed non-cardiac OHCAs, 'confirmed cardiac' were more likely to be witnessed (41% vs 23%, p < 0.01), receive bystander CPR (35% vs 20%, p < 0.001), have a shockable rhythm (27% vs 6.3%, p < 0.001) and have EMS attempted resuscitation (62% vs 44%, p < 0.001). Discussion: Linking OHCA registries with coronial databases for aetiology of the arrest will improve the quality of the data and should be considered by all OHCA registries, particularly for young adult OHCA.

Introduction: International guidelines for basic life support and defibrillation are identical for lay people and healthcare professionals. In 2002, a small meeting hosted by the Resuscitation Council (UK) debated recent advances in resuscitation science, along with the possibility of more demanding procedures for treating out of hospital cardiac arrest (OHCA) that could take advantage of the expertise available with professional use. The resulting algorithm known as Protocol C could not be tested in a randomized trial for reasons relating to consent, but was introduced by one ambulance service as an observational study. Results from a 2-year period from one city within the service area are presented, using the Utstein style of reporting to show the recommended ‘comparator’ group whilst also providing epidemiological data on the frequency of cardiac arrest within the community and the outcome of all resuscitation attempts. Methods: Manual methods were used to collect data from 2009 and 2010 for cases of cardiac arrest treated by crews from the two ambulance stations within the city of Brighton and Hove. All transported patients were tracked individually through the hospital because no official method of data linkage is available. Outcome data were obtained for survival to hospital discharge, or to 30 days for the few who remained in hospital care for that duration. Results In the epidemiological analysis, 454 patients with OHCA were treated over 2 years, of whom 151 (33%) had sustained return of spontaneous circulation (ROSC) at hospital handover and 59 (13%) survived to discharge for 30 days. Within the 'comparator' group of 79 patients, 47 (59%) achieved sustained ROSC to hospital handover and 24 (30%) survived. Conclusion: The use of Protocol C has been associated with rates of sustained ROSC to hospital and of survival to discharge that have reached the range of international best practice. The improvement noted in this observational study cannot be ascribed to the new protocol alone; any wider use should await randomized trials to test the impact of this single variable. Meanwhile, wider adoption of the Utstein system to compare results for treatment of OHCA will provide a potent stimulus for emergency services to seek ways of improving outcome.

Background: Prevention of secondary prehospital risk factors such as hypoxia and hypotension is likely to improve patient prognosis in severe traumatic brain injury (TBI). Because the Dutch trauma care organization is characterized by fast access to specialized trauma care due to the geographical situation, we investigated whether and to what extent secondary risk factors, such as hypoxia and hypotension, and measures,
such as endotracheal intubation, affect outcome in severe TBI in the context of a region with fast access to trauma care. Methods: The medical records of 339 subsequent computed tomography-confirmed patients with TBI with a Glasgow coma scale (GCS) score < 8 who were primarily referred to a Level I trauma center in Amsterdam or Nijmegen in the Netherlands were retrospectively analyzed. Results: Multinomial logistic regression revealed that the strongest outcome predictors in our population were a disturbed pupillary reflex (odds ratio [OR], 5.8), a GCS score of 3 (OR, 4.9), and arterial hypotension (OR, 3.5). Interestingly, we observed no differences between intubated and non-intubated patients with respect to metabolic and respiratory parameters or mortality whereby the injury severity score was slightly higher in endotracheally intubated patients (32 [25, 41]) versus non-intubated patients (25 [22, 29]). Conclusion: In agreement with others, GCS, a disturbed pupil reflex, and arterial hypotension were predictive for the prognosis of primarily referred patients with severe TBI in the Netherlands. In contrast, in the perspective of slightly higher injury scores in intubated patients, prehospital endotracheal intubation was not predictive for patient outcome.

Aim: To investigate the factors associated with adverse clinical features presented by drug overdose/self-poisoning patients and the treatments provided. Methods: Historical patient records collected over 3 months from ambulance crews attending non-fatal overdoses/self-poisoning incidents were reviewed. Logistic regression was used to investigate predictors of adverse clinical features (reduced consciousness, obstructed airway, hypotension or bradycardia, hypoglycaemia) and treatment. Results: Of 22,728 calls attended to over 3 months, 585 (rate 26/1000 calls) were classified as overdose or self-poisoning. In the 585 patients identified, paracetamol-containing drugs were most commonly involved (31.5%). At least one adverse clinical feature occurred in 103 (17.7%) patients, with higher odds in men and opiate overdose or illegal drugs. Older patients and patients with reduced consciousness were more likely to receive oxygen. The latter also had a greater chance of receiving saline. Conclusion: Non-fatal overdose/self-poisoning accounted for 2.6% of patients attended by an ambulance. Gender, illegal drugs or opiates were important predictors of adverse clinical features. The treatments most often provided to patients were oxygen and saline.

The purpose of this study was to determine the prevalence of in-hospital hypotension in patients surviving to admission after resuscitation from out-of-hospital cardiac arrest and compare it to that of traditional Utstein factors in predicting in-hospital mortality. Methods: Single-center retrospective cohort of adult patients surviving to hospital admission after resuscitation from out-of-hospital sudden death between January 1, 2006 and October 31, 2009. Study variables included Utstein template data: age, sex, initial rhythm, witnessed or non-witnessed arrest, presence or absence of bystander CPR, location of arrest, response time (time of 9-1-1 dispatch to first vehicle arrival), and hypotension (systolic pressure < 90 or mean arterial pressure < 60) within 24h of ROSC. Univariate comparisons of categorical variables were performed and the Wilcoxon rank-sum test was used to compare continuous variables. Multivariable logistic regression was then performed after inclusion of Utstein variables. Results: 73 patients met the inclusion criteria, and in-hospital mortality occurred in 54 (74%). On univariate analysis, in-hospital hypotension (OR 3.5, 95%CI 1.1, 10.0, p = 0.02), pre-hospital rhythm other than VF/VT (OR 4.3, 95%CI 1.4, 13.3, p = 0.008), and an unwitnessed arrest (OR 6.9, 95%CI 0.8, 56.5, p = 0.04), were significant predictors of in-hospital mortality. On multivariable analysis, in-hospital hypotension (OR 9.8, 95%CI 1.5, 63.0, p = 0.02), pre-hospital rhythm other than VT/VF (OR 8.5, 95%CI 1.3, 58.8, p = 0.03), and lack of
bystander CPR (OR 13.2, 95%CI 1.6, 11, p = 0.02) remained statistically significant predictors of in-hospital mortality. Conclusions: In-hospital hypotension was predictive of mortality, as was a pre-hospital non-shockable rhythm and lack of bystander CPR. In contrast, traditional pre-hospital risk factors: age, gender, public location of arrest, response time, and witnessed arrest, were not predictive.

Rib and sternal fractures are frequent complications of cardiopulmonary resuscitation (CPR) in adults. This is the first study to evaluate the multidetector CT (MDCT) findings of chest injuries secondary to CPR, by comparing with the findings of radiography. Methods: For 40 patients who underwent MDCT after CPR for a non-traumatic cause of cardiac arrest, we evaluated the MDCT findings of the CPR associated traumatic chest injuries and compared the diagnostic performance of chest radiography and MDCT for the evaluation of chest injuries. Results MDCT revealed that 26 patients (65%) had rib fractures and 12 patients (30%) had sternal fractures. However, radiography detected only 10 patients who had rib fractures. In 25 of the 26 cases, multiple ribs were fractured (ranging up to 13 rib fractures), and the rib fractures were bilateral in 18 of these cases. The majority of rib fractures were located in the anterior part of the thoracic cage. Six of the patients had fracture-related complications (pneumothorax = 1, subclavian vein injury = 1, chest wall hematoma = 4). The sternal fractures predominantly occurred in the middle and lower third of the sternal body (five each for the middle and lower third of the sternal body). Conclusion: Rib and sternal fractures are frequent complications in patients who underwent CPR. MDCT is useful for the evaluation of chest injuries secondary to CPR as compared with that of radiography and also for the evaluation of the fracture-related complications.

We compared the effects of the Airway Scope® on haemodynamic responses during tracheal intubation with those of direct laryngoscopy in normotensive and hypertensive patients. The systolic blood pressure, diastolic blood pressures and heart rate were recorded: (a) before anaesthesia; (b) immediately before intubation; (c) at intubation; and (d) 1, 2, 3, 4 and 5 min after intubation. In normotensive patients, the increase in blood pressure and heart rate over time were significantly lower with the Airway Scope than with the Macintosh laryngoscope (p < 0.003). In hypertensive patients, however, there was no difference in the changes over time in any of these haemodynamic measures between the two devices (p > 0.05). We conclude that the Airway Scope attenuates haemodynamic responses to tracheal intubation in comparison with the laryngoscope in normotensive but not in hypertensive patients.

Paediatric pelvic fractures have been infrequently reviewed. The study was performed to highlight the unique features of pelvic fractures in children. Patients and methods: A 14-year retrospective study was undertaken of all patients treated for a pelvic fracture at our institute. Results Thirty-nine children were included. The mean Injury Severity Score (ISS) was 17.1 (range 4, 75). Simple ring fractures were the most common type (46%), dominated by pedestrian versus motor vehicle trauma (58.9%). A pelvic fracture was evident on the initial plain radiographs of all 39 children. Further radiographic investigations (12 CTs and 1 MRI) were undertaken in 13 (33%) of the children. Additional posterior ring fractures
were identified in 9. A total of 32 children (82%) sustained one or more associated injuries. Head injuries accounted for 25% and orthopaedic/skeletal injuries for 33% of all associated injuries. Fourteen children required a total of 24 acute surgical procedures. Mean outpatient clinical follow-up was for 27 months (range 3, 85). There was one mortality in this series. Eight children (20%) suffered long term sequelae. Conclusion: Paediatric pelvic fractures differ from their adult counterpart in aetiology, fracture type, and associated injury pattern. They represent a reliable marker for severe trauma. Prospective studies are required to define optimal treatment guidelines, particularly in older children.


Objective: To validate a triage flowchart to rule out acute coronary syndrome (ACS) in chest pain patients attending the emergency department (ED). Methods: An observational cohort study of consecutive patients. In all cases, a previously derived five-step triage flowchart (age ≤40 years, absence of diabetes, not previously known coronary artery disease, non-OPpressive and non-retrosternal pain) was applied. Patients meeting all five discriminators were grouped as 'five-step triage non-ACS', the rest as 'five-step triage ACS'. The same strategy was used with a four-step model (without age ≤40 years). After ED study and 1-month follow-up, patients were definitively classified as ‘true ACS’ or ‘true non-ACS’. Validity indexes and receiver operating characteristics curves were calculated. Results: 4231 patients were included: 918 (21.7%) were ‘true ACS’, 3303 (78.1%) ‘true non-ACS’; 10 (0.2%) were lost to follow-up. The five-step triage flowchart classified 4000 (94.8%) as ‘triage ACS’ and 221 (5.2%) as ‘triage non-ACS’; none of the latter was ‘true ACS’. The four-step model classified 3194 (75.6%) as ‘triage ACS’ and 1027 (24.4%) as ‘triage non-ACS’. A ‘true ACS’ was seen in 26 patients from the latter group. Accordingly, five-step triage flowchart specificity and positive predictive value (PPV) to rule out ACS were 100% (95% CI 100% to 100%). For the four-step model specificity and PPV were 97% (95% CI 96% to 98%). Conclusion: The five-step triage flowchart identifies chest pain patients without an ACS. However, only 5% of these patients meet these five criteria. A simpler model allows greater patient inclusion but a higher risk of misclassification of true ACS.


Heat-related illness is reported to be a significant cause of morbidity at outdoor mass gatherings during warm weather. Paramedics are traditionally present at mass gatherings to provide prehospital care for people in need. Objectives: To describe a paramedic-staffed medical rehydration unit and a new role for paramedics at a mass gathering attended by more than 450,000 people. Methods: A 48-bed medical rehydration unit was deployed adjacent to the main field hospital. Paramedics admitted patients to the unit if they met predetermined criteria for mild to moderate heat-related illness. Each paramedic was responsible for four beds. Paramedics initiated oral and intravenous rehydration therapy by following medical directives. Emergency medical services (EMS) physicians reviewed patients before discharge. Results The medical rehydration unit managed 143 patients (3/10,000 attendees). The mean number of patients admitted per hour was nine. The average age was 24 years; 103 (72%) were female. The main presenting complaint was syncope, presyncope, or dizziness in 43 (30%). Forty-four (31%) patients received parenteral and oral fluids; the remainder received oral fluids alone. The average length of stay was 94 minutes (95% CI 82, 106). One hundred seven (75%) patients were discharged. 17 (12%) were transferred to the main field hospital, four (3%) left against medical advice, and two (1%) required transfer to a hospital off site. In 13 (9%) cases, records of patient disposition were incomplete.
Conclusions: This article defines a new role for paramedics and describes the operation of a medical rehydration unit at a large, single-day mass gathering in summer.

Regional ST-segment-elevation myocardial infarction systems are being developed to improve timely access to primary percutaneous coronary intervention (PCI). System delays may diminish the mortality benefit achieved with primary PCI in ST-segment-elevation myocardial infarction patients, but the specific reasons for and clinical impact of delays in patients transferred for PCI are unknown. Methods and Results: This was a prospective, observational study of 2034 patients transferred for primary PCI at a single center as part of a regional ST-segment-elevation myocardial infarction system from March 2003 to December 2009. Despite long-distance transfers, 30.4% of patients (n=613) were treated in <90 minutes and 65.7% (n=1324) were treated in <120 minutes. Delays occurred most frequently at the referral hospital (64.0%, n=1298), followed by the PCI center (15.7%, n=317) and transport (12.6%, n=255). For the referral hospital, the most common reasons for delay were awaiting transport (26.4%, n=535) and emergency department delays (14.3%, n=289). Diagnostic dilemmas (median, 95.5 minutes; 25th and 75th percentiles, 72, 127 minutes) and non-diagnostic initial ECGs (81 minutes; 64, 110.5 minutes) led to delays of the greatest magnitude. Delays caused by cardiac arrest and/or cardiogenic shock had the highest in-hospital mortality (30.6%), in contrast with non-diagnostic initial ECGs, which, despite long treatment delays, did not affect mortality (0%). Significant variation in both the magnitude and clinical impact of delays also occurred during the transport and PCI center segments. Conclusions: Treatment delays occur even in efficient systems for ST-segment-elevation myocardial infarction care. The clinical impact of specific delays in inter-hospital transfer for PCI varies according to the cause of the delay.

Subarachnoid haemorrhage (SAH) is known as one of the aetiologies of out-of-hospital cardiac arrest (OHCA). However, the mechanisms of circulatory collapse in these patients have remained unclear. Methods and results: We examined 244 consecutive OHCA patients transferred to our emergency department. Head computed tomography was performed on all patients and revealed the existence of SAH in 14 patients (5.9%, 10 females). Among these, sudden collapse was witnessed in 7 patients (50%). On their initial cardiac rhythm, all 14 patients showed asystole or pulseless electrical activity, but no ventricular fibrillation (VF). Return of spontaneous circulation (ROSC) was obtained in 10 of the 14 patients (14.9% of all ROSC patients) although all resuscitated patients died later. The ROSC rate in patients with SAH (71%) was significantly higher than that of patients with either other types of intracranial haemorrhage (25%, n=2/8) or presumed cardiovascular aetiologies (22%, n=23/101) (p < 0.01). On electrocardiograms, ST-T abnormalities and/or QT prolongation were found in all 10 resuscitated patients. Despite their electrocardiographic abnormalities, only 3 patients showed echocardiographic abnormalities. Conclusions: The frequency of SAH in patients with all causes of OHCA was about 6%, and in resuscitated patients was about 15%. The initial cardiac rhythm revealed no VF even though half had a witnessed arrest. A high ROSC rate was observed in patients with SAH, although none survived to hospital discharge.

24. Mizushima Y, Ueno M, Watanabe H, Ishikawa K, Matsuoka T. *Discrepancy Between Heart Rate and Makers of Hypoperfusion Is a*
**Predictor of Mortality in Trauma Patients.** J Trauma 2011; 71 (4): 789-92

Background: Tachycardia is an important early sign of shock in trauma. Although the base deficit (BD) and lactate are indicative of hypoperfusion and known to predict mortality, some cases show a discrepancy between heart rate (HR) and BD or lactate; such cases have poor prognosis. The objective of this study was to examine whether lack of tachycardia after hypoperfusion is associated with increased mortality. Methods: Retrospective data were collected on 1,742 adult trauma patients. Mortality was compared with different levels of BD, lactate, and HR on admission. Multivariate logistic regression was used to identify significant risk factors for mortality. Results: Significantly increased mortality was observed in patients with hypoperfusion (BD less than −5 mmol/L or lactate more than 5 mmol/L). Among these patients, those with a normal HR (<80 bpm) were associated with a higher mortality rate than those with tachycardia (HR, 80–100 or >100 bpm). However, systolic blood pressure (SBP) was not significantly different between the different HR groups. Logistic regression analysis revealed that discrepancy between HR and indicators of hypoperfusion (Dis BD: BD less than −5 mmol/L and HR less than 80 bpm; or Dis lac: lactate more than 5 mmol/L and HR less than 80 bpm) are independent predictors of mortality after controlling for age, SBP, Injury Severity Score, head Abbreviated Injury Scale, HR, and BD or lactate (Dis BD: odds ratio, 2.67; 95% confidence interval, 1.07–6.61; p < 0.05 and Dis lac: odds ratio, 4.11; 95% confidence interval, 1.57–10.74; p < 0.01, respectively). Conclusions: The lack of tachycardia in the presence of hypoperfusion is associated with poor prognosis independent of injury severity, SBP, and head injury. A discrepancy between HR and indicators of hypoperfusion could be considered as a predictor of mortality in trauma patients.

25. Morrison JJ, Dubose JJ, Rasmussen TE, Midwinter MJ. Military Application of Tranexamic Acid in Trauma Emergency Resuscitation (MATTERs) Study. Arch Surg 2011; Online first (October 17)

Objectives: To characterize contemporary use of tranexamic acid (TXA) in combat injury and to assess the effect of its administration on total blood product use, thromboembolic complications, and mortality. Design: Retrospective observational study comparing TXA administration with no TXA in patients receiving at least 1 unit of packed red blood cells. A subgroup of patients receiving massive transfusion (>10 units of packed red blood cells) was also examined. Univariate and multivariate regression analyses were used to identify parameters associated with survival. Kaplan-Meier life tables were used to report survival. Setting: A Role 3 Echelon surgical hospital in southern Afghanistan. Patients A total of 896 consecutive admissions with combat injury, of which 293 received TXA, were identified from prospectively collected UK and US trauma registries. Main Outcome Measures Mortality at 24 hours, 48 hours, and 30 days as well as the influence of TXA administration on postoperative coagulopathy and the rate of thromboembolic complications. Results The TXA group had lower unadjusted mortality than the no-TXA group (17.4% vs 23.9%, respectively; P = .03) despite being more severely injured (mean [SD] Injury Severity Score, 25.2 [16.6] vs 22.5 [18.5], respectively; P < .001). This benefit was greatest in the group of patients who received massive transfusion (14.4% vs 28.1%, respectively; P = .004), where TXA was also independently associated with survival (odds ratio = 7.228; 95% CI, 3.016-17.322) and less coagulopathy (P = .003). Conclusions: The use of TXA with blood component-based resuscitation following combat injury results in improved measures of coagulopathy and survival, a benefit that is most prominent in patients requiring massive transfusion. Treatment with TXA should be implemented into clinical practice as part of a resuscitation strategy following severe wartime injury and hemorrhage.

Appendicitis is the most common emergency operation in children. The rate of perforation may be related to duration from symptom onset to treatment. A recent adult study suggests that the perforation risk is minimal in the first 36 hours and remains at 5% thereafter. We studied a pediatric population to assess symptom duration as a risk factor for perforation. Methods: We prospectively studied all children older than 3 years who underwent an appendectomy over a 22-month period. Results: Of 202 patients undergoing appendectomies, 197 had appendicitis. Median age was significantly lower in the perforated group, but temperature and leukocytosis were not. As expected, length of hospital stay was longer in the perforated group (4-13 vs 2-6 days). The incidence of perforation was 10% if symptoms were present for less than 18 hours. This incidence rose in a linear fashion to 44% by 36 hours. Prehospital delays were greater in patients with perforated appendicitis. However, in-hospital delay (from presentation to surgery) was less than 5 hours in the perforated group and 9 hours in the nonperforated group. Discussion: Appendiceal perforation in children is more common than in adults and correlates directly with duration of symptoms before surgery. Perforation is more common in younger children. Unlike in adults, the risk of perforation within 24 hours of onset is substantial (7.7%), and it increases in a linear fashion with duration of symptoms. In our experience, however, perforation correlates more with prehospital delay than with in-hospital delay.

We assessed out-of-hospital cardiac arrests (OHCAs) for various pediatric age groups. METHODS: This prospective, population-based, observational study included all emergency medical service-treated OHCAs in Osaka, Japan, between 1999 and 2006 (excluding 2004). Patients were grouped as adults (>17 years), infants (<1 year), younger children (1 - 4 years), older children (5 - 12 years), and adolescents (13 - 17 years). The primary outcome measure was 1-month survival with favorable neurologic outcome. RESULTS: Of 950 pediatric OHCAs, resuscitations were attempted for 875 patients (92%; 347 infants, 203 younger children, 135 older children, and 190 adolescents). The overall incidence of nontraumatic pediatric OHCAs was 7.3 cases per 100 000 person-years, compared with 64.7 cases per 100 000 person-years for adults and 65.5 cases per 100 000 person-years for infants. Most infant OHCAs occurred in homes (93%) and were not witnessed (90%). Adolescent OHCAs often occurred outside the home (45%), were witnessed by bystanders (37%), and had shockable rhythms (18%). One-month survival was more common after nontraumatic pediatric OHCAs than adult OHCAs (8% [56 of 740 patients] vs 5% [1677 of 33 091 patients]; adjusted odds ratio: 2.26 [95% confidence interval: 1.63, 3.13]). One-month survival with favorable neurologic outcome was more common among children than adults (3% [21 of 740 patients] vs 2% [648 of 33 091 patients]; adjusted odds ratio: 2.46 [95% confidence interval: 1.45, 4.18]). Rates of 1-month survival with favorable neurologic outcome were 1% for infants, 2% for younger children, 2% for older children, and 11% for adolescents. CONCLUSION: Survival and favorable neurologic outcome at 1 month were more common after pediatric OHCAs than adult OHCAs.

BACKGROUND: Hypothermia is an independent contributor to neonatal mortality. All very low-birth-weight (VLBW) newborns have the potential to undergo cold stress or frank hypothermia during delivery room stabilization. Thus, clinicians aiming to maintain normothermia in VLBW
neonates are compelled to use multiple adjuncts of unknown efficacy or safety. **OBJECTIVE:** To evaluate the effectiveness of thermoregulation procedures in maintaining normothermia during delivery room resuscitation and to assess the impact of an unanticipated change in equipment at our institution on the admission temperatures of very low birth weight newborns. **DESIGN/METHODS:** Institutional review board-approved, retrospective analysis of quality assurance data submitted to the Vermont-Oxford Network (VON) for 24 consecutive months starting January 2006. We compared the rate of hypothermia (admission temperature < 36.5°C) in our NICU during 2006 with the aggregate rates reported by VON. We then compared the rates of hypothermia and mean admission temperatures in our NICU during period 1 (when chemical warming packs were used routinely, in addition to plastic wrapping and warm blankets) and period 2 (after packs were discontinued owing to an incident of focal skin injury). **RESULTS:** In 2006, 42% of VLBW babies in our NICU had an admission temperature of less than 36.5°C compared with the VON rate of 61% (interquartile range 48%, 76%). During period 1, 39% of 183 VLBW neonates were hypothermic compared with 68% of 103 during period 2 (P < .001). Mean admission temperatures during periods 1 and 2 were 36.5°C and 36.1°C, respectively (P < .001). A control chart showed the shift in temperatures occurring as period 2 began. No change in practice other than discontinuation of the warming packs was instituted during period 2. The incidence of temperatures greater than 38°C (hyperthermia) was 1.6% during period 1 and 1.0% during period 2. **CONCLUSIONS:** The results associated with this isolated change in practice at our institution suggest that chemical warming packs were a useful adjunct in achieving above-average rates of normothermia during delivery room resuscitation of VLBW newborns. Their potential adverse effects should be weighed against the increased risk of mortality associated with hypothermia in this population.


Objective: The use of epinephrine for the treatment of anaphylaxis by emergency medical technicians (EMTs) has not been rigorously evaluated. The aim of this study was to determine whether first-tier EMTs use epinephrine safely and appropriately for anaphylactic reactions.

Methods: The study used a case-control design. Cases were persons treated by EMTs with epinephrine for presumed anaphylaxis from January 1, 2000, through January 31, 2003, in King County, Washington (n=22). Controls were emergency medical services (EMS)-treated persons matched to cases by diagnosis category, patient age, fire department, and year, but who had not been administered epinephrine by EMTs (n=44). Cases and controls were compared with regard to history, symptoms, and examination characteristics. In a second assessment, physicians blinded to treatment (case/control) status reviewed events to determine whether they would have treated the patient with epinephrine. Results: When cases were compared with controls, cases were more likely to report a history of anaphylaxis (27% vs. 2%), upper airway symptoms (59% vs. 18%), and shortness of breath (77% vs. 27%). Cases were also more likely to have tachypnea (32% vs. 5%), hypotension (41% vs. 9%), decreased level of consciousness (32% vs. 2%), abnormal breath sounds (46% vs. 16%), and rash (50% vs. 23%) (p < 0.01 for all comparisons). The physicians agreed with the EMTs’ decisions regarding epinephrine use (or nonuse) in 86% (57/66) of events: 86% (19/22) in which the EMTs used epinephrine and 86% (38/44) in which the EMTs did not use epinephrine. **Conclusion:** In this EMS system, the EMTs used epinephrine for presumed anaphylaxis in a discriminating manner that typically agreed with physician review.


Background: Decision-making in chest pain of uncertain origin is challenging. Objectives: To evaluate the predictive value of simple
characteristics of pain presentation in patients coming to the emergency department with chest pain and without electrocardiogram ischaemia or raised troponin. Methods: 789 patients were studied. The following categorical pain characteristics were collected: effort related pain, pressing character, radiation, associated symptoms, and ≥ 2 episodes in 24h. Additionally, a predefined semi-quantitative pain score including seven items (Geleijnse score) was completed. Risk factors and co-morbidities were also recorded. The primary and secondary endpoints were cardiac events at 30 days and at 1 year. Results: After adjusting for risk factors and co-morbidities, the pain characteristics associated with the primary and secondary endpoints were effort related pain (HR=2.1, 95% CI 1.5 to 3.0, p=0.0001; HR=1.8, 95% CI 1.3 to 2.5, p=0.0003) and ≥2 episodes in 24h (HR=2.4, 95% CI 1.7 to 3.5, p=0.0001; HR=2.3, 95% CI 1.7 to 3.2, p=0.0001). Both variables retained their predictive value in women, diabetics and elderly (>70 years) patients. The discriminatory capacity of the predictive models including these two pain characteristics for the primary and secondary endpoints (C-statistic 0.76 and 0.76) was better than using the complex semi-quantitative pain score (C-statistic 0.69 and 0.71). Conclusion: In patients presenting to the emergency department with chest pain and without electrocardiogram ischaemia or raised troponin, effort related pain and ≥ 2 episodes in 24h are the main characteristics to be considered for decision making.

**Guideline 14: Acute coronary syndromes**


Objective: To examine the correlation between time to paramedic intubation and survival after prehospital cardiac arrest. Methods: This was a retrospective cohort study of 693 patients who had paramedic endotracheal intubation for prehospital cardiac arrest in King County, Washington (excluding Seattle), between January 1991 and May 2003. Based on the time from patient collapse until intubation, cases were divided into quartiles. Survival in the slower three quartiles (defined as 'slow intubation') was compared with survival in the fastest quartile (defined as 'quick intubation'). Results: In the quick intubation group (intubation time < 12 minutes), 46% of the patients survived; in the slow intubation group (intubation time >13 minutes), 23% of the patients survived. Logistic regression was used to adjust for possible confounders that affect survival: age, gender, location, bystander cardiopulmonary resuscitation, cardiac rhythm, emergency medical technician response time, and paramedic response time. The fully adjusted odds ratio of survival for the slow intubation group compared with the quick intubation group was 0.42 (95% confidence interval 0.26, 0.69). Conclusions: This study is the first of its kind to compare survival with the time interval until an aspect of advanced life support is performed. These findings suggest that faster intubation times may increase odds of survival in prehospital cardiac arrest. Future prospective studies are merited to further understand this association.


Research has demonstrated that children are at particular risk for oligoanalgesia due to assessment difficulties when they are unable to self-report. We sought to evaluate the psychometric properties of the Modified Preverbal, Early Verbal Pediatric Pain Scale (M-PEPPS) when used in an emergency department pediatric population. Methods: We conducted a secondary analysis of data from a prospective, observational study of pain in emergency patients to evaluate the M-PEPPS tool. Data from 118 pediatric patients was subjected to item analysis, reliability analysis, and common factor analysis. Results: Item difficulties suggest that the items capture the range of pain states from mild to severe. Corrected item-total correlations indicate that the instrument discriminates between various levels of pain. Common factor analysis yielded a single,
unrotated common factor solution providing evidence that the M-PEPPS measures the single construct of pain. Cronbach’s alpha for the scale (0.954) suggests excellent reliability. Conclusions: Findings indicate that the M-PEPPS instrument is reliable when used by emergency nurses to measure pediatric pain. The single-factor common factor solution provides support for the scale as measuring the single construct of pain. Additional research is necessary to establish the degree of change in score required for a clinically meaningful reduction in pain to be present.


Aim: To describe health-related quality of life (HRQoL), quality-adjusted life years (QALYs) gained and school performance in subjects having received either bystander or emergency medical service personnel initiated cardiopulmonary resuscitation (CPR) after a drowning incident in childhood. Materials and methods: 64 children admitted to pediatric intensive care (PICU) after successful CPR between 1985 and 2007. Eleven died in the PICU, 9 other within 6 months. In 2009 all long-term survivors, except for two, lived at home. Of the 40 patients eligible for the study, 29 (73%) responded to a questionnaire. HRQoL was assessed with the generic 15D, or its versions for adolescents (16D) or children (17D), and compared to that of general population. These HRQoL scores, age-specific survival probabilities, and HRQoL scores of the general population were used in a Markov model to estimate the number of QALYs gained. Results: Median age of the respondents was 17.3 (range: 3.0–28.4) years and 62% were male. At the time of drowning their median age had been 3.0 (range: 1.2–15.7) years. The drowning incident was associated with a significant loss in HRQoL in the oldest age group (total HRQoL total score 0.881 compared to 0.971 in the general population, P < 0.01) but not in children (HRQoL score 0.944 vs. 0.938). When submersion time exceeded 10 min mean HRQoL score was significantly lower than in patients with a shorter submersion (0.844 vs. 0.938, P = 0.032). The mean undiscounted and discounted (at 3%) number of QALYs gained by treatment were 40.8 and 17.0, respectively. Conclusions: A good HRQoL will be achieved in the majority of patients surviving long-term after a drowning incident in childhood, although HRQoL is affected by the submersion time.


Background and context: Helicopter Emergency Medical Services (HEMS) have been incorporated into modern health systems for their speed and coverage. In the state of New South Wales (NSW), nine HEMS operate from various locations around the state and currently there is no clear picture of their resource implications. The aim of this study was to assess the cost of HEMS in NSW and investigate the factors linked with the variation in the costs, coverage and activities of HEMS. Methods: We undertook a survey of HEMS costs, structures and operations in NSW for the 2008/2009 financial year. Costs were estimated from annual reports and contractual agreements. Data related to the structure and operation of services was obtained by face-to-face interviews, from operational data extracted from individual HEMS, from the NSW Ambulance Computer Aided Despatch system and from the Aeromedical Operations Centre database. In order to estimate population coverage for each HEMS, we used GIS mapping techniques with Australian Bureau of Statistics census information. Results: Across HEMS, cost per mission estimates ranged between $9300 and $19,000 and cost per engine hour estimates ranged between $5343 and $15,743. Regarding structural aspects, six HEMS were run by charities or not-for-profit companies (with partial government funding) and three HEMS were run (and fully funded) by the state government through NSW Ambulance. Two HEMS operated as ‘hub’ services in conjunction with three associated ‘satellite’ services and in contrast, four services operated independently. Variation also existed between the HEMS in the type of helicopter used, the
clinical staffing and the hours of operation. The majority of services undertook both primary scene responses and secondary inter-facility transfers, although the proportion of each type of transport contributing to total operations varied across the services. Interpretation: This investigation highlighted the cost of HEMS operations in NSW which in total equated to over $50 million per annum. Across services, we found large variation in the cost estimates, which was underscored by variation in the structure and operations of HEMS.


Relatively little is known about the use of pulse oximetry in the prehospital setting. The purpose of this study was to determine how emergency medical technicians (EMTs) use pulse oximetry information to influence their decisions regarding the involvement of advanced life support (ALS) personnel in a two-tiered emergency medical services (EMS) system. Methods: EMTs were trained and authorized to use pulse oximetry in predefined clinical situations. The EMTs completed a questionnaire describing the influence of the oximetry information on their decision making regarding the involvement of ALS units. Results: The EMTs reported an influence on their decisions whether to involve ALS care in 35 (12%) of 302 cases. The addition of the pulse oximetry information caused the EMTs to request ALS dispatch in 11 cases, to cancel a previously dispatched ALS response in eight cases, and not to request an ALS response from the scene when they otherwise would have requested it in 16 cases. Conclusion: Prehospital pulse oximetry has a measurable influence on EMT decisions concerning ALS involvement in a two-tiered EMS system. It improves system efficiency by helping to match patients to an appropriate level of care.


Helicopter emergency medical service (HEMS) crew are subject to various sources of environmental, physical, and psychological stress. We measured the changes in heart rate and blood pressure as indicators of stress among the crewmembers of the regional HEMS of the Region Friuli Venezia Giulia, Italy. From August 12 to September 3, 2009, and from February 12 to April 1, 2010, heart rate (HR), diastolic blood pressure (DBP), and systolic blood pressure (SBP) were measured, on a voluntary basis, before and after each flight among the crewmembers. Oxygen saturation (SpO2) was also recorded. The effects of flight and personal characteristics on the parameters after the flight were analyzed through multivariate regression. Data on 95 work shifts, corresponding to 162 flights, were collected. Only the HR changed significantly after the flight (median change: 15 beats/min considering all the flights). The increase in HR was significantly greater in flights with adverse weather conditions, in hostile environments, and at high altitude than in the others. The change in HR was inversely correlated with that of SpO2. After adjusting for potential confounders, the HR after the flight was significantly higher among technical personnel than among physicians and nurses. The increase in HR after the flight indicates that the HEMS crew are exposed to stressful conditions during the mission. Monitoring such parameters may be helpful in recognizing the onset of acute stress and ensuring the safety of the patients and the crew themselves.

Physician-manned emergency medical teams supplement other emergency medical services in some countries. These teams are often selectively deployed to patients who are considered likely to require critical care treatment in the pre-hospital phase. The evidence base for guidelines for pre-hospital triage and immediate medical care is often poor. We used a recognised consensus methodology to define key priority areas for research within the subfield of physician-provided pre-hospital critical care. METHODS: A European expert panel participated in a consensus process based upon a four-stage modified nominal group technique that included a consensus meeting. RESULTS: The expert panel concluded that the five most important areas for further research in the field of physician-based pre-hospital critical care were the following: Appropriate staffing and training in pre-hospital critical care and the effect on outcomes, advanced airway management in pre-hospital care, definition of time windows for key critical interventions which are indicated in the pre-hospital phase of care, the role of pre-hospital ultrasound and dispatch criteria for pre-hospital critical care services. CONCLUSION: A modified nominal group technique was successfully used by a European expert group to reach consensus on the most important research priorities in physician-provided pre-hospital critical care.

Animal, manikin & cadaver models


Automated chest-compression devices (ACCDs) have recently been proposed in the management of out-of-hospital cardiac arrest (cardiopulmonary resuscitation, CPR). During CPR, it is still unknown whether the ACCD or intubation is to be first implemented. Knowing the impact of an ACCD on intubation conditions could strongly contribute to determine the best sequence. Therefore, we undertook an experimental study on intubation conditions on a mannequin with or without the use of an ACCD. Methods Emergency physicians and nurses experienced in the field of cardiac-arrest management (including orotracheal intubation) were randomly assigned to three scenarios to intubate a mannequin: patient lying on the floor without an ACCD (group 1), patient lying on the floor with the ACCD switched off (group 2) or switched on (group 3). The primary end point was intubation time. Estimated intubation difficulty evaluated on a visual analogue scale (VAS), ranging from 0 (easy) to 100 (impossible), number of attempts, Cormack grade and dental traumatisms associated with the intubation procedure were secondary end points. Results: A total of 44 operators performed the intubation. Times to intubation were 14 (11' 22), 15 (10' 21) and 18 (15' 27) s for groups 1, 2 and 3, respectively. The VAS difficulties were 12 (5' 25), 15 (10' 25) and 15 (5' 21), respectively. Intubation conditions did not differ between the 'without an ACCD group' and the 'switched-off ACCD group'. In the 'switched-on ACCD group', time to intubation was significantly increased in comparison with groups 1 and 2 with a median difference of 4 (1,10) and 3 (0, 7) s, respectively. The VAS difficulty was also significantly
increased in the ‘switched-on ACCD group’. Other secondary end-point criteria did not differ between the three groups. Conclusion: Due to the major role of compression during CPR, we suggest that the ACCD should not be systematically switched off for routine intubation.


Mechanical chest compression devices are being implemented as an aid in cardiopulmonary resuscitation (CPR), despite lack of evidence of improved outcome. This manikin study evaluates the CPR-performance of ambulance crews, who had a mechanical chest compression device implemented in their routine clinical practice 8 months previously. The objectives were to evaluate time to first defibrillation, no-flow time, and estimate the quality of compressions. Methods: The performance of 21 ambulance crews (ambulance nurse and emergency medical technician) with the authorization to perform advanced life support was studied in an experimental, randomized cross-over study in a manikin setup. Each crew performed two identical CPR scenarios, with and without the aid of the mechanical compression device LUCAS. A computerized manikin was used for data sampling. Results There were no substantial differences in time to first defibrillation or no-flow time until first defibrillation. However, the fraction of adequate compressions in relation to total compressions was remarkably low in LUCAS-CPR (58%) compared to manual CPR (88%) (95% confidence interval for the difference: 13, 50%). Only 12 out of the 21 ambulance crews (57%) applied the mandatory stabilization strap on the LUCAS device. Conclusions: The use of a mechanical compression aid was not associated with substantial differences in time to first defibrillation or no-flow time in the early phase of CPR. However, constant but poor chest compressions due to failure in recognizing and correcting a malposition of the device may counteract a potential benefit of mechanical chest compressions.


Objective: To compare the speeds and success rates of placement for percutaneous cricothyrotomy versus surgical or open cricothyrotomy. Methods: Twenty-two paramedics (mean 9.7 years of experience), with training in both methods, were timed using a pig trachea in a crossover model. An emergency physician performed timing and documentation of success; timing commenced after the equipment was ready and the membrane was identified. Paramedics were randomly assigned by a coin toss to start in either group. All were actively employed by a municipal third-service emergency medical services (EMS) agency. Paramedics who did not complete one of the methods correctly were excluded from speed analysis. Data were analyzed using descriptive statistics, a t-test of paired samples, and confidence intervals for matched samples. Results Placement of a surgical cricothyrotomy was significantly faster (mean 28 seconds, range 10 - 78 seconds) than the percutaneous method (mean 123 seconds, range 58 - 257 seconds) (p < 0.001). Mean difference between the 20 matched percutaneous versus surgical pairs was 93.75 seconds (95% CI 72.3, 115.2). The surgical route had a 100% success rate at obtaining airway control, whereas the percutaneous method had a 90.9% success rate (p=0.1). Conclusion: In an animal model, surgical cricothyrotomy appeared to be a preferable method for establishing a definitive airway over the percutaneous method. Further research is required to define the optimal approach in the prehospital setting for the invasive airway.

The role of pelvic circumferential compression devices (PCCDs) is to temporarily stabilise a pelvic fracture, reduce the volume and tamponade the bleeding. Tissue damage may occur when PCCDs are left in place longer than a few hours. The aim of this randomised clinical trial was to quantify the pressure at the region of the greater trochanters (GTs) and the sacrum, induced by PCCDs in healthy volunteers. Materials and methods In a crossover study, the Pelvic Binder, SAM-Sling and T-POD were applied successively onto 80 healthy participants in random order. The pressure was measured using a pressure mapping system, with the volunteers in supine position on a spine board and on a hospital bed. Data were analysed using Mixed Linear Modelling. Results On a spine board, the pressure exceeded the tissue damaging threshold at the GTs and the sacrum. Pressure at the GTs was highest with the Pelvic Binder, and lowest with the SAM-Sling. Pressure at the sacrum was highest with the Pelvic Binder. The pressure at the GTs and sacrum was reduced significantly for all three PCCDs upon transfer to a hospital bed. Conclusion: The results of this randomised clinical trial in healthy volunteers showed that patients with pelvic fractures, temporarily stabilised with a PCCD, are at risk for developing pressure sores. The pressure on the skin exceeded the tissue damaging threshold and is, besides PCCD type, influenced by BMI, waist size and age. Regardless with which PCCD trauma patients are stabilised, early transfer from the spine board is of key importance to reduce the pressure to a level below the tissue damaging threshold.Clinicians should be aware of the potential deleterious effects associated with the application of a PCCD, and every effort must be made to remove the PCCD once haemodynamic resuscitation has been established.

Objective: Knowledge remains limited regarding cerebral blood flow autoregulation after cardiac arrest and during postresuscitation hypothermia. We determined the relationship of cerebral blood flow to cerebral perfusion pressure in a swine model of pediatric hypoxic-asphyxic cardiac arrest during normothermia and hypothermia and tested novel measures of autoregulation derived from near-infrared spectroscopy. Design: Prospective, balanced animal study. Setting: Basic physiology laboratory at an academic institution. Subjects: Eighty-four neonatal swine. Interventions: Piglets underwent hypoxic-asphyxic cardiac arrest or sham surgery and recovered for 2 hrs with normothermia followed by 4 hrs of either moderate hypothermia or normothermia. In half of the groups, blood pressure was slowly decreased through inflation of a balloon catheter in the inferior vena cava to identify the lower limit of cerebral autoregulation at 6 hrs postresuscitation. In the remaining groups, blood pressure was gradually increased by inflation of a balloon catheter in the aorta to determine the autoregulatory response to hypertension. Measures of autoregulation obtained from standard laser-Doppler flowmetry and indices derived from near-infrared spectroscopy were compared. Measurements and Main Results: Laser-Doppler flux was lower in postarrest animals compared to sham-operated controls during the 2-hr normothermic period after resuscitation. During the subsequent 4-hr recovery, hypothermia decreased laser-Doppler flux in both the sham surgery and postarrest groups. Autoregulation was intact during hypertension in all groups. With arterial hypotension, postarrest, hypothermic piglets had a significant decrease in the perfusion pressure lower limit of autoregulation compared to postarrest, normothermic piglets. The near-infrared spectroscopy-derived measures of autoregulation accurately detected loss of autoregulation during hypotension. Conclusions: In a pediatric model of cardiac arrest and resuscitation, delayed induction of hypothermia decreased cerebral perfusion and decreased the lower limit of autoregulation. Metrics derived from noninvasive near-infrared spectroscopy accurately identified the lower limit of autoregulation during normothermia and hypothermia in piglets resuscitated from arrest.

Background: Sudden cardiac arrest (CA) is a leading cause of death worldwide. Breathing nitric oxide (NO) reduces ischemia/reperfusion injury in animal models and in patients. The objective of this study was to learn whether inhaled NO improves outcomes after CA and cardiopulmonary resuscitation (CPR).

Methods and Results: Adult male mice were subjected to potassium-induced CA for 7.5 minutes whereupon CPR was performed with chest compression and mechanical ventilation. One hour after CPR, mice were extubated and breathed air alone or air supplemented with 40 ppm NO for 23 hours. Mice that were subjected to CA/CPR and breathed air exhibited a poor 10-day survival rate (4 of 13), depressed neurological and left ventricular function, and increased caspase-3 activation and inflammatory cytokine induction in the brain. Magnetic resonance imaging revealed brain regions with marked water diffusion abnormality 24 hours after CA/CPR in mice that breathed air. Breathing air supplemented with NO for 23 hours starting 1 hour after CPR attenuated neurological and left ventricular dysfunction 4 days after CA/CPR and markedly improved 10-day survival rate (11 of 13; P=0.003 versus mice breathing air). The protective effects of inhaled NO on the outcome after CA/CPR were associated with reduced water diffusion abnormality, caspase-3 activation, and cytokine induction in the brain and increased serum nitrate/nitrite levels. Deficiency of the alpha-1 subunit of soluble guanylate cyclase, a primary target of NO, abrogated the ability of inhaled NO to improve outcomes after CA/CPR. Conclusions: These results suggest that NO inhalation after CA and successful CPR improves outcome via soluble guanylate cyclase-dependent mechanisms.


Objective: To examine the hypothesis that pediatric resuscitation providers hyperventilate patients via bag-valve-mask (BVM) ventilation during performance of cardiopulmonary resuscitation (CPR), quantify the degree of excessive ventilation provided, and determine if this tendency varies according to provider type.

Methods: A retrospective, observational study was conducted of 72 unannounced, monthly simulated pediatric medical emergencies ('mock codes') in a tertiary care, academic pediatric hospital. Responders were code team members, including pediatric residents and interns (MDs), respiratory therapists (RTs), and nurses (RNs). All sessions were video-recorded and reviewed for the rate of BVM ventilation, rate of chest compressions, and the team members performing these tasks. The type of emergency, location of the code, and training level of the team leader were also recorded. Results: Hyperventilation was present in every mock code reviewed. The mean rate of BVM ventilation for all providers in all scenarios was 40.6 ± 11.8 breaths per minute (BPM). The mean ventilation rates for RNs, RTs, and MDs were 40.8 ± 14.7, 39.9 ± 11.7, and 40.5 ± 10.3 BPM, respectively, and did not differ among providers (P = .94). All rates were significantly higher than the recommended rate of 8 to 20 BPM (per Pediatric Advanced Life Support guidelines, varies with patient age) (P < .001). The mean ventilation rate in cases of isolated respiratory arrest was 44.0 ± 13.9 BPM and was not different from the mean BVM ventilation rate in cases of cardiopulmonary arrest (38.9 ± 14.4 BPM; P = .689). Conclusions: Hyperventilation occurred in simulated pediatric resuscitation and did not vary according to provider type. Future educational interventions should focus on avoidance of excessive ventilation.

Objectives: The aim of the present study was to evaluate the performance of three indirect laryngoscopes, Truview EVO2 laryngoscope, Clarus Levitan fiberoptic stylet and AirwayScope AWS, in comparison with direct Macintosh laryngoscope (ML) when performed in normal and difficult airway scenarios. Methods: This prospective comparative study recruited 30 emergency physicians familiar with direct laryngoscopic intubation. Intubations were performed on manikin and were repeated twice for both scenarios. The primary end points were intubation time and rate of failed intubation. Glottis visualization was graded on Cormack and Lehane score and VAS. Results: In normal airway scenario: AWS had shortest intubation time (6.0 s) followed by ML (8.7 s); VAS score of ML and AWS was lower (easier to use) than the other two devices; Cormack and Lehane score was similar for all devices. In difficult airway scenario: AWS had shortest intubation time (5.9 s); VAS score of AWS was lower than the other three devices; TVL, FOS, AWS had better Cormack and Lehane score than ML. Intubation time, rate of failed intubation, and Cormack and Lehane score were similar between attempts in both scenarios. Learning effect was significant in FOS in both scenarios and in TVL in normal airway scenario. Conclusions: AWS performed best in normal and difficult airways. ML performed better than TVL and FOS in normal airways. Performances of ML, TVL and FOS were similar in difficult airways. Skills with AWS could be mastered rapidly. TVL and FOS required more practice to gain expertise.

The aim of this study was to evaluate the Pentax AWS videolaryngoscope (PAV) in intubation of simulated difficult airways by emergency medical staff. Emergency medical staff and students attempted to intubate a manikin using 3 difficult airways settings with both the PAV and a Macintosh (MAC) laryngoscope in a randomized order. The success of tracheal intubation, time required, number of attempts, airway adjunct use, grade of view obtained, and participant comments were recorded. Significantly higher success rates of intubation occurred with the PAV compared with the MAC, irrespective of the level of training or number of previous intubations. With the highest difficulty setting, success occurred in 76.4% with the PAV versus 8.8% with the MAC. The PAV also significantly improved the Cormack and Lehane grading and reduced airway adjunct use, number of intubation attempts, and damage during intubation. The PAV may be a useful adjunct in difficult intubations by emergency medical staff.

We recently reported that female sex protects against cerebral and cardiac injury after hypovolemic cardiac arrest (CA), independent of sex hormone effects. As female sex was also associated with a smaller increase in inducible and neuronal nitric oxide synthase (NOS), we hypothesised that nitric oxide inhibition with methylene blue (MB) improves the outcome, primarily in male animals. Methods: Twenty sexually immature piglets (10 males and 10 females) were bled to mean arterial blood pressure of 35 mmHg, and were subjected to 2 min of untreated CA followed by 8 min of open chest cardiopulmonary resuscitation (CPR). Volume resuscitation was started during CPR with intravenous administration of 3 ml kg−1 hypertonic saline-dextran. Methylene blue was then administered as bolus of 2.5 mg kg−1 over 20 min, followed by 1.5 mg kg−1 infusion over 40 min. Historical data from 21 animals were used as control (no MB). Hemodynamic parameters, myocardial injury
(troponin I), and short-term survival (3-h) were evaluated. Histopathological evaluation of heart specimens was performed. Results: There were no differences between male and female animals in survival or resuscitation rate. After CA female piglets had significantly greater systolic and mean arterial pressures, and had lower troponin I plasma concentrations compared to male piglets, with or without MB. No difference was observed in histopathological analysis of heart specimens between sexes. Conclusions: After resuscitation from hypovolemic CA, female sex protects against cardiac injury, independent of sex hormones. Modulation of NO expression with MB does not improve survival or myocardial histological injury in either sex.


Objectives: A left lateral tilt of 15° has been advocated during trauma resuscitation of near-term pregnant patients to avoid the potential for hemodynamic compromise caused by aortocaval compression in the supine position. This recommendation is supported by limited objective evidence, and an experimental determination of the optimal tilt required would be very difficult to accomplish logistically. A derivation of the Guyton/Coleman/Summers computer model of cardiovascular physiology was used to analyze the theoretically expected hemodynamic responses to varying degrees of lateral tilt for a normal pregnancy and during a simulated hemorrhagic shock. Methods: Computer simulation studies were used to predict the degree of left lateral tilt required to restore hemodynamic normalcy during the final 20 weeks of gestation. The analytic procedure involved recreating the clinical conditions for a virtual subject through a simulated reenactment of the clinical transfer of a pregnant patient from a lateral to a supine positioning. An analysis of model validity in the context of this particular clinical condition found the model predictions to be within 5% to 12% of experimental results. Results: During the simulated lateral to supine position transfer, the virtual patient with Class I hemorrhage had a 7% greater fall in cardiac output and a 17% greater fall in mean arterial pressure (MAP) than the corresponding nonhemorrhagic patient. The model suggests that 15° of tilt will result in hemodynamic normalization only up to 26 weeks of gestation. In addition, 13% greater tilt is required to achieve hemodynamic normalcy in the hemorrhaged term pregnant patient. Conclusions: Current trauma guidelines suggest that the pregnant trauma patient be placed in a 15° left lateral tilt position to prevent aortocaval compression. A computer simulation study suggests that this tilt may be inadequate to offload the vena cava and normalize the circulation.

Case Studies, Letters & Editorials


In all medical interventions complications are studied intensively so that the risk–benefit can be quantified. In cardiopulmonary resuscitation (CPR), and especially in chest compression studies, side effects seem to be of little interest, yet CPR is not a harmless medical treatment. There are only a few studies on the incidence and the ideal method to detect CPR-related rib and/or sternal injuries both in survivors and in the
deceased. Some authors have performed experimental CPR studies on the recently deceased. Sternal fractures are more dangerous than rib fractures as they can cause direct and more severe organ injuries in the thorax: the fracture line and/or the sternal fragments may function as a saw with each further compression. Sternal fractures may occur more frequently in females. In this issue, Kim et al. report on an interesting retrospective study which at first compares computed tomography (CT) with conventional X-ray for the detection of CPR-related thorax injuries in 40 CPR survivors. Although there was no statistical significance, there was a trend towards more rib fractures and sternal fractures in women and in those older than 60 years. Fewer of the rib fractures and none of the 12 sternal fractures found on CT, were detected on the X-ray. These results confirm our own findings that a standard X-ray is not sensitive enough to detect chest wall injuries caused by CPR.....

Two exceptional cases of auto-resuscitation have been published recently, in the Journal. First, Krarup et al. reported on one of few cases of auto-resuscitation with good neurological outcome. Second, Cummings and Noviski published the first case of paediatric auto-resuscitation. Auto-resuscitation, also known as the Lazarus phenomenon, is a poorly understood phenomenon, which is defined as the unassisted return of spontaneous circulation after cardiac arrest. Several potential mechanisms may be involved, for example auto-positive end-expiratory pressure, hyperventilation and alkalosis, hyperkalaemia, delayed action of drugs and unobserved minimal vital signs. Despite scarce evidence, some authors suggest, that after termination of cardiopulmonary resuscitation patients should be monitored with an ECG for ~ 10 min.
We suspected a non-publication bias of false positive death certifications and auto-resuscitation cases in academic databases due to fear of medico-legal consequences, disrepute among physicians and non-acceptance of case reports in medical journals. Thus, in contrast to other auto-resuscitation reviews based on academic publications, we searched for reports in non-academic databases in Austria, Germany and Switzerland. Interestingly....

This case report describes the use of the air-Q intubating laryngeal airway (air-Q ILA; Cookgas LLC, St. Louis, MO) for airway rescue and a conduit for blind tracheal intubation in two pediatric patients with failed rapid sequence intubation and difficult airways secondary to airway bleeding in the emergency department (ED). Objectives: To describe the use of a new supraglottic rescue device in the management of the pediatric patients difficult airway in the emergency setting. Case Report Case 1 was a 5-year-old boy who presented to the ED for bleeding one day after his tonsillectomy. After a rapid sequence intubation, direct laryngoscopy was difficult, with copious bleeding in the oropharynx and inability to visualize the glottis. After two failed direct laryngoscopic attempts to intubate, a size-2 air-Q ILA was inserted. A cuffed 5.0-mm inner diameter (ID) endotracheal tube (ETT) was blindly inserted through the lumen of the air-Q ILA into the trachea successfully. Case 2 was a 13-year-old boy who presented to the ED with a large nasopharyngeal laceration from a motor vehicle accident. After a rapid sequence intubation, direct laryngoscopy showed copious blood with no glottic visualization. A size 3 Laryngeal Mask Airway Classic (cLMA; LMA North America Inc., San Diego, CA) was inserted with a large airway leak, and blind ETT insertion via the cLMA was unsuccessful. Subsequently, a size-2.5 air-Q
ILA was inserted and adequate ventilation was restored. A cuffed 6.0-mm ID ETT was blindly inserted through the air-Q ILA into the trachea successfully. Conclusion: Two cases of failed laryngoscopy in pediatric patients with blood in the airway are described. In each case, insertion of an air-Q ILA was followed by successful blind tracheal intubation via the lumen of the air-Q ILA. Case report

The Heart Foundation’s Guidelines for the Management of Acute Coronary Syndromes was first published in 2006, with an addendum summarizing new evidence and consequent changes in recommendations published in 2007. The current 2011 Addendum summarizes clinical trial evidence published since the last addendum that is relevant to the management of acute coronary syndromes (ACS) in the Australasian context, and makes recommendations for practice change to improve patient outcomes. The core-writing group was comprised mainly of cardiologists and Heart Foundation staff, but included a lone emergency physician. The process of development of the recommendations was iterative, dynamic and highly interactive over an extended period of meetings and teleconferences. Data were not simply taken at face value; there was often robust discussion of the relative merit of published data, its relevance to the Australasian context and practice, and how to deal with evidence gaps. The final recommendations are evidence-based, with grades of evidence reported according to the current National Health and Medical Research Council classifications. This Addendum covers 16 published pages with 58 references. The main topics addressed include serum troponin measurement in the diagnosis of ACS, choice of reperfusion therapy for ST elevation myocardial infarction (STEMI), antithrombotic therapy for STEMI and non-ST elevation ACS (non-STEACS), an approach to assessment of bleeding risk in ACS, oxygen therapy for patients with ACS and system factors. A summary of the changes in each of these domains of particularly relevance to emergency medicine will be discussed. The 2011 addendum is available in full at:

Guideline 14: ACS

Understanding the epidemiological spread of methicillin resistant Staphylococcus aureus (MRSA) is an important aspect in limiting the pathogen's prevalence in a community. Because emergency medical service (EMS) personnel are potential portals of infection both into and out of the hospital, knowledge of their MRSA colonization status may have implications on limiting the further spread of this organism. The prevalence of nasal MRSA colonization in EMS providers has not been documented in the current literature. We conducted a prospective cohort study on a convenience sample of EMS providers from the City of Norfolk Fire Rescue (single tiered combined Fire/EMS agency; 499 EMS providers; 18 450 annual transports; in Norfolk, VA (population, 234 403). From April 15, 2008 to December 2, 2008, 136 subjects were enrolled in the study. This represents 27% (136/499) of the total number of EMS providers in our system. Subjects were considered not eligible for the study if they were younger than 18 years, had an active soft tissue infection, or were immunocompromised. Nasal swabs were collected by study investigators upon arrival to the emergency department (ED) during normal duties or at their individual duty station. This study was approved by the authors' institutional review board. We found that, of the 136 EMS providers tested, only 1 (0.7%) tested positive for MRSA colonization. Community-acquired MRSA is primarily encountered in the ED in the form of skin and soft tissue infections. Skin and soft tissue infections are responsible for 77% to 96% of infections caused by community-acquired MRSA . It is generally accepted that colonization with
MRSA is a precursor to disease, although the exact link is unclear. Up to 38% of healthy subjects colonized with MRSA develop infection over the period of 8 to 10 weeks. Interestingly, the prevalence of MRSA nasal colonization among EMS providers in our urban EMS system was exceedingly low. Our EMS providers were colonized with MRSA at prevalence comparable with the general population and a lower rate than ED personnel. Because of the low prevalence, our findings do not support the need for routine MRSA screening of EMS providers in our community.

Letter

54. Menegazzi JJ. Infant chest compression depth needs further evaluation. Resuscitation 2011; 82 (10): 1362

Dear Sir,

Having done some of the initial research into the two-thumb method of chest compression for infants, I read the article by Reyes et al. with great interest. The authors have made a very important discovery that seems to indicate that there has been an increase in the incidence of rib fractures in infants undergoing CPR at their institution since the adoption of the ILCOR ACLS Guidelines 2005. This finding highlights the need to emphasize two key facts.

First, in all the work that we did we emphasized that the two-thumb technique included a gentle squeezing of the thorax with the fingers that covered the lateral chest. In addition to increasing intrathoracic pressure, this squeezing gives lateral support to the ribs and thus will decrease the likelihood of fracture. If this component of the technique is not being properly taught and/or implemented then the risk of fracture will clearly be increased. Second, and more importantly, the recommendation to compress the infant chest 1/3–1/2 of the anteroposterior diameter (APD) is not based on any scientific evidence. In fact, a radiological study by Kao et al. demonstrated that when compressing at the mid-point of the inter-nipple line in infants a 1/3 APD compression would be 3.4 cm and a 1/2 APD compression would be 5.0 cm. In children a 1/3 APD compression would be a depth of 4.4 cm and a 1/2 APD compression would be 6.5 cm. The figure (reproduced with permission) shows just how deep 1/3 and 1/2 APD compressions would be (Fig. 1). So the increase in rib fractures in infants and children should not be surprising since these depths are greater than what is recommended for adults. Readers of Resuscitation should be reminded that 1/2 ADP compressions are no longer recommended. Until some scientific evidence demonstrating the optimum depth can be evaluated, rescuers should compress infants’ chest cautiously.

Letter

55. Nichani RV. A national registry would inform best practice for mild hypothermia after cardiac arrest. BMJ 2011; 343

With reference to the debate about whether evidence supports the use of mild hypothermia after cardiac arrest, we report our experience. Nine critical care units in the north west of England recently submitted data on 101 patients admitted to critical care after cardiac arrest. We found that therapeutic hypothermia ...

Letter

A 31-year-old woman presented with spontaneous tension pneumothorax. This was initially treated with needle decompression, which led to massive haemothorax. Treatment and methods to reduce the likelihood of this complication are discussed.

Case study

57. Sayre MR. Cardiac arrest survival rates are mutable. Resuscitation 2011; 82 (10): 1257-8
Around the world, survival from out-of-hospital cardiac arrest is the exception rather than the rule. Despite the development of sophisticated emergency medical services (EMS), survival to hospital discharge has changed little over more than 30 years. As Sir William Thomson Kelvin pointed out, “If you cannot measure it, you cannot improve it.” Only a minority of EMS system leaders know the survival rate to hospital discharge for victims of out-of-hospital cardiac arrest cared for by their EMS professionals...Measurement of survival to hospital discharge following out-of-hospital cardiac arrest should be expected of all EMS systems. EMS systems should publicly report their hospital discharge survival rates to their political leaders and the citizens they serve as well as the EMS professionals and hospital staffs caring for those patients. Doing so may be embarrassing for EMS systems which have survival rates today which are similar to Brighton and Hove in 2003. However, public reporting of survival rates will have many positive effects including creating the political will to improve outcomes. ...

We report on a medical emergency, which was handled at dusk in the forecourt of a neighbouring rehabilitation clinic. A 58-year old male patient, who had undergone a triple CABG-operation 11 days before, collapsed and fell on his face. Primarily, he suffered from ventricular fibrillation. Despite problematic conditions for intubation (position of the patient, lighting conditions, and intraoral bleeding), an l-gel supraglottic airway (l-gel), size 4, was easily placed without having to cease thorax compression in the neutral position. Ventilation with adequate thoracic excursion was possible without any leakage of air. Following successful defibrillation, an endotracheal tube, size 7 (Rüsch Company, Kernen, Germany) was placed without difficulty to achieve complete and successful airway management. This was done whilst bleeding persisted. During transport in the ambulance, the l-gel was left in situ in order to stabilise the tube. The l-gel was removed on the intensive care unit during endotracheal tube exchange using a COOK airway exchange catheter. The patient received an automatic implantable cardioverter-defibrillator and was discharged 2 weeks later. He sustained no neurological damage. The pre-hospital use of supraglottic airways devices (SADs) is recommended as an alternative to endotracheal intubation (ETI) when managing difficult airways and when inadequately practised users attempt airway management. However, it is still unclear which SAD is best suited for airway management during resuscitation. The advantages of the l-gel (quick insertion, high sealing pressure, high rate of success) and its safe clinical use render it interesting for potential pre-hospital use. So far, there have been few case reports that assessed the pre-hospital use of the l-gel. Leakage of air due to exceeding the airway leak pressure was reported as a problem. In our case, however, ventilation was performed without difficulty. Generally, SADs should allow secondary ETI. In a comparative investigation, where applying a neck collar simulated a difficult airway, there was a better
fibre optic view of the glottis when using the I-gel. Another investigation studied blind intubation on an airway management trainer. When using the I-gel, the rate of success was only between 47% and 64%. The relatively straight shaft of the I-gel was considered as a potential cause since it does not actively aid the tube passing anteriorly when exiting the I-gel. In general, the I-gel should not be used for blind intubation. However, if ETI is required in a pre-hospital setting where no fibre optic equipment is available, blind intubation through the I-gel could still be considered. Further clinical investigations should determine if the use of different types of endotracheal tubes could enhance the rate of success when performing blind intubation via the I-gel in an emergency situation.

Norepinephrine (NE) is a naturally occurring potent vasopressor and inotrope that is commonly used in acute care medicine. It is an α1,2-β1,2 adrenergic agonist, with a marked α1-sympathomimetic and β1-sympathomimetic activity. This agent has been used in cardiopulmonary arrest events and in the immediate postarrest period. The basic rationale of using vasopressors, such as NE, in the context of a cardiac arrest is an attempt to restore the threshold levels of coronary perfusion pressure and myocardial blood flow. Controversy exists, however, regarding the use of NE in victims of sudden cardiac death with return of spontaneous circulation (ROSC), especially during the postresuscitation care. Some animal models have shown that the addition of adrenergic agents, such as epinephrine and NE, during cardiac arrest decreases blood flow to the kidneys during cardiopulmonary resuscitation. Some of these models have also shown that this effect persists even after ROSC is achieved. Despite the proven fact that high plasma NE levels are found in canine model of cardiac arrest after successful ROSC, suggesting the protective value of this adrenergic agent in cardiac arrest situations, the use of this agent in this context is limited. Many clinicians are concerned of the potential vasoconstrictive effects of NE on the kidney with the resulting renal dysfunction in the postresuscitation period.

60. Xanthos T, Iacovidou N and Ekmektzoglou KA. From cardiopulmonary to cardiorespiratory resuscitation. Resuscitation 2011; 82 (10): 1360
Cardiac arrest (CA) encompasses two distinct, pathophysiological mechanisms; the cessation of activity of the heart and respiration. This is why CA is used interchangeably with the term cardiorespiratory arrest. It was more than 50 years ago when Kouwenhoven, Safar and Jude proposed the idea of cardiopulmonary resuscitation (CPR). However, it might be time to reconsider the term. CA results in combined respiratory and metabolic acidosis, because pulmonary gas exchange ceases and cellular metabolism becomes anaerobic. During the global ischemia in CA, the intracellular environment is characterized by reduction in the myocardial oxygen tension (PO2), increase in carbon dioxide tension (PCO2) and increase of the pH. The concentrations of both O2 and CO2 affect ventilation and gas exchange. The primary purpose of CPR is to deliver oxygenated blood and remove CO2 from the tissues until return of spontaneous circulation. Chest compressions are used so as to ensure a minimal blood flow to the heart and brain while the purpose of ventilation is to oxygenate and to remove CO2 from the blood. Regarding the first component of the term “CPR”, 2 pump theories are advocated so as to postulate the mechanism of blood flow during CPR with the end result being the generation of adequate cerebral perfusion pressure and coronary perfusion pressure (CPP). It now seems that the driving force for blood flow produced by chest compression is some combination of intrathoracic pressure fluctuations and direct cardiac compression, with the latter being, probably, more potent in moving blood for a given amount of pressure rise. However, regarding the second part of the term, scientists at the time did not realize that it was not only the lungs but, rather, the respiration as a whole that should be the goal.
of the resuscitation effort. It is the process of maintaining movement of air from the outside into the alveoli of the lungs for the efficient exchange of gases that is of paramount importance in the resuscitation chain. Ventilation of the lungs of a CA victim has been assumed important for successful resuscitation. Recommendations for ventilation were based on studies performed in the 1950s and 1960s in living humans with normal cardiac output. These studies presumed that the goal of ventilation during CPR was to achieve near “normal” tidal volumes and minute ventilation. However, during CA, the amount of hemoglobin passing through the pulmonary bed is reduced and the amount of O2 necessary to saturate hemoglobin is also reduced, if there is not a large ventilation/perfusion mismatch. Because venous return and thus the quantity of CO2 delivered to the lungs are decreased, the amount of ventilation necessary to remove CO2 is presumably reduced (an adequate ventilation/perfusion ratio can be maintained with lower tidal volumes and respiratory rates than normal).

The authors believe that a discussion should be initiated in the scientific community regarding the term Cardiorespiratory Resuscitation which probably better describes the Resuscitation science, as respiration in general (and not just the lungs), along with the heart, are the focus of resuscitation procedures.

Letter

61. Young N, Cook B and Gillies M. New resuscitation guidelines may result in an increased incidence of severe chest wall injury, and lead to prolonged length of stay in the Intensive Care Unit. Resuscitation 2011; 82 (10): 1355

In October 2010 the Resuscitation Council (UK) and the European Resuscitation Council published new guidelines for basic life support. These guidelines strongly emphasise the importance of high quality chest compressions. In particular they recommend compression of the chest by at least 5 cm, with the European guideline stating that there is insufficient evidence to recommend an upper limit for chest compression. Rescuers are also now advised to place their hands in the centre of the chest rather than count up from the xiphisternum. We work in a large tertiary Intensive Care Unit with around 1100 admissions per year. We routinely admit comatose survivors of out of hospital cardiac arrest for therapeutic hypothermia. Anecdotally more patients appeared to have significant chest wall trauma following out of hospital cardiac arrest since new resuscitation guidelines were implemented. We conducted a retrospective chart review to compare the incidence of significant chest wall trauma – multiple rib fractures, flail segment or flail sternum – occurring in the first quarter of this year compared to the first quarter of 2010. During the first quarter of this year (2011) seven of nineteen patients (37%) we have admitted following out of hospital cardiac arrest have had significant chest wall injuries. Five of these seven patients survived: three had prolonged (greater than 14 days) periods of weaning from mechanical ventilation that we believe was contributed to by their chest wall trauma. During the first quarter of 2010 only two of nineteen patients (11%) admitted following out of hospital arrest had significant chest wall injuries, neither of whom survived. None of the survivors in this time period had an ICU length of stay of greater than 10 days. Both groups contained more males than females with male: female ratio of 16:3 this year and 15:4 in 2010. The age range of both groups was also similar: 2011 median 62, interquartile range 60–71; 2010 median 61, interquartile range 50–69. Our numbers are small at present, do not reach statistical significance (p = 0.12 [two-tailed Fisher’s exact test]) and can at best be regarded as hypothesis generating. We plan to prospectively evaluate all patients presenting to our unit following out of hospital cardiac arrest over the coming year with respect to chest wall trauma, length of Intensive Care Unit stay and survival. While we continue to support current resuscitation guidelines, none of the changes pertaining to chest compression were based on data from randomised trials. We would encourage others to prospectively evaluate the incidence of chest wall trauma in patients presenting following
cardiac arrest.

Letter

Education & ethics in resuscitation


Objective: To evaluate the ability of international point of care information summaries to update evidence relevant to medical practice. Design: Prospective cohort bibliometric analysis. Setting: Top five point of care information summaries (Clinical Evidence, EBMGuidelines, eMedicine, Dynamed, UpToDate) ranked for coverage of medical conditions, editorial quality, and evidence based methodology. Main outcome measures: From June 2009 to May 2010 we measured the incidence of research findings relating to potentially eligible newsworthy evidence. As samples, we chose systematic reviews rated as relevant by international research networks (such as, Evidence-Based Medicine, ACP Journal Club, and the Cochrane Collaboration). Every month we assessed whether each sampled review was cited in at least one chapter of the five summaries. The cumulative updating rate was analysed with Kaplan-Meier curves. Results: From April to December 2009, 128 reviews were retrieved; 53% (68) from the literature surveillance journals and 47% (60) from the Cochrane Library. At nine months, Dynamed had cited 87% of the sampled reviews, while the other summaries had cited less than 50%. The updating speed of Dynamed clearly led the others. For instance, the hazard ratios for citations in EBM Guidelines and Clinical Evidence versus the top performer were 0.22 (95% confidence interval 0.17 to 0.29) and 0.03 (0.01 to 0.05). Conclusions: Point of care information summaries include evidence relevant to practice at different speeds. A qualitative analysis of updating mechanisms is needed to determine whether greater speed corresponds to more appropriate incorporation of new information.


Health care has traditionally been delivered primarily by experts working individually in a decentralized system lacking cohesive organization among professional disciplines. Only recently have the advantages of teamwork training been acknowledged in health care. This article explores the history, benefits, and recommendations for team training in neonatal care. TeamSTEPPS (Rockville, MD) and the revised Neonatal Resuscitation Program are cited as promising models for improved neonatal outcomes through professional teamwork.


Introduction: Providing emergency medical services (EMS) requires significant resources, including the cost of paramedic training, certification, and maintenance of competencies. Currently, no published research examines the cost and performance effectiveness of Web-based training vs. video teleconferencing-based training vs. traditional classroom-based training methods for paramedics. Hypothesis: Paramedics trained in local, remote, and Web-based groups will have similar rates of successful completion of 12-lead electrocardiogram (ECG) training. The Web-based training group will be the most cost-effective method of conducting 12-lead ECG training. Methods: The 12-lead ECG course was taught
to all paramedics (n=63) employed by a county EMS system in southwestern Ontario, Canada. The paramedics were placed into one of three groups: local, remote, and Web-based. The local group (n=17) received all training in a direct-teaching classroom format. The remote group (n=18) received training (lecture and skills) via video teleconferencing technology. The Web-based group (n=21) received training via Web-based learning. The three groups followed the same course schedule, material, slides/presentations, and practice cases. A pilot group of paramedics (n=7) was used to gauge material's depth and teaching times. Independent-samples t-test was used to compare the rates of completion (dependent variable) of the three groups (local, remote, and Web). Results: The local (n=17) and remote (n=18) groups had a 100% successful completion of the 12-lead training program. The Web-based group (n=21) had a non-completion rate of 19% (n=4; p=0.042). The mean costs per student were $300 in the local group, $238 in the remote group, and $200 in the Web-based group. However, after adjusting for retraining, the mean cost per student in the Web-based group was $250. Conclusion: The cost of paramedic training, certification, and maintenance of competence requires a significant amount of resources. Each of the three methods used in this study has distinctive strengths and limitations. In this study, we identified a limitation of the Web-based training method for the introduction of a new procedure.

The concept of family members witnessing the resuscitation or invasive procedure of their relative is one that has garnered much attention over the past few decades. With the rise of family-centered care, family input into healthcare decisions has increased and strict visitation policies have relaxed, even including family at the bedside during invasive procedures and resuscitation. This concept first presented in the early 1980’s when Foote Hospital in Michigan began a program to facilitate the practice of family member presence during resuscitation as a response to demands by families (Doyle, 1987). Hanson and Strawser (1992) presented data from that program as the seminal research on this topic. Since then the research has centered on several different aspects of this issue. Research has been conducted to examine the perspectives of the patient; both children and adults..

We empirically identify those aspects that make an effective lecture according to both quantitative and qualitative assessments of the opinions of a select group of emergency medicine educators. The authors worked collaboratively with the Educational Meetings Committee of the American College of Emergency Physicians (ACEP) to distribute surveys to 150 participants identified as exemplary lecturers in emergency medicine. These participants had been rated in the top 10% of all lecturers by ACEP's Educational Meetings Committee, according to audience evaluations. Respondents quantitatively rated the importance of a set of strategies for the design/organization and delivery of a lecture. Additional qualitative responses were elicited from semi-structured, open-ended questions that were used to identify conceptual themes and subcategories of major themes. One hundred fifty surveys were sent. Seventy-four (49%) of the surveys were returned, of which 67 (45%) were analyzed. Quantitative results revealed the top 3 categories of importance about design/organization (having a manageable scope of content for the allotted time, having clear objectives, and using case-based scenarios) and the top 3 categories of importance about delivery (knowledge of slides/material, having passion/enthusiasm, and interaction with the audience). Qualitative results revealed 5 thematic concepts from the analysis of 281 statements: delivery, vehicle, content, preparation, and uncontrollables, in order of descending importance according to our
results. Under the category 'delivery' the subcategory 'engaging' was the most frequently endorsed quality. 'Relevance' under the category 'content' was the second most endorsed quality of all the statements obtained. Quantitative and qualitative findings indicate that a specific and directed structure, a lecturer's knowledge base, and confidence and enthusiasm for the material are key components in the development of an effective lecture. These self-reported findings help describe strategies of exemplary emergency medicine lecturers that can be considered by faculty, residents, and other presenters.


Airway management is of essential importance in emergency care. Training and skill retention of endotracheal intubation (ETI) - the technique considered as the "gold standard" - poses a problem especially among care providers experiencing a low frequency of airway management situations. Therefore, alternative airway devices such as the laryngeal tube (LT) with potentially steeper learning curves have been developed and studied. Our aim was to evaluate in a manikin model the use of LT after no other training than written instructions only. METHODS: To evaluate the amount of training required to use the LT in a scenario of airway compromise, we assessed the feasibility of providing written instructions and pictures showing its use to 67 out- and in-hospital emergency care providers attending an Emergency Care conference. The majority of the participants were either nurses or firemen with a median of 5 years' history of work in emergency care. RESULTS: In this study 55 % of all participants inserted the LT on the first attempt without additional instructions. An additional 42 % required verbal instructions before successful insertion. Overall, 97% of the participants successfully inserted the LT with two attempts. In logistic regression analysis, no relationship was detected between background variables (basic education, experience of emergency work, frequency of bag-valve-mask ventilation (BVM) and frequency of ETI) and successful insertion of the LT in less than 30 seconds, ability to maintain normoventilation (7 l/min) and need for further instructions during the test. CONCLUSIONS: We found that in this pilot study majority of emergency care providers could insert LT with one or two attempts with written instructions, pictures and verbal instruction. This may provide an option to simplify the training of airway management with LT.


Retention of cognitive knowledge and skill ability is a recognized challenge in all disciplines of health care. It is generally agreed that knowledge and skills decay over time. Many refresher-training programs for emergency medical services (EMS) personnel are offered in two-year cycles. Strategies based on the analysis of knowledge and skill decay over time can be used to improve the effectiveness and efficiency of refresher training programs. Hypothesis: In the absence of refresher training, knowledge and skills necessary for emergency management of acute myocardial infarction (AMI) will persistently decline over time. Methods: A retrospective analysis was conducted of pre- and post-test data collected over a five-year period (January 5, 1999, to March 9, 2004) from a randomized set of learners enrolled in our emergency management of AMI training program. The difference between initial post-test and next pre-test score was compared with the interval between trainings. Practicing paramedic learners were grouped into 180-day intervals for comparison and correlation. Results: The scores from 168 learners were...
evaluated. The average cognitive declines out of a possible 100 points for the shortest interval (180 days) and the longest interval (1,825 days) were 22.00 and 21.15, respectively. This was not statistically significant. There was no correlation in the average decline of knowledge and skill and the time interval between initial and refresher training ($r = 0.05367$). Conclusion: Decline in knowledge and skill for emergency management of AMI occurs less than 180 days after initial training and reaches a nadir that remains stable over five years. Educators should evaluate and determine the knowledge and skills that are most likely to decline over time and use this information to redesign refresher-training programs. Knowledge and skill content that remains stable over time may be reduced or eliminated from refresher programs so more focus is dedicated to 'decay-prone' competencies. This has tremendous implications on the development and implementation of training programs, as it has the potential to lead to more efficient programs of study.


Background: The validity of current guidelines regarding resuscitation of patients in traumatic cardiopulmonary arrest (TCPA) and the ability of emergency medical services (EMS) to appropriately apply them have been called into question. The purpose of this study is to demonstrate the consequences of violating the current published guidelines and whether EMS personnel were able to accurately identify patients in TCPA.

Methods: We conducted a retrospective review of our Level I trauma center's database that identified 294 patients over an 8-year period (January 1, 2003, to December 31, 2010) who suffered prehospital TCPA and met criteria for the withholding or termination of resuscitation based on current guidelines. Patient demographics, prehospital/emergency department physiology, survival, neurologic outcome, and hospital charges were analyzed. Results: One of 294 patients (0.3%) survived to reach hospital discharge with a Glasgow Coma Scale score of 6. The total costs incurred for these 294 patients meeting criteria for withholding or termination of resuscitation were $3,852,446.65. One hundred seventeen (39.8%) patients were evaluated by more than one EMS team. There was 100% agreement on the presence (15 of 15) or absence (102 of 102) of a pulse between the EMS teams. Conclusions: Our data support the current guidelines regarding the withholding or termination of resuscitation of patients in prehospital TCPA and represent the largest series to date on this topic. EMS personnel were able to accurately determine traumatic cardiac arrest in the field in this series. Violation of the current guidelines resulted in six patients being resuscitated to a neurologically devastated state. No loss of neurologically intact survivors would have resulted had strict adherence to the guidelines been maintained.

70. Mpotos N, Lemoyne S, Wyler B, Deschepper E, et al. Training to deeper compression depth reduces shallow compressions after six months in a manikin model. Resuscitation 2011; 82 (10): 1323-7

Studies show that students, trained to perform compressions between 40 and 50 mm deep, often do not achieve sufficient depth at retention testing. We hypothesized that training to achieve depths >50 mm would decrease the proportion of students with depth <40 mm after 6 months, compared to students trained to a depth interval of 40–50 mm. Methods: A basic life support (BLS) self-learning station was attended by 190 third year medicine students. They were first offered the possibility to refresh their skills, following the instructions of a 15 min abbreviated Mini Anne™ video (Laerdal, Norway) using a full size torso and a face shield. This was followed by further training using Resusci Anne Skills Station™ software (Laerdal, Norway). Voice feedback was provided according to randomisation to a standard group (SG) 40–50 mm and a deeper group (DG) >50 mm. Quality of compressions was tested after 6 months. Results: The SG and DG groups consisted of 90 (67% female)
and 100 (58% female) participants respectively. At the end of training, all students reached the target depth without overlap between groups. After 6 months, the proportion of students achieving a depth <40 mm was 26/89 (29%) in the SG vs. 12/89 (14%) in the DG (P = 0.01). The proportion of students with a depth >50 mm was 5/89 (6%) for the SG and 44/89 (49%) in the DG (P < 0.001).

Conclusions: The educational strategy to train students to a deeper depth, reduced shallow compressions 6 months after training.


Debate around medical futility has produced a vast literature that continues to grow. Largely absent from the broader literature is the role of emergency medicine in either starting measures that prove to be futile, withholding treatment or starting the end of life communication process with patients and families. In this discussion we review the status of the futility debate in general, identify some of the perceived barriers in managing futile care in the ED including the ethical and legal issues, and establish the contribution of emergency medicine in this important debate. We conclude that emergency physicians have the clinical ability and the legal and moral standing to resist providing futile treatment. In these situations they can take a different path that focuses on comfort care thereby initiating the process of the much sought after 'good death'.


As many as 90% of all trauma-related deaths occur in developing nations, and this is expected to get worse with modernisation. The current method of creating an emergency care system by modelling after that of a Western nation is too resource-heavy for most developing countries to handle. A cheaper, more community-based model is needed to establish new emergency care systems and to support them to full maturity. Methods: A needs assessment was undertaken in Manenberg, a township in Cape Town with high violence and injury rates. Community leaders and successfully established local services were consulted for the design of a first responder care delivery model. The resultant community-based emergency first aid responder (EFAR) system was implemented, and EFARs were tracked over time to determine skill retention and usage. Results: The EFAR system model and training curriculum. Basic EFARs are spread throughout the community with the option of becoming stationed advanced EFARs. All EFARs are overseen by a local organisation and a professional body, and are integrated with the local ambulance response if one exists. On competency examinations, all EFARs tested averaged 28.2% before training, 77.8% after training, 71.3% 14 months after training. EFARs reported using virtually every skill taught them, and further review showed that they had done so adequately. Conclusion: The EFAR system is a low-cost, versatile model that can be used in a developing region both to lay the foundation for an emergency care system and support a new one to maturity.

73. Williams NM. Advanced life support training and assessment: A literature review. Aust Emerg Nurs J 2011; online first (October 14)

Advanced Life Support (ALS) certification has become a mandatory requirement for most critical care nurses in Australia. The purpose of this review is to critically evaluate current literature in relation to ALS training and certification for critical care nurses. There is some evidence in the literature that ALS training programs can improve patient outcome following cardiac arrest. Teaching methods vary including simulation training, e-learning and lecture based courses. Of continued concern is the consistent message that competence declines rapidly following ALS courses. Whilst many critical care units require evidence of annual ALS assessment there is little evidence that this translates into ongoing practical
competence or confidence. Recommendations from regulatory bodies and ALS training literature reinforce that frequent, relevant and practical learning activities may be more effective, however it is unclear from the review if this occurs nor if critical care nurses remain confident in their skills as time passes.

Introduction: Evidence suggests that simulation training improves preclinical and possibly actual clinical performance in a range of health disciplines and could therefore be expected to do the same for paramedics. This project is based on the observations of the Consultative Committee on Road Traffic Fatalities in Victoria (British Columbia, Canada) that identified over a five-year period consistent management, diagnostic, and technique errors in prehospital trauma care associated with adverse outcomes. Hypothesis: This study aimed to answer the question: “Do clinical simulations using a human patient simulator (HPS) in the education of paramedics in trauma care reduce error rates in preclinical performance?” Methods: The research design was a randomized, controlled study using a pre/post-test design. The participants were student ambulance and intensive care paramedics (n = 120) at three different phases of training. Ethics approval was obtained. Results: Significant improvement in post-test performance was demonstrated by students undertaking simulation-based learning compared with students undertaking case study-based learning (p = 0.008). A subgroup analysis demonstrated that the most significant difference between control and study groups was evident in novice paramedics (p = 0.014). This diminished in the more experienced student ambulance paramedic group (p = 0.059) and was not evident in the student intensive care paramedic group (p = 0.767). Conclusion: Clinical simulations using an HPS in the education of paramedics in trauma care results in reduced errors in preclinical performance when compared with case study based learning in junior paramedics. These findings have implications for the development of future paramedic education programs. Future studies should explore the transition of improved preclinical performance to actual clinical performance.

Buckle rib fractures are incomplete fractures involving the inner cortex alone, and are rarely detected on routine chest X-ray or at autopsy. The characteristics of these fractures have not been well evaluated in situ although they are commonly observed on postmortem CT images especially following CPR. The postmortem CT findings in 42 cases showing buckle rib fractures caused by CPR were reviewed. The cause of death in all cases was non-traumatic. The shape, number, location, and distribution of these buckle rib fractures and their relationship to other types of rib fractures were evaluated using a novel oblique axial multiplanar reconstruction technique. Almost all incomplete rib fractures associated with CPR are buckle rib fractures (90.5%). All rib fractures were distributed from the second to ninth ribs with over 95% being within the second to seventh ribs. Buckle rib fractures are dominant in the seventh to ninth ribs and the proportion of buckle rib fractures located in the vicinity of the costochondral junctions increases with the lower ribs. Over 97% of all CPR associated rib fractures are located in the anterior one third of the ribs based on a new measurement method utilizing oblique axial multiplanar reconstruction of the CT data. When recognition of incomplete or buckle rib fractures on postmortem CT is taken into account, detection of symmetry and continuity of rib fractures typically associated with CPR is improved compared with the detection of complete fractures alone. Recognition of buckle rib fractures and their characteristics on postmortem CT is of benefit to the forensic pathologist in evaluating the possibility of CPR and the differentiation of
resuscitative artifact from forensically significant visceral injury observed at autopsy.


This study examined whether biases concerning age and/or disability status influenced resuscitation decisions. Medical students were randomly chosen to read 1 of 4 vignettes, organized in a 2 (age: infant vs school-age) x 2 (disability: preexisting vs no preexisting) between-subjects design. The vignettes described a pediatric patient experiencing an acute episode who required resuscitation. Following resuscitation, patients with existing disability would continue to have disability, whereas those without would develop disability. Participants indicated whether they would resuscitate, given a 10% chance of success. There was a significant main effect of disability: Medical students displayed a preference for resuscitating previously disabled children compared with previously healthy children when prognosis was held constant, F(1, 121) = 4.89, p = .03. This differential treatment of the two groups cannot easily be morally justified and poses a quandary for educators.

And...winner of the 2011 IgNobel Prize for Medicine / Physiology


In healthy adults, voluntary inhibition of micturition is associated with an increasing sensation in the urge to void and pain, and acute pain has been associated with transient deterioration in aspects of cognitive function. METHODS: Eight healthy young adults consumed 250 ml of water every 15 min until they could no longer inhibit voiding. Performance on standardized measures of cognitive function was measured at hourly intervals which were classified as baseline, when individuals reported an increase in the urge to void, a strong increase in the urge to void, an extreme increase in the urge to void and post micturition. RESULTS: Sensations of the urge to void and pain increased with time of inhibition of urge to void and with amount of water consumed. Having an extreme urge to void exerted a large negative effect on attentional and working memory functions (d > 0.8). These cognitive functions returned to normal levels after micturition. CONCLUSION: The magnitude of decline in cognitive function associated with an extreme urge to void was as large and equivalent or greater than the cognitive deterioration observed for conditions known to be associated with increased accident risk.