Australia and New Zealand Committee on Resuscitation: MAY 2013 Research updates

Advanced life support


A recent out-of-hospital cardiac arrest (OHCA) clinical trial showed improved survival to hospital discharge (HD) with favorable neurologic function for patients with cardiac arrest of cardiac origin treated with active compression decompression cardiopulmonary resuscitation (CPR) plus an impedance threshold device (ACD + ICD) versus standard (S) CPR. The current analysis examined whether treatment with ACD + ITD is more effective than standard (S-CPR) for all cardiac arrests of non-traumatic origin, regardless of the etiology.

Methods: This is a secondary analysis of data from a randomized, prospective, multicenter, intention-to-treat, OHCA clinical trial. Adults with presumed non-traumatic cardiac arrest were enrolled and followed for one-year post arrest. The primary endpoint was survival to hospital discharge (HD) with favorable neurologic function (Modified Rankin Scale score ≤ 3). Results Between October 2005 and July 2009, 2738 patients were enrolled (S-CPR = 1335; ACD + ITD = 1403). Survival to HD with favorable neurologic function was greater with ACD + ITD compared with S-CPR: 7.9% versus 5.7%, (OR 1.42, 95% CI 1.04, 1.95, p = 0.027). One-year survival was also greater: 7.9% versus 5.7%, (OR 1.43, 95% CI 1.04, 1.96, p = 0.026). Nearly all survivors in both groups had returned to their baseline neurological function by one year. Major adverse event rates were similar between groups. Conclusions: Treatment of out-of-hospital non-traumatic cardiac arrest patients with ACD + ITD resulted in a significant increase in survival to hospital discharge with favorable neurological function when compared with S-CPR. A significant increase survival rates was observed up to one year after arrest in subjects treated with ACD + ITD, regardless of the etiology of the cardiac arrest.

2. Häске D, Schempf B, Gaier G and Niederberger C. Performance of the i-gel™ during pre-hospital cardiopulmonary resuscitation. Resuscitation 2013; Early online (4 May)

Current cardiopulmonary resuscitation (CPR) guidelines recommend airway management and ventilation whilst minimising interruptions to chest compressions. We have assessed i-gel™ use during CPR. Methods: In an observational study of i-gel™ use during CPR we assessed the ease of i-gel™ insertion, adequacy of ventilation, the presence of a leak during ventilation, and whether ventilation was possible without interrupting chest compressions. Results: We analysed i-gel™ insertion by paramedics (n = 63) and emergency physicians (n = 7) in 70 pre-hospital CPR attempts. There was a 90% first attempt insertion success rate, 7% on the second attempt, and 3% on the third attempt. Insertion was reported as easy in 80% (n = 56), moderately difficult in 16% (n = 11), and difficult in 4% (n = 3). Providers reported no leak on ventilation in 80% (n = 56), a moderate leak in 17% (n = 12), and a major leak with no chest rise in 3% (n = 2). There was a significant association between ease of insertion and the quality of the seal (r = 0.99, p = 0.02). The i-gel™ enabled continuous chest compressions without pauses for ventilation in 74% (n = 52) of CPR attempts. There was no difference in the incidence of leaks on ventilation between patients having continuous chest compressions and patients who had pauses in chest compressions for ventilation (83% versus 72%, p = 0.33, 95% CI [−0.1282, 0.4037]). Ventilation during CPR was adequate during 96% of all CPR attempts. Conclusions: The i-gel™ is an easy supraglottic airway device to insert...
and enables adequate ventilation during CPR.

The importance of minimising aortocaval compression during cardiopulmonary resuscitation in late pregnancy is widely accepted. Current European guidelines suggest employing manual displacement of the uterus with left lateral tilt to achieve this. Several methods for producing lateral tilt have been described; however, the optimum method is unknown. By performing simulated cardiopulmonary resuscitation on a manikin, we compared four of these methods: a folded labour ward pillow; a pre-formed foam wedge; a custom-made hard wooden wedge; and the 'human wedge'. Primary outcome measures were maintenance of adequate tilt, stability and effectiveness of chest compressions (rate, depth and adequate release). Overall, the foam and wooden wedges were significantly more stable and reliable at maintaining tilt than the pillow (p < 0.0001); the wooden wedge was more stable and effective than the foam wedge (p < 0.0001). Chest compressions were least effective with the human wedge (p = 0.02). Effectiveness of chest compressions with lateral tilt was comparable to that reported previously in supine manikin studies. We recommend the use of dedicated foam or hard wedges rather than pillows or the human wedge for producing lateral tilt during cardiopulmonary resuscitation.

Few studies have reported factors that result in a better neurological outcome in patients with postcardiac arrest syndrome (PCAS) following return of spontaneous circulation (ROSC). We investigated the factors affecting neurological outcome in terms of both prehospital care and treatments after arrival at hospital in patients with PCAS. METHODS: The study enrolled patients with cardiogenic cardiac arrest who were admitted to an intensive care unit after ROSC with PCAS. We investigated the association of the following factors with outcome: age, gender, witness to event present, bystander cardiopulmonary resuscitation (CPR) performed, ECG waveform at the scene, time interval from receipt of call to arrival of emergency personnel, time interval from receipt of call to arrival at hospital, prehospital defibrillation performed, special procedures performed by emergency medical technician, and time interval from receipt of call to ROSC, coronary angiography/percutaneous coronary intervention (PCI) and therapeutic hypothermia performed. RESULTS: The study enrolled 227 patients with PCAS. Compared with the poor neurological outcome group, the good neurological outcome group had a statistically significant higher proportion of the following factors: younger age, male, witness present, bystander CPR performed, first ECG showed ventricular fibrillation/pulseless ventricular tachycardia, defibrillation performed during transportation, short time interval from receipt of call to ROSC, coronary angiography/PCI and therapeutic hypothermia performed. Of these factors, the only independent factor associated with good neurological outcome was the short time interval from receipt of the call to ROSC. CONCLUSIONS: In the present study, shortening time interval from receipt of call to ROSC was the only important independent factor to achieve good neurological outcome in patients with PCAS.

Nitric oxide (NO) is often used to treat heart failure accompanied with pulmonary edema. According to present knowledge, however, NO donors
are contraindicated when systolic blood pressure is less than 90 mmHg. Based on recent findings and our own clinical experience, we formulated a hypothesis about the new breakthrough complex lifesaving effects of NO donors in patients with cardiac arrest and cardiopulmonary resuscitation therapy. It includes a direct hemodynamic effect of NO donors mediated through vasodilation of coronary arteries in cooperation with improvement of cardiac function and cardiac output through reversible inhibition of mitochondrial complex I and mitochondrial NO synthase, followed by reduction in reactive oxygen species and correction of myocardial stunning. Simultaneously, an increase in vascular sensitivity to sympathetic stimulation could lead to an increase in diastolic blood pressure. Confirmation of this hypothesis in clinical practice would mean a milestone in the treatment for cardiac arrest and cardiopulmonary resuscitation.


Antiarrhythmic drugs like lidocaine are usually given to promote return of spontaneous circulation (ROSC) during ongoing out-of-hospital cardiac arrest (OHCA) from ventricular fibrillation/tachycardia (VF/VT). Whether administering such drugs prophylactically for post-resuscitation care after ROSC prevents re-arrest and improves outcome is unstudied. Methods: We evaluated a cohort of 1721 patients with witnessed VF/VT OHCA who did (1296) or did not receive prophylactic lidocaine (425) at first ROSC. Study endpoints included re-arrest, hospital admission and survival. Results: Prophylactic lidocaine recipients and non-recipients were comparable, except for shorter time to first ROSC and higher systolic blood pressure at ROSC in those receiving lidocaine. After initial ROSC, arrest from VF/VT recurred in 16.7% and from non-shockable arrhythmias in 3.2% of prophylactic lidocaine recipients, 93.5% of whom were admitted to hospital and 62.4% discharged alive, as compared with 37.4%, 7.8%, 84.9% and 44.5%, of corresponding non-recipients (all p < 0.0001). Adjusted for pertinent covariates, prophylactic lidocaine was independently associated with reduced odds of re-arrest from VF/VT, odds ratio, (95% confidence interval) 0.34 (0.26-0.44) and from non-shockable arrhythmias (0.47 (0.29-0.78)); a higher hospital admission rate (1.88, (1.28-2.76)) and improved survival to discharge (1.49 (1.15-1.95)). However in a propensity score-matched sensitivity analysis, lidocaine's only beneficial association with outcome was in a lower incidence of recurrent VF/VT arrest. Conclusions: Administration of prophylactic lidocaine upon ROSC after OHCA was consistently associated with less recurrent VF/VT arrest, and therapeutic equipoise for other measures. The prospect of a promising association between lidocaine prophylaxis and outcome, without evidence of harm, warrants further investigation.


Some observational studies indicate that endotracheal intubation is associated with a worse outcome compared to bag-mask ventilation after out-of-hospital cardiac arrest in emergency medical services (EMS) systems without rapid sequence intubation (RSI). We evaluated the role of RSI in airway management following cardiac arrest. Methods: We conducted a cohort study of all non-traumatic arrest patients treated by a metropolitan EMS system from 2007 to 2011. Advanced airway management information was obtained from a prospective airway registry and linked to a cardiac arrest registry. We used multivariate logistic regression to estimate the association between attempted intubation status and survival to hospital discharge. Results: Of 3133 patients, 82% underwent attempted intubation without RSI, 15% underwent attempted RSI, and 3% experienced no intubation attempt. Survival to hospital discharge differed by attempted intubation status: 11% (n = 291/2576) for intubation without RSI, 48% (n = 226/471) for RSI, and 71% (n = 61/86) for “no intubation.” Compared to the intubation without RSI group, the adjusted odds ratios of survival were 5.6 (95% CI 4.3, 7.2) for the RSI group and 15 (95% CI 9, 27) for the “no intubation” group. Conclusion: In this
population-based cohort of out-of-hospital cardiac arrest, RSI was used in 15% of patients and associated with a better prognosis than intubation attempted without paralytics. Because this subset with a favorable prognosis may not be readily intubated in systems without paralytics, these findings could help to explain the adverse relationship between intubation and survival observed in prior studies.


Major trauma is the leading worldwide cause of death in young adults. The mortality from traumatic cardiac arrest remains high but survival with good neurological outcome from cardiopulmonary arrest following major trauma has been regularly reported. Rapid, effective intervention is required to address potential reversible causes of traumatic cardiac arrest if the victim is to survive. Current ILCOR guidelines do not contain a standard algorithm for management of traumatic cardiac arrest. We present a simple algorithm to manage the major trauma patient in actual or imminent cardiac arrest. Methods: We reviewed the published English language literature on traumatic cardiac arrest and major trauma management. A treatment algorithm was developed based on this and the experience of treatment of more than a thousand traumatic cardiac arrests by a physician – paramedic pre-hospital trauma service. Results: The algorithm addresses the need for treatment of those patients who are considered to have a poor prognosis (such as those with a history of previous cardiac arrest, those with a history of drug or alcohol abuse, or those with a history of recent cardiac surgery). Conclusions: The requirement to rapidly address a number of potentially reversible pathologies in a short time period lends the management of traumatic cardiac arrest to a simple treatment algorithm. A standardised approach may prevent delay in diagnosis and treatment and improve current poor survival rates.


Objective: Little is known about which symptoms are manifested before out-of-hospital cardiac arrest (OHCA). The objective of this study is to describe the prodromal symptoms of OHCA focusing on the onset of the symptom in relation of etiology of cardiac arrests, and to analyze the association between those symptoms and their outcomes after OHCA. Methods: This prospective, population-based cohort study enrolled all persons aged 18 years or older who had experienced OHCA of presumed cardiac and non-cardiac origin that were witnessed by bystanders or emergency medical system (EMS) personnel in Osaka from 2003 through 2004. Results: There were 1042 were presumed to be of cardiac origin and 424 of non-cardiac. Patients with non-cardiac origin were more likely to have prodromal symptoms than those with cardiac etiology (70.0% vs. 61.8%, p = 0.003). Over 40% of OHCA regardless of etiology had displayed symptoms at least several minutes before their arrest (40.2% [259/644] in those of cardiac origin and 45.5% [135/297] in those of non-cardiac origin). As to cardiac origin, the most frequent prodromal symptom was dyspnea (27.6%), followed by chest pain (20.7%) and syncope (12.7%). For non-cardiac origin, the most frequent symptom was also dyspnea (40.7%), but chest pain was rarely presented (3.4%). Although, prodromal symptoms themselves were not associated with better neurological outcomes (adjusted odds ratio [AOR], 2.03; 95% confidence interval [CI], 1.00–4.13), earlier contact to a patient yielded better neurological outcomes (AOR per every one-minute increase, 0.90; 95% CI, 0.82–0.99). Conclusions: Many of OHCA regardless of etiology have prodromal symptoms before arrest. Prodromal symptoms induced early activation of the EMS system, and may thus improve outcomes after OHCA.

Filtering the cardiopulmonary resuscitation (CPR) artifact has been a major approach to minimizing interruptions to CPR for rhythm analysis. However, the effects of these filters on interruptions to CPR have not been evaluated. This study presents the first methodology for directly quantifying the effects of filtering on the uninterrupted CPR time. METHODS: A total of 241 shockable and 634 nonshockable out-of-hospital cardiac arrest records (median duration, 150 seconds) from 248 patients were analyzed. Filtering and rhythm analysis were commenced after 1 minute of CPR, and the end point for CPR was established at the time of the first shock diagnosis. Kaplan-Meier curves were used to compute the probability of interrupting CPR as a function of time. The probabilities of delivering 2 minutes of uninterrupted CPR for the shockable and nonshockable rhythms were compared with the 2-minute cycles of uninterrupted CPR recommended by the guidelines. RESULTS: For the nonshockable rhythms, the probabilities of delivering at least 2 and 3 minutes of uninterrupted CPR were 58% (95% confidence interval, 54%-62%) and 48% (44%-52%), respectively. These are the probabilities of reducing and substantially reducing the frequency of CPR interruptions for rhythm analysis. For the shockable rhythms, the probability of avoiding unnecessary CPR prolongation beyond 2 minutes was 100% (99%-100%). CONCLUSIONS: Filtering reduces the frequency of CPR interruptions for rhythm analysis in less than 60% of nonshockable rhythms. New strategies to increase the probability of prolonging CPR for nonshockable rhythms should be defined and evaluated using the methodology proposed in this study.


Aim: As recent clinical data suggest a harmful effect of arterial hyperoxia on patients after resuscitation from cardiac arrest (CA), we aimed to investigate this association during cardiopulmonary resuscitation (CPR), the earliest and one of the most crucial phases of recirculation. Methods: We analysed 1015 patients who from 2003 to 2010 underwent out-of-hospital CPR administered by emergency medical services serving 300,000 inhabitants. Inclusion criteria for further analysis were nontraumatic background of CA and patients > 18 years of age. One hundred and forty-five arterial blood gas analyses including oxygen partial pressure (PaO2) measurement were obtained during CPR. Results: We observed a highly significant increase in hospital admission rates associated with increases in PaO2 in steps of 100 mmHg (13.3 kPa). Subsequently, data were clustered according to previously described cutoffs (≤60 mmHg [8 kPa]), 61–300 mmHg [8.1–40 kPa], >300 mmHg [>40 kPa]). Baseline variables (age, sex, initial rhythm, rate of bystander CPR and collapse-to-CPR time) of the three compared groups did not differ significantly. Rates of hospital admission after CA were 18.8%, 50.6% and 83.3%, respectively. In a multivariate analysis, logistic regression revealed significant prognostic value for PaO2 and the duration of CPR. Conclusion: This study presents novel human data on the arterial PaO2 during CPR in conjunction with the rate of hospital admission. We describe a significantly increased rate of hospital admission associated with increasing PaO2. We found that the previously described potentially harmful effects of hyperoxia after return of spontaneous circulation were not reproduced for PaO2 measured during CPR.


Aim of the study: Mild therapeutic hypothermia is a major advance in post-resuscitation-care. Some questions remain unclear regarding the time to initiate cooling and the time to achieve target temperature below 34 °C. We examined whether seasonal variability of outside temperature
influences the body temperature of cardiac arrest victims, and if this might have an effect on outcome. Methods: Patients with witnessed out-of-hospital cardiac arrests were enrolled retrospectively. Temperature variables from 4 climatic stations in Vienna were provided from the Central Institute for Meteorology and Geodynamics. Depending on the outside temperature at the scene the study participants were assigned to a seasonal group. To compare the seasonal groups a Student’s t-test or Mann–Whitney U test was performed as appropriate. Results Of 134 patients, 61 suffered their cardiac arrest during winter, with an outside temperature below 10 °C; in 39 patients the event occurred during summer, with an outside temperature above 20 °C. Comparing the tympanic temperature recorded at hospital admission, the median of 36 °C (IQR 35.3–36.3) during summer differed significantly to winter with a median of 34.9 °C (IQR 34–35.6) (p < 0.05). This seasonal alterations in core body temperature had no impact on the time-to-target-temperature, survival rate or neurologic recovery. Conclusion: The seasonal variability of outside temperature influences body temperature of out-of-hospital cardiac arrest victims.


Prehospital intubation does not result in a survival advantage in patients experiencing penetrating trauma, yet resistance to immediate transportation to facilitate access to definitive care remains. An animal model was developed to determine whether intubation provides a survival advantage during severe hemorrhagic shock. We hypothesized that intubation would not provide a survival advantage in potentially lethal hemorrhage. METHODS: After starting a propofol drip, Yorkshire pigs were intubated (n = 6) or given bag-valve mask ventilation (n = 7) using 100% oxygen. The carotid artery was cannulated with a 14-gauge catheter, and a Swan-Ganz catheter was placed under fluoroscopy using a central venous introducer. After obtaining baseline hemodynamic and laboratory data, the animals were exsanguinated through the carotid line until death. The primary end point was time until death, while secondary end points included volume of blood shed, temperature, cardiac index, mean arterial pressure, lactic acid, base excess, and creatinine levels measured in 10-minute intervals. RESULTS: There was no difference in time until death between the two groups (51.1 [2.5] minutes vs. 48.5 [2.4] minutes, p = 0.52). Intubated animals had greater volume of blood shed at 30 minutes (33.6 [4.4] mL/kg vs. 28.5 [4.3] mL/kg, p = 0.03), 40 minutes (41.7 [4.7] mL/kg vs. 34.9 [3.8] mL/kg, p = 0.04), and 50 minutes (49.2 [8.6] mL/kg vs. 40.2 [1.0] mL/kg, p = 0.001). In addition, the intubated animals were more hypothermic at 40 minutes (35.5[degrees]C [0.4[degrees]C] vs. 36.7[degrees]C [0.2[degrees]C], p = 0.01) and had higher lactate levels (2.4 [0.1] mmol/L vs. 1.8 [0.4] mmol/L, p = 0.04) at 10 minutes. Cardiac index (p = 0.66), mean arterial pressure (p = 0.69), base excess (p = 0.14), and creatinine levels (p = 0.37) were not different throughout the shock phase. CONCLUSION: Intubation does not convey a survival advantage in this model of severe hemorrhagic shock. Furthermore, intubation in the setting of severe hemorrhagic shock may result in a more profuse hemorrhage, worse hypothermia, and higher lactate when compared with bag-valve mask ventilation.


Background: Although the occurrence of intraoperative cardiac arrest is rare, it is a severe adverse event with a high mortality rate. Trauma patients have additional causes for intraoperative arrest, and we hypothesised that the survival of trauma patients who experienced intraoperative cardiac arrest would be worse than nontrauma patients who experienced intraoperative cardiac arrest. Objectives The aim of the present study was to compare the outcomes of trauma and non-trauma patients after intraoperative cardiac arrest. Methods In a tertiary university hospital and trauma centre, the intraoperative cardiac arrest cases were evaluated from January 2007 to December 2009, excluding
patients submitted to cardiac surgery. Data were prospectively collected using the Utstein-style. Outcomes among the patients with trauma were compared to the patients without trauma. Results We collected data from 81 consecutive intraoperative cardiac arrest cases: 32 with trauma and 49 without trauma. Patients in the trauma group were younger than the patients in the non-trauma group (44 ± 23 vs. 63 ± 17, p < 0.001). Hypovolaemia (63% vs. 35%, p = 0.022) and metabolic/hydro-electrolytic disturbances (41% vs. 2%, p < 0.001) were more likely to cause the cardiac arrest in the trauma group. The first documented arrest rhythm did not differ between the groups, and pulseless electrical activity was the most prevalent rhythm (66% vs. 53%, p = 0.698). The return of spontaneous circulation (47% vs. 63%, p = 0.146) and survival to discharge with favourable neurological outcome (16% vs. 14%, p = 0.869) did not differ between the two groups. Conclusions: The outcomes did not differ between patients with trauma and non-trauma intraoperative cardiac arrest.


Aims: The pattern of interruptions to chest compressions in pre-hospital cardiac arrests in Wellington, New Zealand, was examined prospectively to determine whether the mode of defibrillation chosen by paramedics influenced interruptions, shock success and the return of spontaneous circulation (ROSC). Methods: A prospective observational cohort study of 44 adult cardiac arrests in which 203 shocks were administered by Wellington Free Ambulance (WFA) paramedics was undertaken to compare Code-stat® electronic records from Medtronic® Lifepak 12 and Lifepak 15 defibrillators used in semi-automated (AED) or manual mode. Interruptions during the 30 s prior to shock delivery as well as pre-shock and post-shock pauses were calculated. Shock success and ROSC were the outcome measures. Results: Pre-shock pauses were shorter in manual mode (median 3 s, IQR 2–5) versus AED mode (median 4 s, IQR 3–6; p = 0.003). Interruptions of CPR in the 30 s prior to shock delivery were also shorter in manual mode (median 7 s, IQR 4–11) versus AED mode (median 14 s, IQR 12–16; p < 0.001). Shock success rates and post-shock pauses were not statistically different between modes. ROSC was significantly higher in manual mode (18.49%) versus AED mode (8.33%, p = 0.042). Conclusion: When paramedics used the defibrillator in manual mode as compared to AED mode, interruptions to CPR during the 30 s prior to shock delivery were significantly reduced and pre-shock pauses were also shorter. This was associated with increased ROSC. Manual defibrillation should be the preferred option for appropriately trained paramedics. Training in this locality has been changed accordingly.


Aim of the study: To question the beneficial effects of the recommended early percutaneous coronary intervention (PCI) after out-of-hospital cardiac arrest on 30-day survival with favourable neurological outcome. Methods: Prospectively collected data of 1277 out of hospital cardiac arrest patients between 2005 and 2010 from a registry at a tertiary care university hospital were used for a cohort study. Results: In 494 (39%) arrest patients ST-segment elevation was identified in 249 (19%). Within 12 h after restoration of spontaneous circulation catheter laboratory investigations were initiated in 197 (79%) and PCI in 183 (93%) (78% got PCI in less than 180 min). Adjustment for a cumulative time without
chest compressions < 2 min, initial shockable rhythm, cardiac arrest witnessed by healthcare professionals, and a higher core temperature at time of hospitalization reduced the effect of PCI on favourable neurological outcome at 30 days (OR 1.40; 95% CI, 0.53–3.7) compared to the multivariate analysis (OR 2.52; 95% CI, 1.42–4.48). Conclusion: This cohort study failed to demonstrate the beneficial effects of PCI as part of post-resuscitation care on 30-day survival with a favourable neurological outcome.


To compare the early postarrest inflammatory cytokine response between animals administered amiodarone (AMIO) and lidocaine (LIDO) intra-arrest during resuscitation from ventricular fibrillation (VF). Domestic swine (n=32) were placed under general anesthesia and instrumented before spontaneous VF was induced by balloon occlusion of the left anterior descending coronary artery. After 7 min of VF, standard ACLS resuscitation was performed and animals were randomized to either bolus AMIO (5 mg/kg, n=13) or LIDO (1 mg/kg, n=14) for recurrent or refractory VF. A non-antiarrhythmic (n=5) was also used for comparison. Following return of spontaneous circulation (ROSC), tumor necrosis factor (TNF)-alpha levels were drawn at 30 and 60 min. Groups were comparable with respect to pre-arrest hemodynamics and resuscitation variables. In the postarrest period, the LIDO and non-antiarrhythmic group demonstrated virtually identical TNF-alpha response trajectories. However, TNF-alpha levels were significantly higher in AMIO- than LIDO-treated animals at 30 min (geometric mean 539 versus 240 pg/mL, 2.2-fold higher, 95% confidence interval [CI] 1.3-3.8-fold higher, P=0.003) and at 60 min (geometric mean 570 versus 204 pg/mL, 2.8-fold higher, 95% CI 1.1-7.0-fold higher, P=0.03). Significant differences in the postarrest TNF-alpha levels were observed between animals treated with AMIO as compared to those treated with LIDO. Improved rates of ROSC seen with AMIO may come at the expense of a heightened proinflammatory state in the postcardiac arrest period.

Basic life support


BACKGROUND: Telephone-CPR (T-CPR) can increase rate of bystander CPR as well as CPR quality. Instructions for T-CPR were developed when most callers used a land line. Telephones today are often wireless and can be brought to the patient. They often have speaker function which further allows the rescuer to receive instructions while performing CPR. We wanted to measure adult lay people's ability to activate the speaker function on their own mobile phone. METHODS: Elderly lay people, previously trained in CPR, were contacted by telephone. Participants with speaker function experience were asked to activate this without further instructions, while participants with no experience were given instructions on how to activate it. Participants were divided in three groups; Group 1: Can activate the speaker function without instruction, Group 2: Can activate the speaker function with instruction, and Group 3: Unable to activate the speaker function. Time to activation for group 1 and 2 was compared using Mann-Whitney U-test. RESULTS: Seventy-two elderly lay people, mean age 68 +/- 6 years participated in the study. Thirty-five (35)% of the participants were able to activate the speaker function without instructions, 29% with instructions and 36% were unable
to activate the speaker function. The median time to activate the speaker function was 8s and 93s, with and without instructions, respectively ($p < 0.01$). **CONCLUSION:** One-third of the elderly could activate speaker function quickly, and two-third either used a long time or could not activate the function.


This report describes the case of an 18-year-old woman who was found in the sea suffering from cardiac arrest and hypothermia, 90 minutes after she entered the water to swim. The rescue team used an automated external defibrillator to record prehospital management. This recording showed an isoelectric electrocardiogram followed by a ventricular fibrillation, an unsuccessful defibrillation, and lastly, a return of spontaneous circulation with Osborn wave. When she was admitted to the intensive care unit two hours later, the woman's central temperature was 28 degrees C. The case is interesting because of several points. First, to the best of the authors' knowledge, this is the only case of cardiac arrest with severe hypothermia followed by a return of spontaneous circulation documented with an automated external defibrillator recording. Second, the hypothermia is an atypical case occurring in the summer. Hypothermia must be considered even in unlikely circumstances, such as summer in the south of France, when ambient temperatures are high. Lastly, after three days, the patient recovered successfully from cardiopulmonary arrest without cerebral dysfunction. Claret P-G, Bobbia X, Dingemans G, Onde O, Sebbane M, de La Coussaye J-E. Drowning, hypothermia and cardiac arrest: an 18-year-old woman with an automated external defibrillator recording. Prehosp Disaster Med. 2013;28(5):1-3.


Wrist pain in rescuers performing chest compressions as part of cardiopulmonary resuscitation has been reported anecdotally and recently in the literature. Studies have indicated that rescuers apply as much as 644 N of force to the victim's chest with each compression, while standards require one hundred compressions per minute. Recent research suggests that forces transmitted through the rescuers' wrists of less than 10% of those seen during the performance of chest compressions significantly strain the scapholunate ligament. Biomechanical research should be performed to further evaluate this possible correlation. Compensation for worker injury maybe involved.


Aim of the study: Sternal and rib fractures are frequent complications caused by chest compressions during cardiopulmonary resuscitation (CPR). This study aimed to investigate the potential association of CPR-related thoracic and abdominal injuries and compression depth measured with an accelerometer. Methods: We analysed the autopsy records, CT scans or chest radiographs of 170 adult patients, suffering in-hospital cardiac arrest at the Tampere University Hospital during the period 2009–2011 to investigate possible association of chest compressions and iatrogenic injuries. The quality of manual compressions during CPR was recorded on a Philips, HeartStart MRx Q-CPR™-defibrillator. Results: Patients were 110 males and 60 females. Injuries were found in 36% of male and 23% of female patients. Among male patients CPR-related injuries were associated with deeper mean – and peak compression depths ($p < 0.05$). No such association was
observed in women. The frequency of injuries in mean compression depth categories <5, 5–6 and >6 cm, was 28%, 27% and 49% (p = 0.06). Of all patients 27% sustained rib fractures, 11% sternal fracture and eight patients had haematomas/ruptures in the myocardium. In addition, we observed one laceration of the stomach without bleeding, one ruptured spleen, one mediastinal haemorrhage and two pneumothoraxes.

Conclusion: The number of iatrogenic injuries in male patients was associated with chest compressions during cardiopulmonary resuscitation increased as the measured compression depth exceeded 6 cm. While there is an increased risk of complications with deeper compressions it is important to realize that the injuries were by and large not fatal.


There is controversy regarding the association between age and being female and survival to hospital discharge after out-of-hospital cardiac arrest (OHCA). We hypothesized that younger females (aged 12–49 years) would be independently associated with increased survival after OHCA when compared to other age and sex groups. Methods: We conducted a secondary analysis of prospectively collected data from 29 United States cities that participate in the Cardiac Arrest Registry to Enhance Survival (CARES). Patients were included if they were ≥12 years of age and had a documented resuscitation attempt from October 1, 2005 through December 31, 2009. Hierarchical multivariable logistic regression analyses were used to estimate the associations between age and sex groups and survival to hospital discharge. Results Females were less likely to have a cardiac arrest in public, was witnessed, or was treatable with defibrillation. Females in the 12–49 year old age group had a similar proportion of survival to hospital discharge when compared to age-matched males (females 11.6% vs. males 11.2%), while males ≥50 years old were more likely to survive when compared to age matched females (females 6.9% vs. males 9.6%). Age stratified regression models demonstrated that 12–49 year old females had the largest association with survival to hospital discharge (OR 1.55, 95% CI 1.20–2.00), while females in the ≥50 year old age group had a smaller increased odds of survival to hospital discharge (OR 1.18, 95% CI 1.03–1.35), which only lasted until the age of 55 years (OR 1.12, 95% CI 0.97–1.29). Conclusions: Younger aged females were associated with increased odds of survival despite being found with poorer prognostic arrest characteristics.


Assessment and comparison of the electrical parameters (energy, current, first and second phase waveform duration) among eighteen AEDs. Methods: Engineering bench tests for a descriptive systematic evaluation in commercially available AEDs. AEDs were tested through an ECG simulator, an impedance simulator, an oscilloscope and a measuring device detecting energy delivered, peak and average current, and duration of first and second phase of the biphasic waveforms. All tests were performed at the engineering facility of the Lombardia Regional Emergency Service (AREU). Results Large variations in the energy delivered at the first shock were observed. The trend of current highlighted a progressive decline concurrent with the increases of impedance. First and second phase duration varied substantially among the AEDs using the exponential biphasic waveform, unlike rectilinear waveform AEDs in which phase duration remained relatively constant. Conclusions: There is a large variability in the electrical features of the AEDs tested. Energy is likely not to be the best indicator for strength dose selection. Current and shock duration should be both considered when approaching the technical features of AEDs. These findings may prompt further
investigations to define the optimal current and duration of the shock waves to increase the success rate in the clinical setting.

OBJECTIVES: The quality of chest compressions along with defibrillation is the cornerstone of cardiopulmonary resuscitation (CPR), which is known to improve the outcome of cardiac arrest. We aimed to investigate the relationship between the compression rate and other CPR quality parameters including compression depth and recoil. METHODS: A conventional CPR training for lay rescuers was performed 2 weeks before the ‘CPR contest’. CPR anytime training kits were distributed to respective participants for self-training on their own in their own time. The participants were tested for two-person CPR in pairs. The quantitative and qualitative data regarding the quality of CPR were collected from a standardised check list and SkillReporter, and compared by the compression rate. RESULTS: A total of 161 teams consisting of 322 students, which includes 116 men and 206 women, participated in the CPR contest. The mean depth and rate for chest compression were 49.0+/−8.2 mm and 110.2+/−10.2/min. Significantly deeper chest compression depths were noted at rates over 120/min than those at any other rates (47.0+/−7.4, 48.8+/−8.4, 52.3+/−6.7, p=0.008). Chest compression depth was proportional to chest compression rate (r=0.206, p<0.001), but there were significantly more incomplete chest recoils at the rate of over 120/min than at any other rates (9.8%, 6.3%, 25.6%, p=0.011). CONCLUSIONS: The study showed conflicting results in the quality of chest compression including chest compression depth and chest recoil by chest compression rate. Further evaluation regarding the upper limit of the chest compression rate is needed to ensure complete full chest wall recoil while maintaining an adequate chest compression depth.

Much attention has been given to the strategic placement of automated external defibrillators (AEDs). The purpose of this study was to examine the correlation of strategically placed AEDs and the actual location of cardiac arrests. METHODS: A retrospective review of data maintained by the Maryland Institute for Emergency Medical Services Systems (MIEMSS), specifically, the Maryland Cardiac Arrest Database and the Maryland AED Registry, was conducted. Location types for AEDs were compared with the locations of out-of-hospital cardiac arrests in Howard County, Maryland. The respective locations were compared using scatter diagrams and r2 statistics. RESULTS: The r2 statistics for AED location compared with witnessed cardiac arrest and total cardiac arrests were 0.054 and 0.051 respectively, indicating a weak relationship between the two variables in each case. No AEDs were registered in the three most frequently occurring locations for cardiac arrests (private homes, skilled nursing facilities, assisted living facilities) and no cardiac arrests occurred at the locations where AEDs were most commonly placed (community pools, nongovernment public buildings, schools/educational facilities). CONCLUSION: A poor association exists between the location of cardiac arrests and the location of AEDs.

Because out-of-hospital cardiac arrests (OHCAs) due to a major trauma rarely present with shockable rhythms, the potential benefits of using automated external defibrillators (AEDs) at the scene of traumatic OHCAs have not been examined. Methods: We conducted an observational, retrospective cohort study using an Utstein-style analysis in Tainan city, Taiwan. The enrollees were adult patients with traumatic OHCAs
accessed by emergency medical technicians (EMTs) from January 1, 2004 to December 31, 2010. The exposure was the use or non-use of AEDs at the scene, as determined by the clinical judgment of the EMTs. The primary outcome evaluated was a sustained (≥2 h) return of spontaneous circulation (ROSC), and the secondary outcomes were prehospital ROSC, overall ROSC, survival to hospital admission, survival at one month and favorable neurologic status at one month. Results: A total of 424 patients (313 males) were enrolled, of whom 280 had AEDs applied, and 144 did not. Only 25 (5.9%) patients had received bystander cardiopulmonary resuscitation (CPR), and merely 21 (7.5%) patients in the AED group presented with shockable rhythms. Compared to the non-AED group, the primary and secondary outcomes of the AED group were not significantly different, except for a significantly lower prehospital ROSC rate (1.1% vs 4.9%, p < 0.05). Multivariate analysis showed no significant interactions between the use of AEDs and other key variables. Use of the AED was not associated with sustained ROSC (OR 1.33; 95% CI 0.75–2.38, p = 0.33). Conclusions: In a community with a low prevalence of shockable rhythms and administration of bystander CPR in patients with traumatic OHCA, we found no significant differences in the sustained ROSC between the AED and the non-AED groups. Considering scene safety and the possible interruption of CPR, we do not encourage the routine use of AEDs at the scene of traumatic OHCA.

Mortality rates in Osaka for cardiac arrest after witnessed ventricular tachycardia (VT) or ventricular fibrillation (VF) have decreased dramatically. We sought to estimate the contribution of changes in out-of-hospital care to this decrease. Methods: We applied a previously validated statistical model, IMPACT, to data obtained from the Utstein Osaka Project, which registers all cardiopulmonary arrests in Osaka. The outcome was death within the first month after the arrest. Sensitivity analysis was conducted by simulating an increase in the use of public access defibrillators (PADs). Results: From 1999 through 2008, age- and sex-adjusted standardized 1-month mortality fell from 88.6% to 57.1%. There were 105 fewer deaths than expected in 2008 (295 deaths). The IMPACT model explained 62.5% of the decrease (67 deaths) in the 1-month mortality. The main contributors to the decrease in mortality were an increase in the use of biphasic waveform defibrillators, and a shortened time to first shock. These were partly offset by an increase in the administration of epinephrine by emergency medical services personnel. According to the simulation, an increase in PAD use from 1.9% to 34.4% would reduce mortality from the observed 57.1% to 49.5%. Conclusions: Modeling suggests that improvement in out-of-hospital care accounted for approximately 60% of the decline in deaths following witnessed VT or VF arrests in Osaka between 1999 and 2008. Increased usage of PADs could further improve these outcomes.

27. Ong ME, Quah JL, Ho AF, Yap S, Edwin N, Ng YY, . . . Foo DC. National population based survey on the prevalence of first aid, cardiopulmonary resuscitation and automated external defibrillator skills in Singapore. Resuscitation 2013; Early online (23 May)
AIM: This study aimed to assess knowledge, attitudes and practices among Singapore residents towards life-saving skills and providing emergency assistance in the community using a population representative sample. METHODS: A population based, random sample of 7840 household addresses were selected from a validated national sampling frame. Respondents were interviewed using face-to-face interview method. One adult aged between 18 and 69 years within each household was randomly selected using the "next birthday" method. RESULTS: The response rate achieved was 65.2% with 4192 respondents. The distribution of age, gender and ethnic group were similar to the Singapore resident population for 2009. A high proportion of participants believed that adults should be trained in first aid (89.1%) and cardiopulmonary resuscitation (CPR) (82.6%) while a lower proportion (57.2%) believed this for automated external defibrillator (AED). Proportion who had ever
been trained in first aid was 34.3%, CPR was 31.4% and AED was 10.7%. In an emergency, respondents were most willing to use life-saving skills on family members or relatives (87.6%), followed by friends and colleagues (80.7%) and complete strangers (61.3%). Common barriers to applying life-saving skills were lack of knowledge (36%), fear of doing harm (22.1%) and lack of confidence (15.3%). Respondents who were more likely to have current life-saving certification were younger employed Malay male (p<0.05). CONCLUSION: This study found that although a high proportion of respondents believed that adults should be trained in first aid, CPR and AED, the proportion who had ever been trained in these skills are much lower.

The purpose of this study was to identify and compare patterns of trauma associated with AutoPulse(R) CPR and manual CPR. Finalized autopsy records from 175 decedents brought to the Harris County Institute of Forensic Sciences were reviewed, 87 received manual-only CPR, and 88 received AutoPulse(R) CPR (in combination with manual CPR as per standard protocol). The characteristic pattern observed in manual-only CPR use included a high frequency of anterior rib fractures, sternal fractures, and midline chest abrasions along the sternum. The characteristic pattern observed in AutoPulse(R) CPR use included a high frequency of posterior rib fractures, skin abrasions located along the anterolateral chest and shoulder, vertebral fractures, and a few cases of visceral injuries including liver lacerations, splenic lacerations, and hemoperitoneum. Knowledge of the AutoPulse(R) CPR injury pattern can help forensic pathologists differentiate therapeutic from inflicted injuries and therefore avoid an erroneous assessment of cause and manner of death.

The objective of this study was to conduct a meta-analysis of literature examining rates of return of spontaneous circulation from load-distributing band and piston-driven chest compression devices as compared with manual cardiopulmonary resuscitation. DATA SOURCES: Searches were conducted in MEDLINE, the ClinicalTrials.gov registry, and bibliographies on manufacturer websites for studies written in English. STUDY SELECTION: Selection criteria for the meta-analysis required that studies must be human controlled (randomized, historical, or case-control) investigations with confirmed out-of-hospital cases. DATA EXTRACTION: A total of 12 studies (load-distributing band cardiopulmonary resuscitation versus manual cardiopulmonary resuscitation = 8, piston-driven cardiopulmonary resuscitation versus manual cardiopulmonary resuscitation = 4), comprising a total of 6,538 subjects with 1,824 return of spontaneous circulation events, met the selection criteria. DATA SYNTHESIS: Random effects models were used to assess the relative effect of treatments on return of spontaneous circulation. Compared with manual cardiopulmonary resuscitation, load-distributing band cardiopulmonary resuscitation had significantly greater odds of return of spontaneous circulation (odds ratio, 1.62 [95% CI, 1.36, 1.92], p < 0.001). The treatment effect for piston-driven cardiopulmonary resuscitation was similar to manual cardiopulmonary resuscitation (odds ratio, 1.25 [95% CI, 0.92, 1.68]; p = 0.151). The corresponding difference in percentages of return of spontaneous circulation rates from cardiopulmonary resuscitation was 8.3% for load-distributing band cardiopulmonary resuscitation and 5.2% for piston-driven cardiopulmonary resuscitation. Compared with manual cardiopulmonary resuscitation, combining both mechanical cardiopulmonary resuscitation devices produced a significant treatment effect in favor of higher odds of return of spontaneous circulation with mechanical cardiopulmonary resuscitation devices (odds ratio, 1.53 [95% CI, 1.32, 1.78], p < 0.001). CONCLUSION: The ability to achieve return of spontaneous circulation with mechanical chest compression devices is significantly improved.
when compared with manual chest compressions. In the case of load-distributing band cardiopulmonary resuscitation, it was superior to manual cardiopulmonary resuscitation as the odds of return of spontaneous circulation were over 1.6 times greater. The robustness of these findings should be tested in large randomized clinical trials.

**Education, implementation and teams**


Despite a well-described association of age and injury with mortality and decreased functional status, inpatient mortality studies have traditionally not included analysis of do not resuscitate (DNR) status. We hypothesized that the increased likelihood of DNR status in older patients alters age-adjusted mortality rates in trauma. **METHODS:** The trauma registry was queried for adult patients admitted to our Level I trauma center (January 2005-December 2008) and divided into eight age groups by decade. Ages 15-44 years were collapsed because of the lack of variation. We compared age, case fatality rate, and DNR status by univariate analysis and trends by [chi]² (p < 0.05). **RESULTS:** Of the 15,227 adult patients admitted, 13% were elderly (>=65) and 7% died. DNR status was known in 75% of deaths, and 42% of those had active DNR orders on the chart at time of death. DNR likelihood increased with age (p < 0.05), from 5% to 18%. With DNRs excluded, mortality variability across all ages was markedly diminished (4-7%). **CONCLUSION:** DNR status among trauma patients varies significantly because of inconsistent implementation and meaning between hospitals, and successive decades are more likely to have an active DNR order at time of death. When DNR patients were excluded from mortality analysis, age was minimally associated with an increased risk of death. The inclusion of DNR patients within mortality studies likely skews those analyses, falsely indicating failed resuscitative efforts rather than humane decisions to limit care after injury.


**BACKGROUND:** The optimal age to begin CPR training is a matter of debate. This study aims to determine if elementary schoolchildren have the capacity to administer CPR efficiently. **METHODS:** This quasi-experimental study took place in a Quebec City school. Eighty-two children 10 to 12 years old received a 6-hour CPR course based on the American Heart Association (AHA) Guidelines. A comparison group of 20 adults who had taken the same CPR course was recruited. After training, participants' performance was evaluated using a Skillreporter manikin. The primary outcome was depth of compressions. The secondary outcomes were compression rate, insufflation volume and adherence to the CPR sequence. Children's performance was primarily evaluated based on the 2005 AHA standards and secondarily compared to the adults' performance. **RESULTS:** Schoolchildren did not reach the lower thresholds for depth (28.1 +/- 5.9 vs 38 mm; one-sided p = 1.0). The volume of the recorded insufflations was sufficient (558.6 +/-222.8 vs 500 ml; one-sided p = 0.02), but there were a significant number of unsuccessful insufflation attempts not captured by the Skillreporter. The children reached the minimal threshold for rate (113.9 +/-18.3 vs 90/min; one-sided p
They did not perform as well as the adults regarding compression depth (p < 0.001), but were comparable for insufflation volume (p = 0.83) and CPR sequence. CONCLUSIONS: In this study, schoolchildren aged 10-12 years old did not achieve the standards for compression depth, but achieved adequate compression rate and CPR sequence. When attempts were successful at generating airflow in the Skillreporter, insufflation volume was also adequate.

BACKGROUND: Debate continues regarding the effectiveness of Family Witnessed Resuscitation and little is known about the reasons why staff invite family presence. AIM: Explore why health professionals invite or not invite Family Witnessed Resuscitation. DESIGN: Descriptive qualitative study. METHOD: Three open-ended questions enabled 114 clinicians to describe why they would or would not invite family presence. Data were analysed using qualitative data analysis. RESULTS: Four themes representing factors that influenced staff decision to invite or not invite Family Witnessed Resuscitation were identified: motivating factors, personal choice, staff judgment, and organisational factors. Motivating factors described reasons to invite family presence, and staff and organisational factors were reasons to not invite family presence. CONCLUSION: Family presence can be beneficial for staff and family and is likely to be motivated by family-specific factors where this choice is appropriate for all stakeholders. Participants described factors that can impact on the appropriateness of inviting family presence and these need to be considered before an invitation is extended. RELEVANCE TO PRACTICE: To support all parties throughout the process it is imperative that a skilled support person be available to the family and that written policies and guidelines be available for staff.

Background: Cardiopulmonary resuscitation (CPR) is an important advance directive (AD) topic in patients with progressive cancer; however such discussions are challenging. Objective: This study investigates whether video educational information about CPR engenders broader advance care planning (ACP) discourse. Methods: Patients with progressive pancreas or hepatobiliary cancer were randomized to an educational CPR video or a similar CPR narrative. The primary end-point was the difference in ACP documentation one month posttest between arms. Secondary end-points included study impressions; pre- and post-intervention knowledge of and preferences for CPR and mechanical ventilation; and longitudinal patient outcomes. Results: Fifty-six subjects were consented and analyzed. Rates of ACP documentation (either formal ADs or documented discussions) were 40% in the video arm (12/30) compared to 15% in the narrative arm (4/26), OR=3.6 [95% CI: 0.9-18.0], p=0.07. Post-intervention knowledge was higher in both arms. Posttest, preferences for CPR had changed in the video arm but not in the narrative arm. Preferences regarding mechanical ventilation did not change in either arm. The majority of subjects in both arms reported the information as helpful and comfortable to discuss, and they recommended it to others. More deaths occurred in the video arm compared to the narrative arm, and more subjects died in hospice settings in the video arm. Conclusions: This pilot randomized trial addressing downstream ACP effects of video versus narrative decision tools demonstrated a trend towards more ACP documentation in video subjects. This trend, as well as other video effects, is the subject of ongoing study.
Cardiopulmonary resuscitation (CPR) improves outcomes after cardiac arrest. Much of the lay public is untrained in CPR skills. We evaluated the effectiveness of a compression-only CPR video self-instruction (VSI) with a personal manikin in the lay public. METHODS: Adults without prior CPR training in the past year or responsibility to provide medical care were randomized into one of three groups: 1) Untrained before testing, 2) 10-minute VSI in compressions-only CPR (CPR Anytime, American Heart Association, Dallas, TX), or 3) 22-minute VSI in compressions and ventilations (CPR Anytime). CPR proficiency was assessed using a sensored manikin. The primary outcome was composite skill competence of 90% during five minutes of skill demonstration. Evaluated were alternative cut-points for skill competence and individual components of CPR. 488 subjects (143 in untrained group, 202 in compressions-only group and 143 in compressions and ventilation group) were required to detect 21% competency with compressions-only versus 7% with untrained and 34% with compressions and ventilations. RESULTS: Analyzable data were available for the untrained group (n = 135), compressions-only group (n = 185) and the compressions and ventilation group (n = 119). Four (3%) achieved competency in the untrained group (p-value = 0.57 versus compressions-only), nine (4.9%) in the compressions-only group, and 12 (10.1%) in the compressions and ventilations group (p-value 0.13 vs. compressions-only). The compressions-only group had a greater proportion of correct compressions (p-value = 0.028) and compressions with correct hand placement (p-value = 0.0004) compared to the untrained group. CONCLUSIONS: VSI in compressions-only CPR did not achieve greater overall competency but did achieve some CPR skills better than without training.

Bystander resuscitation efforts, such as cardiopulmonary resuscitation (CPR) and use of an automatic external defibrillator (AED), save lives in cardiac arrest cases. School training in CPR and AED use may increase the currently low community rates of bystander resuscitation. The study objective was to determine the rates of CPR and AED training in Toronto secondary schools and to identify barriers to training and training techniques. Methods: This prospective study consisted of telephone interviews conducted with key school staff knowledgeable about CPR and AED teaching. An encrypted Web-based tool with prespecified variables and built-in logic was employed to standardize data collection. Results: Of 268 schools contacted, 93% were available for interview and 83% consented to participate. Students and staff were trained in CPR in 51% and 80% of schools, respectively. Private schools had the lowest training rate (39%). Six percent of schools provided AED training to students and 47% provided AED training to staff. Forty-eight percent of schools had at least one AED installed, but 25% were unaware if their AED was registered with emergency services dispatch. Cost (17%), perceived need (11%), and school population size (10%) were common barriers to student training. Frequently employed training techniques were interactive (32%), didactic instruction (30%) and printed material (16%). Conclusions: CPR training rates for staff and students were moderate overall and lowest in private schools, whereas training rates in AED use were poor in all schools. Identified barriers to training include cost and student population size (perceived to be too small to be cost-effective or too large to be implemented). Future studies should assess the application of convenient and cost-effective teaching alternatives not presently in use.
36. Li JY, Yong TY, Hakendorf P, Ben-Tovim D and Thompson CH. *The survival of patients with not-for-resuscitation orders.* QJM: monthly journal of the Association of Physicians 2013; Early online (17 May)

Studies have shown higher in-hospital mortality rates in patients with not-for-resuscitation (NFR) decisions. Long-term survival of these patients after their discharge from acute care is largely unknown as is communication of such decisions to primary care givers through letters or discharge summaries. 

**AIM:** To evaluate the in-hospital mortality and post-discharge survival of general medical patients with documented resuscitation decisions as well as the prevalence of these decisions being communicated to primary health care providers through discharge summaries. 

**DESIGN:** Retrospective cross-sectional study. 

**METHODS:** The medical records of 618 general medical patients admitted to an Australian tertiary referral teaching hospital between January and December 2007 were reviewed to determine the documentation of resuscitation decisions. Mortality rates in-hospital and up to 5 years post-discharge were assessed in relation to the nature of any resuscitation decisions. Communication of these decisions in the discharge summaries was also evaluated. 

**RESULTS:** One hundred and thirty-six (22%) patients had resuscitation decisions documented of whom 91 (67%) did not want resuscitation (NFR). For this NFR group, the in-hospital mortality rate was 20%, and their cumulative 1- and 5-year mortality rates were 53 and 85%, respectively. Of the 112 patients with resuscitation decisions who survived to discharge, 104 of them (93%) had discharge summaries completed but only 9 (8.4%) had resuscitation decisions documented in those discharge summaries. 

**CONCLUSION:** Many general medical patients with a documented NFR decision survive beyond 1 year after their index admission. The rate of communication of resuscitation decisions in hospital discharge summaries is low.


Pre-training evaluation and feedback have been shown to improve medical students’ skills acquisition of basic life support (BLS) immediately following training. The impact of such training on BLS skills retention is unknown. This study was conducted to investigate effects of pre-training evaluation and feedback on BLS skills retention in medical students. 

**Methods:** Three hundred and thirty 3rd year medical students were randomized to two groups, the control group (C group) and pre-training evaluation and feedback group (EF group). Each group was subdivided into four subgroups according to the time of retention-test (at 1-, 3-, 6-, 12-month following the initial training). After a 45-min BLS lecture, BLS skills were assessed (pre-training evaluation) in both groups before training. Following this, the C group received 45 min training. 15 min of group feedback corresponding to students’ performance in pre-training evaluation was given only in the EF group that was followed by 30 min of BLS training. BLS skills were assessed immediately after training (post-test) and at follow up (retention-test). 

**Results** No skills difference was observed between the two groups in pre-training evaluation. Better skills acquisition was observed in the EF group (85.3 ± 7.3 vs. 68.1 ± 12.2 in C group) at post-test (p < 0.001). In all retention-test, better skills retention was observed in each EF subgroup, compared with its paired C subgroup. 

**Conclusions:** Pre-training evaluation and feedback improved skills retention in the EF group for 12 months after the initial training, compared with the control group.

The 2010 Resuscitation Guidelines require high-quality chest compression and rapid defibrillation for patients with ventricular fibrillation with rhythm analysis and defibrillation repeated every 2 min. A lack of adherence to the guidelines by medical students was observed during simulated resuscitation training. OBJECTIVES: To assess whether real-time cardiopulmonary resuscitation guidance, including an audiovisual countdown timer, a metronome, a display of the chest compression quality and voice prompts, might improve adherence to the guidelines by medical students. DESIGN: Prospective, randomised, cross-over simulation study. SETTING: Studienhospital Munster, Faculty of Medicine University Munster, Germany. PARTICIPANTS: One hundred and forty-one medical students (fifth year) in 47 teams. INTERVENTION: Simulated resuscitation with and without real-time cardiopulmonary resuscitation guidance. MAIN OUTCOME MEASURES: The preshock pause, post-shock pause, fraction of time without chest compression and defibrillation intervals. Observed quality parameters were chest compression depth and chest compression rate. RESULTS: With real-time cardiopulmonary resuscitation guidance, there were improved mean (SD) chest compression rates (105 +/- 8 vs. 121 +/- 12 bpm; P < 0.005), fewer inappropriate shock intervals [median (interquartile range) 0 (1 to 5) vs. 4 (1 to 7); P < 0.005], a smaller fraction of time without chest compression (18.9 +/- 4.4 vs. 22.5 +/- 7.0%; P < 0.005) and shorter post-shock pauses (2.3 +/- 0.9 vs. 3.4 +/- 1.2 s; P < 0.005). CONCLUSION: Real-time cardiopulmonary resuscitation guidance significantly increased adherence to the guidelines by medical students treating simulated out-of-hospital cardiac arrest. Using a simple tool such as a countdown timer makes it possible to reduce the number of inappropriate shock intervals and time without chest compression.


BACKGROUND: Survival after out-of-hospital cardiac arrest (OHCA) is improved when bystanders provide Basic Life Support (BLS). However, bystander BLS does not occur frequently. The aim of this study was to assess the effects on attitudes regarding different aspects of resuscitation of a one-year targeted media campaign and widespread education in a rural Danish community. Specifically, we investigated if the proportion willing to provide BLS and deploy an automated external defibrillator (AED) increased. METHODS: BLS and AED courses were offered and the local television station had broadcasts about resuscitation in this study community. A telephone enquiry assessed the attitudes towards different aspects of resuscitation among randomly selected citizens before (2008) and after the project (2009). RESULTS: For responses from 2008 (n = 824) to 2009 (n = 815), there was a significant increase in the proportions who had participated in a BLS course within the past 5 years, from 34% to 49% (p = 0.0001), the number willing to use an AED on a stranger (p < 0.0001), confident at providing chest compressions (p = 0.03), and confident at providing mouth-to-mouth ventilations (MMV) (p = 0.048). There was no significant change in the proportions willing to provide chest compressions (p = 0.15), MMV (p = 0.23) or confident at recognizing a cardiac arrest (p = 0.09). The most frequently reported reason for not being willing to provide chest compressions, MMV and use an AED was insecurity about how to perform the task. CONCLUSION: A targeted media campaign and widespread education can significantly increase the willingness to use an AED, and the confidence in providing chest compressions and MMV. The willingness to provide chest compressions and MMV may be less influenced by a targeted campaign.

knowledge transfer in an older population most likely to witness cardiac arrest: a theory-informed interview approach. Emergency medicine journal: EMJ 2013; Early online (03 May)

BACKGROUND: We sought to identify perceived barriers and facilitators to cardiopulmonary resuscitation (CPR) training and performing CPR among people above the age of 55 years. METHODS: We conducted semi-structured qualitative interviews with a purposive sample of independent-living individuals aged 55 years and older from urban and rural settings. We developed an interview guide based on the constructs of the Theory of Planned Behaviour, which elicits salient attitudes, social influences and control beliefs potentially influencing CPR training and performance. Interviews were recorded, transcribed verbatim and analysed until achieving data saturation. Two independent reviewers performed inductive analyses to identify emerging themes, and ranked them by way of consensus. RESULTS: Demographics for the 24 interviewees: mean age 71.4 years, women 58.3%, urban location 75.0%, single dwelling 58.3%, CPR training 79.2% and prior CPR on real victim 8.3%. Facilitators of CPR training included: (1) classes in a convenient location; (2) more advertisements; and (3) having a spouse. Barriers to taking CPR training included: (1) perception of physical limitations; (2) time commitment; and (3) cost. Facilitators of providing CPR included: (1) 9-1-1 CPR instructions; (2) reminders/pocket cards; and (3) frequent but brief updates. Barriers to providing CPR included: (1) physical limitations; (2) lack of confidence; and (3) ambivalence of duty to act in a large group. CONCLUSIONS: We identified key facilitators and barriers for CPR training and performance in a purposive sample of individuals aged 55 years and older.

Paediatric advanced life support

41. Fogarty E, Dunning E, Koe S, Bolger T and Martin C. The 'Jedward' versus the 'Mohawk': a prospective study on a paediatric distraction technique. Emergency medicine journal: EMJ 2013; Early online (01 May)

OBJECTIVE: To examine the use of a standard hospital glove, inflated as a balloon with a face drawn on it, as a distraction technique in children with an acute injury. METHODS: We designed a study to assess the 'best' way to orientate the glove when drawing a face on it. A prospective study was performed in the authors' institution, where all children between the ages of 2 and 8 years presenting during the study period were given the option of playing with one of two glove balloons with a face drawn on it in two different ways. RESULTS: 149 paediatric patients were assessed, of whom 136 picked a glove, 75 picked the 'Jedward' version and 61 the 'Mohawk' version. CONCLUSIONS: A standard hospital glove, inflated as a balloon with a face drawn on it, is a useful distraction for children with an acute injury. The face drawn should be drawn 'Jedward' style.


We sought to verify, using computed tomography (CT) examinations of infants, which the left ventricle (LV) is compressed and abdominal
compression avoided by using the chest compression landmarks recommended by the 2010 American Heart Association (AHA) Guidelines for infant cardiopulmonary resuscitation (CPR). Methods: Using CT examinations of 63 infants performed between March 2002 and July 2011, we retrospectively measured the distance between the INL and the xiphoid process, and the distance of the lower third (LT) of the sternum. The distances between LV maximal diameter (LVMD) and xiphoid processes were also measured to determine whether LVs would be compressed by chest compressions. These distances were compared with the finger placements by 20 adults, when placed on infant mannequins for simulated two-finger or two-thumb infant CPR. Results: The mean distances of the INL and the LT of the sternum were 32 ± 8 mm and 12 ± 2 mm from the xiphoid, respectively. The LVMD was placed 15 ± 6 mm from the xiphoid process. When we overlaid the width of adult finger placement (a mean of 28 mm for two-finger technique, and 23 mm for two-thumb technique), the LV was compressed in 57 patients (90.5%) and 59 patients (93.7%), respectively. The upper abdomen was compressed in 22 patients (34.9%) by the two-finger technique and in 16 patients (25.3%) by the two-thumb technique with the range of 0.3–10.8 mm. Conclusion: When applying the 2010 AHA Guidelines for infant CPR, recommended finger placement allows for adequate compression of the LV in more than 90% of patients. In 23–35% of infants, the upper abdomen is compressed from 0.3 mm to 10.7 mm.

43. Martin PS, Kemp AM, Theobald PS, Maguire SA and Jones MD. Does a more “physiological” infant manikin design effect chest compression quality and create a potential for thoracic over-compression during simulated infant CPR? Resuscitation 2013; 84 (5): 666-71

Poor survivability following infant cardiac arrest has been attributed to poor quality chest compressions. Current infant CPR manikins, used to teach and assess chest compression technique, appear to limit maximum compression depths (CDmax) to 40 mm. This study evaluates the effect of a more “physiological” CDmax on chest compression quality and assesses whether proposed injury risk thresholds are exceeded by thoracic over-compression. A commercially available infant CPR manikin was instrumented to record chest compressions and modified to enable compression depths of 40 mm (original; CDmax40) and 56 mm (the internal thoracic depth of a three-month-old male infant; CDmax56). Forty certified European Paediatric Life Support instructors performed two-thumb (TT) and two-finger (TF) chest compressions at both CDmax settings in a randomised crossover sequence. Chest compression performance was compared to recommended targets and compression depths were compared to a proposed thoracic over-compression threshold. Compressions achieved greater depths across both techniques using the CDmax56, with 44% of TT and 34% of TF chest compressions achieving the recommended targets. Compressions achieved depths that exceeded the proposed intra-thoracic injury threshold. The modified manikin (CDmax56) improved duty cycle compliance; however, the chest compression rate was consistently too high. Overall, the quality of chest compressions remained poor in comparison with internationally recommended guidelines. This data indicates that the use of a modified manikin (CDmax56) as a training aid may encourage resuscitators to habitually perform deeper chest compressions, whilst avoiding thoracic over-compression and thereby improving current CPR quality. Future work will evaluate resuscitator performance within a more realistic, simulated CPR environment.

Acute coronary syndromes
Despite attention directed at treatment times of ST-segment elevation myocardial infarctions (STEMIs), little is known about the types of STEMIs presenting to the emergency department (ED). Objective. The purpose of this study was to determine the relative frequencies and characteristics of emergency medical services (EMS) STEMIs compared with those in patients who present to the ED by walk-in. This information may be applied in EMS training, system planning, and public education.

Methods. This was a query of a prospectively gathered database of all STEMIs in patients presenting to Summa Akron City Hospital ED in 2009 and 2010. We collected demographic information, chief complaint, mode and time of arrival, and STEMI pattern (anterior, lateral, inferior, or posterior). We excluded transfers and in-hospital STEMIs. We calculated means, percentages, significance, and 95% confidence intervals (CIs) ± 10%. Results. We analyzed data from 308 patients. Most patients (241/308, 78%, CI 73%–83%) arrived by EMS, were male (203/308, 66%, CI 60%–71%), and were white (286/308, 93%, CI 89%–96%). Patients arriving by EMS were older (average 63 years, range 35–95) than walk-in patients (average 57 years, range 24–92). Two percent (5/241, 2%, CI 1%–5%) of EMS STEMI patients were under 40 years of age, compared with 10% (7/67, 10%, CI 4%–20%) of walk-in patients (p = 0.0017). The most common chief complaint was chest pain (278/308, 90%, CI 86%–93%). Inferior STEMIs were most common (167/308, 54%, CI 49%–60%), followed by anterior (127/308, 41%, CI 48%–60%), lateral (8/308, 3%, CI 1%–5%), and posterior (6/308, 2%, CI 1%–4%). A day-of-the-week analysis showed that no specific day was most common for STEMI presentation. Forty percent (122/308, 40%, CI 34%–45%) of patients presented during open catheterization laboratory hours (Monday through Friday, 0730–1700 hours). There was no significant statistical difference between EMS and walk-in patients with regard to STEMI pattern or patient demographics. Conclusions. In this study, 95% (294/308) of all STEMIs were inferior or anterior infarctions, and these types of presentations should be stressed in EMS education.

Most STEMI patients at this institution arrived by ambulance and during off-hours. Younger patients were more likely to walk in. We need further study, but we may have identified a target population for future interventions.

45. Cone DC, Lee CH and Van Gelder C. EMS Activation of the Cardiac Catheterization Laboratory Is Associated with Process Improvements in the Care of Myocardial Infarction Patients. Prehosp Emerg Care 2013; 17 (3): 293-8

Introduction. Prior data from our institution suggested that our paramedics can accurately interpret ST-segment elevation myocardial infarction (STEMI) on prehospital 12-lead electrocardiograms (ECGs), and that activation of the cardiac catheterization laboratory by paramedics immediately upon diagnosing STEMI at the scene could potentially decrease door-to-balloon (D2B) times. A “field activation” protocol was thus initiated in May 2010. This study examined D2B times and compliance with the national 90-minute D2B performance benchmark in the first 14 months.

Hypothesis. We hypothesized that D2B times would be shorter, and 90-minute compliance better, when the catheterization laboratory was activated by emergency medical services (EMS), compared with when either EMS failed to activate the catheterization laboratory or when the STEMI patient arrived by means other than EMS. Methods. For this prospective, observational study, EMS and hospital data were reviewed for consecutive STEMI patients at a single hospital between May 2010 and July 2011. Patients were categorized as: 1) EMS field activations, 2) patients transported by EMS without EMS catheterization laboratory activation (e.g., ambulance from outside our area, paramedic missed STEMI/protocol violation), or 3) walk-in STEMI patient. Data were manipulated in Excel, means with standard deviations (SDs) and 95% confidence intervals (95% CIs) were determined, and analysis of variance (ANOVA) with Dunnett’s correction was used to compare groups. Results. There were 38 EMS field activations, 47 non-activation EMS STEMI arrivals, and 28 walk-in STEMI patients. The mean (±SD) D2B times were 37 (±17), 87 (±40), and 80 (±23) minutes, respectively. D2B time was better for the EMS field activations than for either non-
activation EMS transports (difference of means 35.3 min, 95% CI 22.3–48.3 min, p < 0.001) or walk-in patients (difference of means 37.0 min, 95% CI 21.8–52.2 min, p < 0.001). Compliance with the 90-minute D2B benchmark was 100%, 72%, and 68%, respectively, and was better for the EMS field activations than for either of the other groups (p < 0.001). Conclusions. In the system studied, EMS field activation of the catheterization laboratory for patients with STEMI is associated with shorter D2B times and better compliance with 90-minute benchmarks than ED activation for either walk-in STEMI patients or STEMI patients arriving by EMS without field activation. Improvements are needed in compliance with the field activation protocol to maximize these benefits.

Cardiac troponins are the preferred biomarkers for diagnosis of myocardial infarction because of their high sensitivity and specificity for myocardial injury. However, acute and chronic conditions distinct from acute coronary syndromes (ACS) commonly lead to small elevations in troponin levels, with few data available regarding management of care for patients with such conditions. Recently developed highly sensitive troponin assays will likely lead to a substantial increase in the proportion of detectable troponin levels attributable to non-ACS conditions. Novel algorithms with highly sensitive assays, incorporating baseline troponin values and changes in values over 1 to 2 hours, may allow rapid exclusion of myocardial infarction and help to address specificity concerns but must be validated in appropriate target populations. Enhanced detection of very low troponin levels with highly sensitive assays has made feasible several potential new indications for troponin testing, including in the ambulatory setting, where assessment for low-level chronic myocardial injury may enhance risk stratification for heart failure and cardiac death.

Although cardiac risk prediction is widely used in various clinical settings, its potential role in enhancing prehospital triage is yet to be understood. Objective: To systematically review the diagnostic accuracy of short-term clinical prediction models for potential use in a prehospital population with suspected acute coronary syndrome. Methods: Eleven electronic medical databases were searched from 1990 to the end of August 2010 for all English-language observational and interventional studies. An online search strategy tool was used to identify grey-literature studies. Eligibility criteria were: 1) an unselected population of adult acute coronary syndrome patients; 2) recruited within the Emergency Department or Emergency Medical Services; 3) reported multivariate analysis encompassing patient history or physical examination; 4) reported short-term outcome measures; 5) were not solely computer protocols; and 6) were not reliant on tests unavailable out of the hospital. Data extraction was conducted by a single reviewer and verified by a second reviewer. Two reviewers using a validated quality assessment tool assessed study quality independently. Results: A total of seven clinical prediction models were identified. Only two models reported were derived from a prehospital study population. Six clinical prediction models described good discriminate abilities (c-statistic) of 0.72 to 0.87. Among the range of independent predictors identified, electrocardiogram abnormalities, age, heart rate, and systolic blood pressure provided the strongest prognostic information. Conclusion: The models identified provided reasonable diagnostic accuracy for determining short-term outcomes. Methodological weaknesses and variability in the populations investigated limit their use in clinical practice.

Prehospital electrocardiography (PH ECG) is becoming the standard of care for patients activating Emergency Medical Services for symptoms of acute coronary syndrome (ACS). Little is known about the prognostic value of ischemia found on PH ECG. Objective: The purpose of this study was to determine whether manifestations of acute myocardial ischemia on prehospital ECG are predictive of adverse hospital outcomes. Methods: This study was a retrospective analysis of all PH ECs recorded in 630 patients who called 911 for symptoms of ACS and were enrolled in a prospective clinical trial. ST-segment monitoring software was added to the PH ECG device with automatic storage and transmission of ECGs to the destination Emergency Department. Patient medical records were reviewed for adverse hospital outcomes. Results: In 630 patients who called 911 for ACS symptoms, 270 (42.9%) had PH ECG evidence of ischemia. Overall, 37% of patients with PH ECG ischemia had adverse hospital outcomes compared with 27% of patients without PH ECG ischemia (p < 0.05). Those with PH ECG ischemia were 1.55 times more likely to have adverse hospital outcomes than those without PH ECG ischemia (95% CI 1.09–2.21; p < 0.05), after controlling for other predictors of adverse hospital outcomes (i.e., age, sex, and medical history). Conclusions: Evidence of ischemia on PH ECG is an independent predictor of adverse hospital outcomes. ST-segment monitoring in the prehospital setting can identify high-risk patients with symptoms of ACS and provide important prognostic information at presentation to the Emergency Department.

Neonatal resuscitation

Objective: To evaluate the skills and team behavior of pediatric residents during resuscitation with a high-fidelity mannequin before and after a deliberate practice intervention. Methods. Each month residents participate in two 90-minute video recorded sessions (2-3 weeks apart) in an "off-site" delivery room during their neonatal ICU rotation. Teams responded to a scenario that required 5 skills (positive pressure ventilation, chest compressions, endotracheal intubation, umbilical vein catheterization, and epinephrine administration). Skills were scored for technique and timeliness and team behaviors for communication, management, and leadership. A 2-hour focused intervention was given between sessions. Results. In all, 33 residents (11 teams) completed the sessions. Gaps in procedural skills noted during the first session were corrected. Timeliness for completion of skills remained below expectations. Improvements in team behaviors were noted. Conclusions. Deliberate practice improved procedural skills and team performance. Lack of improvement in timeliness suggests that a different educational paradigm is required.

Objective: Effective neonatal cardiopulmonary resuscitation (CPR) requires 3:1 coordinated manual inflations (MI) and chest compressions (CC). We hypothesized that playing a musical prompt would help coordinate CC and MI during CPR. Study Design: In this pilot trial we studied the effect the "Radetzkymarsch" (110 beats per minute) on neonatal CPR. Thirty-six medical professionals performed CPR on a neonatal manikin. CC and MI were recorded with and without the music played, using a respiratory function monitor and a tally counter. Statistical analysis included Wilcoxon test. Results: Without music, the median (interquartile range) rate of CC was 115 (100 to 129) per minute and the rate of MI was 38 (32 to 42) per minute. When listening to the auditory prompt, the rate of CC decreased significantly to 96 (96 to 100) per minute (p = 0.002) and the rate of MI to 32 (30 to 34) per minute (p = 0.001). The interquartile range of inter-operator variability decreased up to
86%. Conclusion: Listening to an auditory prompt improved compliance with the recommended delivery rates of CC and MI during neonatal CPR.


BACKGROUND: Wiping of the mouth and nose at birth is an alternative method to oronasopharyngeal suction in delivery-room management of neonates, but whether these methods have equivalent effectiveness is unclear. METHODS: For this randomised equivalency trial, neonates delivered at 35 weeks’ gestation or later at the University of Alabama at Birmingham Hospital, Birmingham, AL, USA, between October, 2010, and November, 2011, were eligible. Before birth, neonates were randomly assigned gentle wiping of the face, mouth (implemented by the paediatric or obstetric resident), and nose with a towel (wipe group) or suction with a bulb syringe of the mouth and nostrils (suction group). The primary outcome was the respiratory rate in the first 24 h after birth. We hypothesised that respiratory rates would differ by fewer than 4 breaths per min between groups. Analysis was by intention to treat. This study is registered with ClinicalTrials.gov, number NCT01197807. FINDINGS: 506 neonates born at a median of 39 weeks’ gestation (IQR 38–40) were randomised. Three parents withdrew consent and 15 non-vigorous neonates with meconium-stained amniotic fluid were excluded. Among the 488 treated neonates, the mean respiratory rates in the first 24 h were 51 (SD 8) breaths per min in the wipe group and 50 (6) breaths per min in the suction group (difference of means 1 breath per min, 95% CI -2 to 0, p<0.001). INTERPRETATION: Wiping the nose and mouth has equivalent efficacy to routine use of oronasopharyngeal suction in neonates born at or beyond 35 weeks’ gestation. FUNDING: None.


Various supraglottic airway devices are routinely used to maintain airway patency in children and adults. However, oropharyngeal airways or laryngeal masks (LM) are not routinely used during neonatal resuscitation. Methods: The aim of this article was to review the available literature about the use of supraglottic airway devices during neonatal resuscitation. We reviewed books, resuscitation manuals and articles from 1830 to the present using the search terms “Infant”, “Newborn”, “Delivery Room”, “Resuscitation”, “Airway management”, “Positive Pressure Respiration”, “Oropharyngeal Airway” and “Laryngeal Mask”. Results: No study was identified using oropharyngeal airways during neonatal resuscitation. Four trials including 509 infants compared positive pressure ventilation with a LM, bag and mask or an endotracheal tube. Infants in the LM group were intubated less frequently compared to infants in the bag and mask ventilation group 4/275 vs. 28/234 (OR 0.13, 95% CI 0.05–0.34). Infants resuscitated with the LM had significantly less unsuccessful resuscitations 4/275 vs. 31/234 (OR 0.10, 95% CI 0.03–0.28). Two trials including 34 preterm infants compared surfactant administration via LM vs. endotracheal tube. LM surfactant administration was safe and no adverse events were reported. Conclusion: The efficacy and safety of oropharyngeal airways during neonatal resuscitation remain unclear and randomized trials are required. The current evidence suggests that resuscitation with a LM is a feasible and safe alternative to mask ventilation in infants > 34 weeks gestation and birth weight > 2000 g. However, further randomized control trials are needed to evaluate short- and long-term outcomes following use of laryngeal masks. In addition, surfactant administration via LM should be used only within clinical trials.

Tracheal intubation remains a common procedure during neonatal intensive care. Rapid confirmation of correct tube placement is important because tube malposition is associated with serious adverse outcomes. The current gold standard test to confirm tube position is a chest radiograph, however this is often delayed until after ventilation has commenced. Hence, point of care methods to confirm correct tube placement have been developed. The aim of this article is to review the available literature on tube placement in newborn infants. We reviewed books, resuscitation manuals and articles from 1830 to the present with the search terms “Infant, Newborn”, “Endotracheal intubation”, “Resuscitation”, “Clinical signs”, “Radiography”, “Respiratory Function Tests”, “Laryngoscopy”, “Ultrasonography”, and “Bronchoscopy”. Various techniques have been studied to help clinicians assess tube placement. However, despite 85 years of clinical practice, the search for higher success rates and quicker intubation continues. Currently, chest radiography remains the gold standard test to confirm tube position. However, rigorous evaluation of new techniques is required to ensure the safety of newborn infants.

General papers


Whether rapid lowering of elevated blood pressure would improve the outcome in patients with intra-cerebral hemorrhage is not known. Methods: We randomly assigned 2839 patients who had had a spontaneous intra-cerebral hemorrhage within the previous 6 hours and who had elevated systolic blood pressure to receive intensive treatment to lower their blood pressure (with a target systolic level of <140 mm Hg within 1 hour) or guideline-recommended treatment (with a target systolic level of <180 mm Hg) with the use of agents of the physician's choosing. The primary outcome was death or major disability, which was defined as a score of 3 to 6 on the modified Rankin scale (in which a score of 0 indicates no symptoms, a score of 5 indicates severe disability, and a score of 6 indicates death) at 90 days. A prespecified ordinal analysis of the modified Rankin score was also performed. The rate of serious adverse events was compared between the two groups. Results Among the 2794 participants for whom the primary outcome could be determined, 719 of 1382 participants (52.0%) receiving intensive treatment, as compared with 785 of 1412 (55.6%) receiving guideline-recommended treatment, had a primary outcome event (odds ratio with intensive treatment, 0.87; 95% confidence interval [CI], 0.75 to 1.01; P=0.06). The ordinal analysis showed significantly lower modified Rankin scores with intensive treatment (odds ratio for greater disability, 0.87; 95% CI, 0.77 to 1.00; P=0.04). Mortality was 11.9% in the group receiving intensive treatment and 12.0% in the group receiving guideline-recommended treatment. Nonfatal serious adverse events occurred in 23.3% and 23.6% of the patients in the two groups, respectively. Conclusions: In patients with intracerebral hemorrhage, intensive lowering of blood pressure did not result in a significant reduction in the rate of the primary outcome of death or severe disability. An ordinal analysis of modified Rankin scores indicated improved functional outcomes with intensive lowering of blood pressure. (Funded by the National Health and Medical Research Council of Australia; INTERACT2 ClinicalTrials.gov number, NCT00716079 ).


There is great disparity in the education, experience, and staffing requirements for civilian and Army aeromedical transports (AMT). Objective: This study sought to determine if medical skills beyond the standard training for Army flight medics were indicated and being performed on Army
AMT missions. As a secondary measure, the percentage of indicated interventions performed by basic Emergency Medical Technician (EMT-B) and paramedic (EMT-P) flight medics were compared. Methods: This was a retrospective review of Army AMT charts including patients transported by an EMT-B-staffed unit in Iraq and an EMT-P-staffed unit in Afghanistan from July 2008 to June 2009. Charts were reviewed independently by two Emergency Medicine board-certified Army flight surgeons. Results: Of 984 interventions found to be indicated on the 406 charts that met inclusion criteria, 36% were rated as EMT-P level. Seventeen percent were indicated but not performed. EMT-Bs failed to perform indicated procedures 35% of the time vs. 3% in the EMT-P group ($p < 0.001$). For paramedic-level procedures, EMT-Bs failed to make 76% of appropriate interventions, compared to < 1% in the EMT-P group ($p < 0.001$). Conclusions: There seems to be a substantial number of procedures beyond the scope of standard Army flight medic training being required for Army AMT missions. It seems that when advance interventions are indicated, those trained to the EMT-P level perform them significantly more often than those trained to Army standard. Conclusions: Based on the findings of this study, the authors suggest the Army consider adopting the standards required for civilian AMT.


Background. Paramedics are an important health human resource and are uniquely mobile in most communities across Canada. In the last dozen years, challenges in the delivery of health care have prompted governments from around the globe to consider expanding the role paramedics play in health systems. Utilizing paramedics for the management of urgent, low-acuity illnesses and injuries has been coined “community paramedicine,” but the role, safety, and effectiveness of this concept are poorly understood. Objective. We undertook a systematic review of the international literature to describe existing community paramedic programs. Method. We used the Cochrane methodology for systematic reviews. An international group of experts developed a search strategy and a health information specialist executed this search in Medline, Embase, and CINAHL starting January 1, 2000. We included all research articles in the English language that reported a research methodology. We excluded commentaries and letters to the editor. Two investigators independently screened citations in a hierarchical manner and abstracted data. Results. Of 3,089 titles, 10 articles were included in the systematic review and one additional paper was author-nominated. The nature of the 11 articles was heterogeneous, and only one randomized controlled trial (RCT) was found. This trial showed community paramedicine to be beneficial to patients and health systems. The other articles drew conclusions favoring community paramedicine. Conclusion. Community paramedicine research to date is lacking, but programs in the United Kingdom, Australia, and Canada are perceived to be promising, and one RCT shows that paramedics can safely practice with an expanded scope and improve system performance and patient outcomes. Further research is required to fully understand how expanding paramedic roles affect patients, communities, and health systems.

57. Bodger O, Theron A and Williams D. Comparison of three techniques for calculation of the Parkland formula to aid fluid resuscitation in paediatric burns. European journal of anaesthesiology 2013; Early online (29 May)

Inadequate fluid resuscitation of acute burns may result in hypovolaemic shock. Excessive fluid resuscitation may result in fluid overload. A nomogram which uses the popular Parkland formula and ‘4-2-1’ regime has been recently described to facilitate the calculation of fluid requirements in children during the first 24 h following burn injury. OBJECTIVE: To compare the accuracy and speed of calculation of three different methods (pen and paper, electronic calculator and nomogram), which all use the Parkland formula and ‘4-2-1’ regime to calculate maintenance and resuscitation fluid requirements for children in the first 24 h after burn injury. DESIGN: A randomised volunteer study using computer-generated simulated patient data. SETTING: Welsh Centre for Burns, ABM University Local Health Board, Swansea, UK. Data were
collected between February 2011 and October 2011. PARTICIPANTS: The group consisted of 36 volunteers including trainee and consultant surgeons and anaesthetists. INTERVENTION: Thirty-six participants performed 318 calculations, using each of the three methods of calculation up to three times. MAIN OUTCOME MEASURES: Accuracy, speed and acceptability of the different methods. RESULTS: For nomogram, calculator and pen and paper: magnitude of error [low (> = 25%), medium (> = 50%) and high (> = 75%)]: [5.7, 4.7 and 3.8%], [12.1, 12.1 and 7.5%], [28.6, 21.9 and 16.2%]; [P < 0.001, P = 0.001 and P = 0.006]. Calculation time: [s; mean (SD)]: 121 (48), 109 (52) and 240 (140); P < 0.001. The mean (SD) of the difficulty scores were 17.3 (13), 20.6 (13.4) and 62.2 (23.4); P < 0.001. CONCLUSION: The nomogram was the most accurate method of calculating fluid requirements using the Parkland formula, was only slightly slower than the electronic calculator and was deemed the easiest to use. The nomogram is also low cost, robust, and provides a rapid means of detecting and preventing the large errors that we have shown can occur when an electronic device is used as the primary method of resuscitation fluid calculation. We, therefore, suggest that the nomogram is a suitable method for the calculation of the Parkland formula to guide resuscitation and maintenance fluid requirements in the first 24 h of paediatric burns or for cross-checking the results obtained by other means of calculation.

58. Bodnar D, Rashford S, Hurn C, Quinn J, Parker L, Isoardi K and Williams S. Characteristics and outcomes of patients administered blood in the prehospital environment by a road based trauma response team. Emergency medicine journal: EMJ 2013; Early online (07 May)
OBJECTIVE: To describe the characteristics, clinical interventions and the outcomes of patients administered packed red blood cells (pRBCs) by a metropolitan, road based, doctor-paramedic trauma response team (TRT). METHODS: A retrospective cohort study examining 18 months of historical data collated by the Queensland Ambulance Service TRT, the Pathology Queensland Central Transfusion Laboratory, the Royal Brisbane and Women's Hospital and the Princess Alexandra Hospital Trauma Services was undertaken. RESULTS: Over an 18-month period (1 January 2011 to 30 June 2012), 71 trauma patients were administered pRBCs by the TRT. Seven patients (9.9%) died on scene and 39 of the 64 patients (60.9%) transported to hospital survived to hospital discharge. 57 (89.1%) of the transported patients had an Injury Severity Score (ISS) > 15, with a mean ISS, Revised Trauma Score (RTS) and Trauma-Injury Severity Score of 32.11, 4.70 and 0.57, respectively. No patients with an RTS < 2 survived to hospital discharge. 53 patients (82.8%) received additional pRBCs in hospital with 17 patients (26.6%) requiring greater than 10 units pRBCs in the first 24 h. 47 patients (73.4%) required surgical or interventional radiological procedures in the first 24 h. CONCLUSIONS: There is a potential role for prehospital pRBC transfusions in an integrated civilian trauma system. The RTS calculated using the initial set of observations may be a useful tool in determining in which patients the administration of prehospital pRBC transfusions would be futile.

BACKGROUND: The scope of prehospital (PH) interventions has expanded recently-not always with clear benefit. PH crystalloid resuscitation has been challenged, particularly in penetrating trauma. Optimal PH crystalloid resuscitation strategies remain unclear in blunt trauma as does the influence of PH hypotension. The objective was to characterize outcomes for PH crystalloid volume in patients with and without PH hypotension. METHODS: Data were obtained from a multicenter prospective study of blunt injured adults transported from the scene with ISS > 15. Subjects were divided into HIGH (>500 mL) and LOW (<=500 mL) PH crystalloid groups. Propensity-adjusted regression determined the association of PH crystalloid group with mortality and acute coagulopathy (admission International Normalized Ratio, >1.5) in subjects with and
without PH hypotension (systolic blood pressure [SBP], <90 mm Hg) after controlling for confounders. RESULTS: Of 1,216 subjects, 822 (68%) received HIGH PH crystalloid and 616 (51%) had PH hypotension. Initial base deficit and ISS were similar between HIGH and LOW crystalloid groups in subjects with and without PH hypotension. In subjects without PH hypotension, HIGH crystalloid was associated with an increase in the risk of mortality (hazard ratio, 2.5; 95% confidence interval [95% CI], 1.3-4.9; p < 0.01) and acute coagulopathy (odds ratio [OR], 2.2; 95% CI, 1.01-4.9; p = 0.04) but not in subjects with PH hypotension. HIGH crystalloid was associated with correction of PH hypotension on emergency department (ED) arrival (OR, 2.02; 95% CI, 1.06-3.88; p = 0.03). The mean corrected SBP in the ED was 104 mm Hg. Each 1 mm Hg increase in ED SBP was associated with a 2% increase in survival in subjects with PH hypotension (OR, 1.02; 95% CI, 1.01-1.03; p < 0.01).,

CONCLUSION: In severely injured blunt trauma patients, PH crystalloid more than 500 mL was associated with worse outcome in patients without PH hypotension but not with PH hypotension. HIGH crystalloid was associated with corrected PH hypotension. This suggests that PH resuscitation should be goal directed based on the presence or absence of PH hypotension.


BACKGROUND: Peripherally inserted central catheters (PICCs) are associated with an increased risk of venous thromboembolism. However, the size of this risk relative to that associated with other central venous catheters (CVCs) is unknown. We did a systematic review and meta-analysis to compare the risk of venous thromboembolism associated with PICCs versus that associated with other CVCs. METHODS: We searched several databases, including Medline, Embase, Biosis, Cochrane Central Register of Controlled Trials, Conference Papers Index, and Scopus. Additional studies were identified through hand searches of bibliographies and internet searches, and we contacted study authors to obtain unpublished data. All human studies published in full text, abstract, or poster form were eligible for inclusion. All studies were of adult patients aged at least 18 years who underwent insertion of a PICC. Studies were assessed with the Newcastle-Ottawa risk of bias scale. In studies without a comparison group, the pooled frequency of PICC-related deep vein thrombosis was calculated for patients receiving PICCs. In studies comparing PICCs with other CVCs, summary odds ratios (ORs) were calculated with a random effects meta-analysis. FINDINGS: Of the 533 citations identified, 64 studies (12 with a comparison group and 52 without) including 29 503 patients met the eligibility criteria. In the non-comparison studies, the weighted frequency of PICC-related deep vein thrombosis was highest in patients who were critically ill (13.91%, 95% CI 7.68-20.14) and those with cancer (6.67%, 4.69-8.64). Our meta-analysis of 11 studies comparing the risk of deep vein thrombosis related to PICCs with that related to CVCs showed that PICCs were associated with an increased risk of deep vein thrombosis (OR 2.55, 1.54-4.23, p<0.0001) but not pulmonary embolism (no events). With the baseline PICC-related deep vein thrombosis rate of 2.7% and pooled OR of 2.55, the number needed to harm relative to CVCs was 26 (95% CI 13-71). INTERPRETATION: PICCs are associated with a higher risk of deep vein thrombosis than are CVCs, especially in patients who are critically ill or those with a malignancy. The decision to insert PICCs should be guided by weighing of the risk of thrombosis against the benefit provided by these devices. FUNDING: None.


With ever increasing concern over ambulance handover delays this paper looks at the impact of dedicated A&E nurses for ambulance handovers and the effect it can have on ambulance waiting times. It demonstrates that although such roles can bring about reduced waiting times, it also suggests that using this as a sole method to achieve these targets would require unacceptably low staff utilisation.

In patients with severe head injuries, transportation to a trauma centre within the “golden hour” are important markers of trauma system effectiveness but evidence regarding impacts on patient outcomes is limited. **Objective:** To determine the effect of patient arrival within the golden hour on patient outcomes. **Methods:** A retrospective cohort of adult patients with severe head injuries (head AIS ≥ 3) arriving within 24 h of injury was identified using the trauma registry from 2000 to 2011. Survival analysis was used to determine the effect of patient arrival time on overall mortality. Study outcomes were in hospital mortality and survival to hospital discharge without requiring transfer for ongoing rehabilitation or nursing home care. **Results:** There was a significant association with mortality with each incremental minute of patient arrival (HR 1.002, 95%CI 1.001–1.004, p = 0.001). There was however no survival benefit observed for patients arriving within 60 min of injury time (HR 0.77, 95%CI 0.50–1.18, p = 0.22) but an apparent benefit for those presenting within 2 h of injury time (HR 0.31, 95%CI 0.15–0.66, p = 0.002). Patient arrival within 60 min of injury time was associated with increased odds of survival to hospital discharge without requiring ongoing rehabilitation (OR 1.78, 95%CI 1.14–2.79, p = 0.01). **Conclusion:** A survival benefit exists in patients arriving earlier to hospital after severe head injury but the benefit may extend beyond the golden hour. There was evidence of improved functional outcomes in patients arriving within 60 min of injury time.

63. Edwards MA, Verwey J, Herbert S, Horne S and Smith JE. *Cervical spine clearance in the elderly: do elderly patients get a bad deal?* Emergency medicine journal: EMJ 2013; Early online (23 May)

**OBJECTIVE:** To investigate whether elderly patients, presenting following trauma and requiring immobilisation and imaging of the cervical spine, require increased use of CT and spend longer immobilised when compared to the younger population. **METHODS:** A retrospective chart review was undertaken of 35 adults aged 18-65 years, and 32 adults over 65 years, requiring cervical spine imaging following trauma. **RESULTS:** 1 of the 35 younger patients, and 16 of the 32 elderly patients, underwent CT. Elderly patients spent 1:05 h longer immobilised (p<0.005). **CONCLUSIONS:** Half of the elderly patients underwent CT, and they were immobilised for significantly longer than younger patients. Measures should be adopted to facilitate early diagnosis and mitigate complications of prolonged immobilisation in elderly patients with neck trauma.


Objective: Blood pressure (BP) cuffs are potential vectors for transmission of multi-resistant organisms (MROs). The present study aims to determine MRO colonisation rates in BP cuffs from areas of high patient flow as an assessment of the quality of disinfection and infection control practices.

65. Hussmann B, Lefering R, Waydhas C, Touma A, Kauther MD, Ruchholtz S and Lendemans S. *Does increased prehospital replacement volume lead to a poor clinical course and an increased mortality? A matched-pair analysis of 1896 patients of the Trauma Registry of the German Society for Trauma Surgery who were managed by an emergency doctor at the accident site*. Injury 2013; 44 (5): 611-7
Severe bleeding after trauma frequently leads to a poor outcome. Prehospital fluid replacement therapy is regarded as an important primary treatment option. Our study aimed to assess the influence of prehospital fluid replacement therapy on the post-traumatic course of severely injured patients in a retrospective analysis of matched pairs. Patients and methods: The data of 51,425 patients of the Trauma Registry of the German Society for Trauma Surgery were analysed. The following patients were included: Injury Severity Score ≥ 16 points, primary admission, age ≥ 16 years, no isolated brain injury, transfusion of at least one unit of packed red blood cells (pRBC), systolic blood pressure ≥ 60 mm Hg at the accident site. The patients were divided into two groups according to the following matched-pair criteria (low-volume: 0–1500 ml prehospital volume replaced; high-volume: ≥1501 ml prehospital volume): intubation at the accident site (yes/no), time from injury to hospital ± 10 min., means of rescue (emergency helicopter, MICU), Abbreviated Injury Scale (body regions), injury year, systolic blood pressure and age (years). All patients were managed by an emergency doctor at the accident site. Results: A total of 948 patients in each group met the inclusion criteria. Increasing replacement volume was associated with an increased need for transfusion (pRBCs: low-volume: 7 units, high-volume: 8.3 units; p < 0.001) and a reduced ability to coagulate (prothrombin ratio (PR): low-volume: 68%, high-volume: 61.5%; p < 0.001). Patients in shock (systolic BP < 90 mm Hg) upon admission to the hospital were equally in both groups (25.6%; p = 0.98). Significantly higher lethality was observed in cases of increasing volume (low-volume: 22.7%, high-volume: 27.6%; p < 0.01). Conclusions: Excessive prehospital fluid replacement leads to an increased mortality rate. The results of this study support the concept of restrained volume replacement in the prehospital treatment of patients with severe trauma.


Greater Sydney Area Helicopter Emergency Medical Service (GSA-HEMS) operates a doctor and paramedic team providing pre-hospital and inter-hospital retrieval. Falls are an important cause of morbidity and mortality among trauma patients. In NSW, patients injured by falling comprise 38% of those with serious to critical injuries (ISS > 15). The mortality of falls in this group is 15.2%, higher than the mortality rate for other common injury mechanisms. Mortality rate for high falls (>5 m) is similar to that of low/medium falls. Aims: The primary aim was describe the basic demographics, transportation, injured areas, treatment and mortality of falls survivors attended to by GSA-HEMS. The secondary aim was to determine if there was any association between height of fall, revised trauma score (RTSc) and need for advanced pre-hospital interventions. Methods Cases of trauma due to falling were identified by searching an electronic database covering the period June 2007 to March 2010. Hardcopy casesheets were abstracted using a proforma. Data was collected on demographics, timings, winch use, height of fall, physiologic variables, injured areas, advanced pre-hospital interventions and mortality at 24 h. Associations between height of fall and RTSc, and height of fall and pre-hospital interventions were compared using Fischer's exact test. Results: One hundred and fifty-four of 208 potential cases identified were cases of trauma due to falls, representing 13% of all pre-hospital trauma cases retrieved by the service. Median age of patients was 37, 67% of patients were male. Helicopter transport was use for 97% of cases, with 47% requiring winch extraction. High falls (>5 m), which accounted for 25% of cases, were more likely to show non-normal RTSc. A greater proportion of high falls required advanced pre-hospital interventions. Conclusions: Our experience describes a HEMS system that is often called to falls not just based on injury severity or requirement for advanced pre-hospital intervention, but also due to geographical and topographical impediments to access and transport of the patient by ground. This may have implications in forward planning and activation of HEMS services.

67. Karnatovskaia LV, Lee AS, Gajic O and Festic E. The Influence of Prehospital Systemic Corticosteroid Use on Development of
Acute Respiratory Distress Syndrome and Hospital Outcomes. Critical care medicine 2013; Early online (11 May)
The role of systemic corticosteroids in pathophysiology and treatment of acute respiratory distress syndrome is controversial. Use of prehospital systemic corticosteroid therapy may prevent the development of acute respiratory distress syndrome and improve hospital outcomes. DESIGN: This is a preplanned retrospective subgroup analysis of the prospectively identified cohort from a trial by the U.S. Critical Illness and Injury Trials Group designed to validate the Lung Injury Prediction Score. SETTING: Twenty-two acute care hospitals. PATIENTS: Five thousand eighty-nine patients with at least one risk factor for acute respiratory distress syndrome at the time of hospitalization. INTERVENTION: Propensity-based analysis of previously recorded data. MEASUREMENTS AND MAIN RESULTS: Three hundred sixty-four patients were on systemic corticosteroids. Prevalence of acute respiratory distress syndrome was 7.7% and 6.9% (odds ratio, 1.1 [95% CI, 0.8-1.7]; p = 0.54) for patients on systemic corticosteroid and not on systemic corticosteroids, respectively. A propensity for being on systemic corticosteroid was derived through logistic regression by using all available covariates. Subsequently, 354 patients (97%) on systemic corticosteroid were matched to 1,093 not on systemic corticosteroid by their propensity score for a total of 1,447 patients in the matched set. Adjusted risk for acute respiratory distress syndrome (odds ratio, 0.96 [95% CI, 0.54-1.38]), invasive ventilation (odds ratio, 0.84 [95% CI, 0.62-1.12]), and in-hospital mortality (odds ratio, 0.97 [95% CI, 0.63-1.49]) was then calculated from the propensity-matched sample using conditional logistic regression model. No significant associations were present. CONCLUSIONS: Prehospital use of systemic corticosteroid neither decreased the development of acute respiratory distress syndrome among patients hospitalized with at one least risk factor, nor affected the need for mechanical ventilation or hospital mortality.

Evidence suggests that aggressive crystalloid resuscitation is associated with significant morbidity in various clinical settings. We wanted to assess whether aggressive early crystalloid resuscitation adversely affects outcomes in adult blunt trauma patients. METHODS: Data were derived from the Glue Grant database. Our primary outcome measure was all-cause in-hospital mortality. Secondary outcomes included days on mechanical ventilation; intensive care unit (ICU) and hospital length of stay (LOS); inflammatory (acute lung injury and adult respiratory distress syndrome, or multiple-organ failure) and resuscitation-related morbidity (abdominal and extremity compartment syndromes or acute renal failure) and nosocomial infections (ventilator-associated pneumonia, bloodstream, urinary tract, and surgical site infections). RESULTS: In our sample of 1,754 patients, in-hospital mortality was not affected, but ventilator days (p < 0.001) as well as ICU (p = 0.009) and hospital (p = 0.002) LOS correlated strongly with the amount of crystalloids infused in the first 24 hours after injury. Amount of crystalloid resuscitation was also associated with the development of adult respiratory distress syndrome (p < 0.001), multiple-organ failure (p < 0.001), bloodstream (p = 0.001) and surgical site infections (p < 0.001), as well as abdominal (p < 0.001) and extremity compartment syndromes (p = 0.028) in a dose-dependent fashion, when age, Glasgow Coma Scale (GCS), severity of injury and acute physiologic derangement, comorbidities, as well as colloid and blood product transfusions were controlled for. CONCLUSION: Crystalloid resuscitation is associated with a substantial increase in morbidity, as well as ICU and hospital LOS in adult blunt trauma patients.

69. Mathews JD, Forsythe AV, Brady Z, Butler MW, Goergen SK, Byrnes GB, . . . Darby SC. Cancer risk in 680 000 people exposed to computed tomography scans in childhood or adolescence: data linkage study of 11 million Australians. BMJ (Clinical research ed.)
OBJECTIVE: To assess the cancer risk in children and adolescents following exposure to low dose ionising radiation from diagnostic computed tomography (CT) scans. DESIGN: Population based, cohort, data linkage study in Australia. COHORT MEMBERS: 10.9 million people identified from Australian Medicare records, aged 0-19 years on 1 January 1985 or born between 1 January 1985 and 31 December 2005; all exposures to CT scans funded by Medicare during 1985-2005 were identified for this cohort. Cancers diagnosed in cohort members up to 31 December 2007 were obtained through linkage to national cancer records. MAIN OUTCOME: Cancer incidence rates in individuals exposed to a CT scan more than one year before any cancer diagnosis, compared with cancer incidence rates in unexposed individuals. RESULTS: 60,674 cancers were recorded, including 3,150 in 680,211 people exposed to a CT scan at least one year before any cancer diagnosis. The mean duration of follow-up after exposure was 9.5 years. Overall cancer incidence was 24% greater for exposed than for unexposed people, after accounting for age, sex, and year of birth (incidence rate ratio (IRR) 1.24 (95% confidence interval 1.20 to 1.29); P<0.001). We saw a dose-response relation, and the IRR increased by 0.16 (0.13 to 0.19) for each additional CT scan. The IRR was greater after exposure at younger ages (P<0.001 for trend). At 1-4, 5-9, 10-14, and 15 or more years since first exposure, IRRs were 1.35 (1.25 to 1.45), 1.25 (1.17 to 1.34), 1.14 (1.06 to 1.22), and 1.24 (1.14 to 1.34), respectively. The IRR increased significantly for many types of solid cancer (digestive organs, melanoma, soft tissue, female genital, urinary tract, brain, and thyroid); leukaemia, myelodysplasia, and some other lymphoid cancers. There was an excess of 608 cancers in people exposed to CT scans (147 brain, 356 other solid, 48 leukaemia or myelodysplasia, and 57 other lymphoid). The absolute excess incidence rate for all cancers combined was 9.38 per 100,000 person years at risk, as of 31 December 2007. The average effective radiation dose per scan was estimated as 4.5 mSv. CONCLUSIONS: The increased incidence of cancer after CT scan exposure in this cohort was mostly due to irradiation. Because the cancer excess was still continuing at the end of follow-up, the eventual lifetime risk from CT scans cannot yet be determined. Radiation doses from contemporary CT scans are likely to be lower than those in 1985-2005, but some increase in cancer risk is still likely from current scans. Future CT scans should be limited to situations where there is a definite clinical indication, with every scan optimised to provide a diagnostic CT image at the lowest possible radiation dose.


Laryngoscopy and tracheal intubation provoke a marked sympathetic response, potentially harmful in patients with cerebral or cardiovascular pathology or haemorrhage. Standard pre-hospital rapid sequence induction of anaesthesia (RSI) does not incorporate agents that attenuate this response. It is not known if a clinically significant response occurs following pre-hospital RSI or what proportion of injured patients requiring the intervention are potentially at risk in this setting. Methods: We performed a retrospective analysis of 115 consecutive pre-hospital RSI's performed on trauma patients in a physician-led Helicopter Emergency Medical Service. Primary outcome was the acute haemodynamic response to the procedure. A clinically significant response was defined as a greater than 20% change from baseline recordings during laryngoscopy and intubation. Results: Laryngoscopy and intubation provoked a hypertensive response in 79% of cases. Almost one-in-ten patients experienced a greater than 100% increase in mean arterial pressure (MAP) and/or systolic blood pressure (SBP). The mean (95% CI) increase in SBP was 41(31–51) mmHg and MAP was 30(23–37) mmHg. Conditions leaving the patient vulnerable to secondary injury from a hypertensive response were common. Conclusions: Laryngoscopy and tracheal intubation, following a standard pre-hospital RSI, commonly induced a clinically significant hypertensive response in the trauma patients studied. We believe that, although this technique is effective in securing the pre-hospital trauma airway, it is poor at attenuating adverse physiological effects that may be detrimental in this patient group.

BACKGROUND: Worldwide, 2.75 billion passengers fly on commercial airlines annually. When in-flight medical emergencies occur, access to care is limited. We describe in-flight medical emergencies and the outcomes of these events. METHODS: We reviewed records of in-flight medical emergency calls from five domestic and international airlines to a physician-directed medical communications center from January 1, 2008, through October 31, 2010. We characterized the most common medical problems and the type of on-board assistance rendered. We determined the incidence of and factors associated with unscheduled aircraft diversion, transport to a hospital, and hospital admission, and we determined the incidence of death. RESULTS: There were 11,920 in-flight medical emergencies resulting in calls to the center (1 medical emergency per 604 flights). The most common problems were syncope or presyncope (37.4% of cases), respiratory symptoms (12.1%), and nausea or vomiting (9.5%). Physician passengers provided medical assistance in 48.1% of in-flight medical emergencies, and aircraft diversion occurred in 7.3%. Of 10,914 patients for whom post-flight follow-up data were available, 25.8% were transported to a hospital by emergency-medical-service personnel, 8.6% were admitted, and 0.3% died. The most common triggers for admission were possible stroke (odds ratio, 3.36; 95% confidence interval [CI], 1.88 to 6.03), respiratory symptoms (odds ratio, 2.13; 95% CI, 1.48 to 3.06), and cardiac symptoms (odds ratio, 1.95; 95% CI, 1.37 to 2.77). CONCLUSIONS: Most in-flight medical emergencies were related to syncope, respiratory symptoms, or gastrointestinal symptoms, and a physician was frequently the responding medical volunteer. Few in-flight medical emergencies resulted in diversion of aircraft or death; one fourth of passengers who had an in-flight medical emergency underwent additional evaluation in a hospital. (Funded by the National Institutes of Health.)


Transport of critically ill children has become necessary following centralisation of paediatric specialist services. Children's Acute Transport Service (CATS) retrieves critically ill children in the Greater London area. Our teams have had to stop during these journeys to assist in road traffic accidents or ill passers-by. We undertook a review of our practice over a 3.5-year period. Our teams had to stop on 12 occasions over this period amounting to an incidence rate of 1 per 959 ambulance journeys. Although this is an infrequent occurrence, the impact on the retrieved patient and service delivery could be significant. We would like to direct the attention of transport services to this problem.


Advanced Life Support (ALS) providers may perform more invasive prehospital procedures, while Basic Life Support (BLS) providers offer stabilisation care and often “scoop and run”. We hypothesised that prehospital interventions by urban ALS providers prolong prehospital time and decrease survival in penetrating trauma victims. Study design: We prospectively analysed 236 consecutive ambulance-transported, penetrating trauma patients an our urban Level-1 trauma centre (6/2008–12/2009). Inclusion criteria included ICU admission, length of stay > days, or in-hospital death. Demographics, clinical characteristics, and outcomes were compared between ALS and BLS patients. Single and
multiple variable logistic regression analysis determined predictors of hospital survival. Results: Of 236 patients, 71% were transported by ALS and 29% by BLS. When ALS and BLS patients were compared, no differences in age, penetrating mechanism, scene GCS score, Injury Severity Score, or need for emergency surgery were detected (p > 0.05). Patients transported by ALS units more often underwent prehospital interventions (97% vs. 17%; p < 0.01), including endotracheal intubation, needle thoracostomy, cervical collar, IV placement, and crystalloid resuscitation. While ALS ambulance on-scene time was significantly longer than that of BLS (p < 0.01), total prehospital time was not (p = 0.98) despite these prehospital interventions (1.8 ± 1.0 per ALS patient vs. 0.2 ± 0.5 per BLS patient; p < 0.01). Overall, 69.5% ALS patients and 88.4% of BLS patients (p < 0.01) survived to hospital discharge. Conclusion: Prehospital resuscitative interventions by ALS units performed on penetrating trauma patients may lengthen on-scene time but do not significantly increase total prehospital time. Regardless, these interventions did not appear to benefit our rapidly transported, urban penetrating trauma patients.

Acute pulmonary edema (APE) is a common cause of acute dyspnea. In the prehospital setting, it is often difficult to differentiate APE from other causes of shortness of breath (SOB). Radiography and echocardiography aid in the identification of APE but are often not available. There is little information on how accurately ambulance paramedics identify patients with APE. Objectives. This study aimed to 1) describe the prehospital clinical presentation and management of patients with a clinical diagnosis of APE and 2) compare the accuracy of coding of APE by paramedics against the emergency department (ED) medical discharge diagnosis. Methods. This study included a retrospective cohort of all patients who had episodes identified as APE by ambulance paramedics and were transported to a metropolitan hospital ED in 2011. Two databases were used: an ambulance database and the Emergency Department Information System. The ED medical discharge diagnosis (using International Statistical Classification of Diseases and Related Problems, 10th Revision, Australian Modification [ICD-10-AM] codes) was used as the comparator with paramedic-assigned problem codes for APE. The outcomes for the study were the positive predictive value, i.e., the proportion of patients identified as having APE in the ambulance database who also had an ED discharge diagnosis of APE, and the sensitivity of paramedic identification of APE, i.e., the proportion of patients with an ED discharge diagnosis of APE that were correctly identified as APE by the ambulance paramedics. Results. Four hundred ninety-five patients were transported to an ED with APE identified by the paramedics as the primary problem code. Shortness of breath, crepitations, high systolic blood pressure, and chest pain were the most common presenting signs and symptoms. Pink frothy sputum was rare (3% of patient episodes of APE). One hundred eighty-six patients received an ED discharge diagnosis of APE, i.e., a positive predictive value of 41%. Of 631 ED presentations with APE, paramedics identified 186, i.e., a sensitivity of 29%. Conclusion. Acute pulmonary edema is difficult to identify in the prehospital setting because of the variability in the signs and symptoms associated with this condition. Improved identification of APE is essential in the initiation of appropriate and timely care. Ambulance paramedics need to be aware of such variability when considering patients who may be suffering from APE.

Photos of non-emotional rationalists and…..do we need a reason for more chocolate milk?


ANZCOR Research updates MAY 2013_Suzanne Davies
It is now standard practice, at Universities around the world, for academics to place pictures of themselves on a personal profile page maintained as part of their University’s web-site. Here we investigated what these pictures reveal about the way academics see themselves. Since there is an asymmetry in the degree to which emotional information is conveyed by the face, with the left side being more expressive than the right, we hypothesised that academics in the sciences would seek to pose as non-emotional rationalists and put their right cheek forward, while academics in the arts would express their emotionality and pose with the left cheek forward. We sourced 5829 pictures of academics from their University websites and found that, consistent with the hypotheses, there was a significant difference in the direction of face posing between science academics and English academics with English academics showing a more leftward orientation. Academics in the Fine Arts and Performing Arts however, did not show the expected left cheek forward bias. We also analysed profile pictures of psychology academics and found a greater bias toward presenting the left cheek compared to science academics which makes psychologists appear more like arts academics than scientists. These findings indicate that the personal website pictures of academics mirror the cultural perceptions of emotional expressiveness across disciplines.

Full text available at: http://www.plosone.org/article/info:doi/10.1371/journal.pone.0038940


An optimal post-exercise nutrition regimen is fundamental for ensuring recovery. Therefore, research has aimed to examine post-exercise nutritional strategies for enhanced training stimuli. Chocolate milk has become an affordable recovery beverage for many athletes, taking the place of more expensive commercially available recovery beverages. Low-fat chocolate milk consists of a 4:1 carbohydrate:protein ratio (similar to many commercial recovery beverages) and provides fluids and sodium to aid in post-workout recovery. Consuming chocolate milk (1.0-1.5*kg(-1) h(-1)) immediately after exercise and again at 2 h post-exercise appears to be optimal for exercise recovery and may attenuate indices of muscle damage. Future research should examine the optimal amount, timing, and frequency of ingestion of chocolate milk on post-exercise recovery measures including performance, indices of muscle damage, and muscle glycogen resynthesis.