Advanced life support


Guidelines recommend standardized treatment of post-cardiac arrest patients to improve outcomes. However, the infrastructure, resources, and personnel required to meet the complex needs of cardiac arrest victims remain a barrier to care. Given that regionalization of time-dependent high-acuity illness is an emerging paradigm, the aim of the present study was to develop and implement a regionalized approach to post-cardiac arrest care. We performed a prospective observational study on all patients treated in a regionalized clinical pathway from November 2007 through June 2011. All patients were enrolled after admission to an urban academic medical center. Clinical data including arrest and treatment variables, complications, and outcome were collected on consecutive patients with the use of a preformatted standard data collection tool using Utstein criteria. A total of 220 patients were enrolled; 127 (58%) patients were local direct admissions from our community, and 93 (42%) were transferred from 1 of 24 outlying referral hospitals. One hundred six (48%, 95% CI 38%-53%) patients survived to hospital discharge. The primary outcome of hospital survival with good neurologic function was observed in 94 (43%, 95% CI 32%-48%). There was no difference in survival with good neurologic outcome among local and referred patients. Overall 1-year survival was 44% (95% CI 38%-51%). Among patients discharged from the hospital with good neurologic function, 93% (95% CI 85%-97%) remained alive at 1 year. Development of a regionalized approach to post-cardiac arrest care using previously established referral relationships is feasible, and implementation of such an approach was clinically effective in our region.

ANZCOR guideline 11.7: Post resuscitation therapy


Mild therapeutic hypothermia has been shown to improve neurologic outcomes after sudden cardiac arrest. Therapeutic hypothermia should be started as soon as return of spontaneous circulation occurs. However, saline is difficult to keep chilled in the prehospital environment. We sought to determine whether a cooler and ice packs could keep saline cold under prehospital conditions. In phase 1 of the experiment, two 1000-mL bags of prechilled 0.9% normal saline were placed in a cooler with 3 ice packs. An additional bag of 1000-mL 0.9% normal saline remained outside the cooler as a control. Over 9 consecutive days, we measured the ambient air temperature and the temperature of each bag of saline every 4 hours. In phase 2 of the experiment, the cooler was kept sealed, and the temperature of the saline was measured after 24 hours. The mean temperatures over 24 hours ranged as follows: ambient temperature, 24C to 27.2C; bottom bag, 0.6C to 3.5C; top bag, 1.4C to 5.7C; and control bag, 9.8C to 26.8C. A t test was used to compare the chilled saline against the control bag. Statistical significance (P < .05) was achieved at all times. In phase 2 of the experiment, after 24 hours, 100% of the bottom bags and 93% of the top bags were less than 6C. Our data demonstrate that saline can be kept chilled in ambulances for 24 hours using ice packs and coolers. The estimated cost is less than $50.00 per ambulance. Using coolers and ice packs is an inexpensive way for emergency medical service agencies to initiate prehospital hypothermia.
ANZCOR Guideline 11: Therapeutic hypothermia after cardiac arrest


During in-hospital cardiac arrests, how long resuscitation attempts should be continued before termination of efforts is unknown. We investigated whether duration of resuscitation attempts varies between hospitals and whether patients at hospitals that attempt resuscitation for longer have higher survival rates than do those at hospitals with shorter durations of resuscitation efforts. Methods: Between 2000 and 2008, we identified 64,339 patients with cardiac arrests at 435 US hospitals within the Get With The Guidelines - Resuscitation registry. For each hospital, we calculated the median duration of resuscitation before termination of efforts in non-survivors as a measure of the hospital's overall tendency for longer attempts. We used multilevel regression models to assess the association between the length of resuscitation attempts and risk-adjusted survival. Our primary endpoints were immediate survival with return of spontaneous circulation during cardiac arrest and survival to hospital discharge. 31 198 of 64 339 (48·5%) patients achieved return of spontaneous circulation and 9912 (15·4%) survived to discharge. For patients achieving return of spontaneous circulation, the median duration of resuscitation was 12 min (IQR 6–21) compared with 20 min (14–30) for non-survivors. Compared with patients at hospitals in the quartile with the shortest median resuscitation attempts in non-survivors (16 min [IQR 15–17]), those at hospitals in the quartile with the longest attempts (25 min [25–28]) had a higher likelihood of return of spontaneous circulation (adjusted risk ratio 1·12, 95% CI 1·06–1·18; p<0·0001) and survival to discharge (1·12, 1·02–1·23; 0·021). Interpretation: Duration of resuscitation attempts varies between hospitals. Although we cannot define an optimum duration for resuscitation attempts on the basis of these observational data, our findings suggest that efforts to systematically increase the duration of resuscitation could improve survival in this high-risk population.


Care of the patient with return of spontaneous circulation following sudden cardiac death is complex and challenging. A systematic and comprehensive approach can increase the chances of meaningful recovery of the postarrest patient. This article focuses on a systematic approach to the postarrest patient, which includes optimizing oxygenation and ventilation, maintaining adequate perfusion pressure, monitoring oxygen delivery, initiating and maintaining therapeutic hypothermia, and identifying patients appropriate for emergent cardiac catheterization. Using this approach, providers treating the postarrest patient can maximize the chance that a patient walks out of the hospital neurologically intact.

ANZCOR Guideline 11.7: Post resuscitation therapy


Objective: To evaluate the value of continuous electroencephalography in early prognostication in patients treated with hypothermia after cardiac arrest. Design: Prospective cohort study. Setting: Medical intensive care unit. Patients: Sixty patients admitted to the intensive care unit for therapeutic hypothermia after cardiac arrest. Intervention: None. Measurements and Main Results: In all patients, continuous electroencephalogram and daily somatosensory evoked potentials were recorded during the first 5 days of admission or until intensive care unit discharge. Neurological outcomes were based on each patient’s best achieved Cerebral Performance Category score within 6 months. Twenty-seven of 56 patients (48%) achieved good neurological outcome (Cerebral Performance Category score 1, 2). At 12 hrs after resuscitation, 43% of the patients with good
neurological outcome showed continuous diffuse slow electroencephalogram rhythms, whereas this was never observed in patients with poor outcome. The sensitivity for predicting poor neurological outcome of low-voltage and isoelectric electroencephalogram patterns 24 hrs after resuscitation was 40% (95% confidence interval 19%, 64%) with a 100% specificity (confidence interval 86%, 100%), whereas the sensitivity and specificity of absent somatosensory evoked potential responses during the first 24 hrs were 24% (confidence interval 10%, 44%) and 100% (confidence interval: 87%, 100%), respectively. The negative predictive value for poor outcome of low-voltage and isoelectric electroencephalogram patterns was 68% (confidence interval 50%, 81%) compared to 55% (confidence interval 40%, 60%) for bilateral somatosensory evoked potential absence, both with a positive predictive value of 100% (confidence interval 63%, 100% and 59%, 100% respectively). Burst-suppression patterns after 24 hrs were also associated with poor neurological outcome, but not inevitably so. Conclusions: In patients treated with hypothermia, electroencephalogram monitoring during the first 24 hrs after resuscitation can contribute to the prediction of both good and poor neurological outcome. Continuous patterns within 12 hrs predicted good outcome. Isoelectric or low-voltage electroencephalograms after 24 hrs predicted poor outcome with a sensitivity almost twice larger than bilateral absent somatosensory evoked potential responses.

ANZCOR Guidelines 11.7/11.8: Therapeutic hypothermia/Post resuscitation therapy

6. Peters JH and Hoogerwerf N. Prehospital endotracheal intubation; need for routine cuff pressure measurement? Emerg Med J 2012; Online first (25 October): In endotracheal intubation, a secured airway includes an insufflated cuff distal to the vocal cords. High cuff pressures may lead to major complications occurring after a short period of time. Cuff pressures are not routinely checked after intubation in the prehospital setting, dealing with a vulnerable group of patients. We reviewed cuff pressures after intubation by Helicopter Emergency Medical Services and paramedics noted in a dispatch database. Initial cuff pressures are almost all too high, needing adjustment to be in the safe zone. Dutch paramedics lack manometers and, therefore, only few paramedic intubations are followed by cuff pressure measurements. We recommend cuff pressure measurements after all (prehospital) intubations and, therefore, all ambulances need to be equipped with cuff manometers. ANZCOR Guideline 11.6: Equipment & techniques in adult ALS

Many studies over the past decade have investigated delaying initial defibrillation to perform cardiopulmonary resuscitation (CPR), as it has been associated with increased rates of restoration of spontaneous circulation and/or survival. Since 2006, a number of studies have investigated these procedures. The objective of this study was to undertake a literature review examining the commencement of CPR before defibrillation in the out-of-hospital setting. Methods: A literature review was undertaken using the electronic medical databases Ovid Medline, EMBASE, CINHAL Plus, Cochrane Systematic Review and Meditext, from their commencement to the end of June 2011. Keywords used in the search included: CPR, defibrillation, ventricular fibrillation, VF, EMS, EMT, paramedic, emergency medical service, emergency medical technician, prehospital, out-of-hospital and ambulance. References of relevant articles were also reviewed. Findings: Of the 3079 articles located, 10 met the inclusion criteria. The results of these studies showed conflicting results. All retrospective studies (n=6) indicated a benefit in performing pre-shock CPR on patients with ventricular fibrillation for durations between 90 and 180s. Conversely, all randomised controlled trials demonstrated no benefit from providing CPR before defibrillation compared with immediate defibrillation for return of spontaneous circulation, neurological outcome and/or survival to hospital discharge. However, none of the studies reported evidence that CPR before defibrillation is harmful. Conclusion: Conflicting evidence remains regarding the benefit of CPR before defibrillation. The establishment of a consistent timeframe of chest compressions before defibrillation in
the out-of-hospital setting will provide uniformity in standards in clinical practice and education and training.  


Objectives: When managing airways in a prehospital setting, emergency physicians have to deal with difficult intubation (DI), which increases morbidity and mortality. The primary goal of this study was to determine predictors of DI in the out-of-hospital field faced by the French physician-staffed Emergency Medical Service. Methods: The study was a prospective, observational study, including all consecutive patients intubated during a 30-month period. Patients having experienced standard intubation (two attempts or less) or DI (more than two attempts) were compared. Results: Six hundred and ninety-four patients were included: 70 (11%) were classified as DI and 583 as standard intubations. Logistic regression showed that airways obstruction [odds ratio (OR), 4.1; 95% confidence interval (CI), 1.71, 14.4], intubation on the floor (OR, 2.6; 95% CI, 1.04, 6.6), and a hyoid-mental distance less than three fingers (OR, 2.3; 95% CI, 1.2, 4.7) were independent predictors of DI. Immediate complications occurred in 89 patients (16%): 66 (11%) in the standard intubation group and 23 (31%) in the DI group (P<0.01). Conclusion: For prehospital orotracheal intubation, independent risk factors of DI are a mental-thyroid distance less than three fingers, a patient on the floor, and a superior airways obstruction. Anticipation of DI could result in fewer attempts, and fewer complications, as the rate of complication increases with the difficulty of intubation.


Identification of the cause of out-of-hospital cardiac arrest (OHCA) is of paramount importance. We investigated the ability of our imaging strategy to provide an early etiological diagnosis of OHCA and the influence of this strategy on ICU survival. Methods: Retrospective review of a prospectively acquired ICU database (01/2000–12/2010) including all OHCA patients without obvious extra-cardiac cause, for which an early diagnosis research was conducted (coronary angiography and/or brain and chest CT scan) within 24 h after resuscitation. These procedures could be performed separately or be combined, according to a decision algorithm. Results: Of the 1274 patients admitted after OHCA during this 10-year period, the imaging strategy was applied in 896 patients. Patients who benefited from coronary angiography and/or CT scan were admitted to our ICU after a median delay of 180 [130–220] min after resuscitation. Seven hundred and forty-five coronary angiographies were performed, of which 452 (61%) identified at least one significant coronary lesion deemed responsible for the OHCA. CT-scan was performed in 355 patients and provided a diagnosis in 72 patients (20%), mainly stroke (n = 38) and pulmonary embolism (n = 19). Overall, this strategy allowed early diagnosis in 524 patients (59%). ICU survival was significantly higher for patients with a diagnosis identified by coronary angiography as compared with CT-scan (43% vs 10%, p < 0.001). Conclusion: The use of an early diagnosis protocol with immediate coronary angiography and/or CT scan provided the etiology of nearly two thirds of OHCA cases. In this large retrospective database, coronary angiography yielded a better diagnostic value than brain and/or chest CT-scan.

Background: Despite the publication and dissemination of the Advanced Cardiac Life Support guidelines, variability in the use of drugs during resuscitation from out-of-hospital cardiac arrest may exist between different Emergency Medical Services throughout North America. The purpose of this study was to characterize the use of such drugs and evaluate their relationship to cardiac arrest outcomes. Methods and results The Resuscitation Outcomes Consortium Registry-Cardiac Arrest collects out-of-hospital cardiac arrest data from 264 Emergency Medical Services agencies in 11 geographical locations in the US and Canada. Multivariable logistic regression was used to assess the association between drug use, characteristics of the cardiac arrest and a pulse at emergency department arrival and survival to discharge. A total of 16,221 out-of-hospital cardiac arrests were attended by 74 Emergency Medical Services agencies. There was a considerable variability in the administration of amiodarone and lidocaine for the treatment of shock resistant ventricular tachycardia/ventricular fibrillation. For non-shockable rhythms, atropine use ranged from 29 to 95% and sodium bicarbonate use ranged from 0.2 to 73% across agencies in the 89% of agencies that used the drug. Epinephrine use ranged from 57 to 98% within agencies. Neither lidocaine nor amiodarone was associated with a survival benefit while there was an inverse relationship between the administration of epinephrine, atropine and sodium bicarbonate and survival to hospital discharge. Conclusions: There is considerable variability among Emergency Medical Services agencies in their use of pharmacological therapy for out-of-hospital cardiac arrests which may be resolved by performing large randomized trials examining effects on survival.


Out-of-hospital cardiac arrest has a poor prognosis. The main aetiology is ischaemic heart disease. Aim: To make a systematic review addressing the question: “In patients with return of spontaneous circulation following out-of-hospital cardiac arrest, does acute coronary angiography with coronary intervention improve survival compared to conventional treatment?” Methods: Peer reviewed articles written in English with relevant prognostic data were included. Comparison studies on patients with and without acute coronary angiography were pooled in a meta-analysis. Results: Thirty-two non-randomised studies were included of which 22 were case-series without patients with conservative treatment. Seven studies with specific efforts to control confounding had statistical evidence to support the use of acute coronary angiography following resuscitation from out-of-hospital cardiac arrest. The remaining 25 studies were considered neutral. Following acute coronary angiography, the survival to hospital discharge, 30 days or six months ranged from 23% to 86%. In patients without an obvious non-cardiac aetiology, the prevalence of significant coronary artery disease ranged from 59% to 71%. Electrocardiographic findings were unreliable for identifying angiographic findings of acute coronary syndrome. Ten comparison studies demonstrated a pooled unadjusted odds ratio for survival of 2.78 (1.89; 4.10) favouring acute coronary angiography. Conclusion: No randomised studies exist on acute coronary angiography following out-of-hospital cardiac arrest. An increasing number of observational studies support feasibility and a possible survival benefit of an early invasive approach. In patients without an obvious non-cardiac aetiology, acute coronary angiography should be strongly considered irrespective of electrocardiographic findings due to a high prevalence of coronary artery disease.


Survival data for out-of-hospital cardiac arrest (OHCA) victims initially in PEA or asystole who convert to a shockable rhythm during attempted resuscitation, relative to an initial shockable rhythm, have never been previously reported. This study was done to assess OHCA outcomes among a large cohort of adults in the CARES dataset stratified by three rhythm categories: initial shockable (IS), converted shockable (CS), and never
shockable (NS). Methods: The study was IRB approved. All adult index events at participating sites (2005–2010) were study eligible. All patient data elements were provided. Odds ratios of CS and NS status for survival to hospital discharge were calculated via multivariate logistic regression that adjusted for demographics, site, resuscitation initiators, AED use, and other covariates. Results: There were 40,274 OHCA records submitted to the CARES registry during the study period. After exclusions, our final sample size was 30,939 (7404 IS [23.9%], 3225 CS [10.4%], 20,310 NS [65.7%]). Raw survival rates of CS and NS patients were similar (4.7% vs. 4.1%, respectively; p = 0.08) but significantly lower than IS patients (26.9%; p < 0.001). The adjusted OR of survival to hospital discharge for CS was 0.17 (95%CI: 0.14, 0.20) and for NS it was 0.17 (95% CI: 0.15, 0.18) with IS as the referent. Conclusion: After OHCA, the survival rate for CS victims is significantly lower than for IS patients. These findings suggest that CS and IS are different entities and that alternatives to existing resuscitation algorithm tailored to patients with CS should be investigated.


Adequate coronary perfusion pressure (CPP) during cardiopulmonary resuscitation (CPR) is essential for establishing return of spontaneous circulation. The objective of this study was to compare short-term survival using a hemodynamic directed resuscitation strategy versus an absolute depth-guided approach in a porcine model of asphyxia-associated cardiac arrest. We hypothesized that a hemodynamic directed approach would improve short-term survival compared to depth-guided care. Methods: After 7 min of asphyxia, followed by induction of ventricular fibrillation, 19 female 3-month old swine (31 ± 0.4 kg) were randomized to receive one of three resuscitation strategies: (1) hemodynamic directed care (CPP-20): chest compressions (CCs) with depth titrated to a target systolic blood pressure of 100 mmHg and titration of vasopressors to maintain CPP > 20 mmHg; (2) depth 33 mm (D33): target CC depth of 33 mm with standard American Heart Association (AHA) epinephrine dosing; or (3) depth 51 mm (D51): target CC depth of 51 mm with standard AHA epinephrine dosing. All animals received manual CPR guided by audiovisual feedback for 10 min before first shock. Results: 45-Min survival was higher in the CPP-20 group (6/6) compared to D33 (1/7) or D51 (1/6) groups; p = 0.002. Coronary perfusion pressures were higher in the CPP-20 group compared to D33 (p = 0.011) and D51 (p = 0.04), and in survivors compared to non-survivors (p < 0.01). Total number of vasopressor doses administered and defibrillation attempts were not different. Conclusions: Hemodynamic directed care targeting CPPs > 20 mmHg improves short-term survival in an intensive care unit porcine model of asphyxia-associated cardiac arrest.


To evaluate the association between haemodynamic variables during the first 24 h after intensive care unit (ICU) admission and neurological outcome in out-of-hospital cardiac arrest (OHCA) victims undergoing therapeutic hypothermia. Methods: In a multi-disciplinary ICU, records were reviewed for comatose OHCA patients undergoing therapeutic hypothermia. The hourly variable time integral of haemodynamic variables during the first 24 h after admission was calculated. Neurologic outcome was assessed at day 28 and graded as favourable or adverse based on the Cerebral Performance Category of 1–2 and 3–5. Bi- and multivariate regression models adjusted for confounding variables were used to evaluate the association between haemodynamic variables and functional outcome. Results: 67/134 patients (50%) were classified as having favourable outcome. Patients with adverse outcome had a higher mean heart rate (73 [62–86] vs. 66 [60–78] bpm; p = 0.04) and received noradrenaline more
frequently (n = 17 [25.4%] vs. n = 9 [6%]; p = 0.02) and at a higher dosage (128 [56–1004] vs. 13 [2–162] μg h−1; p = 0.03) than patients with favourable outcome. The mean perfusion pressure (mean arterial blood pressure minus central venous blood pressure) (OR = 1.001, 95% CI = 1–1.003; p = 0.04) and cardiac index time integral (OR = 1.055, 95% CI = 1.003–1.109; p = 0.04) were independently associated with adverse outcome at day 28. Conclusion: Mean perfusion pressure and cardiac index during the first 24 h after ICU admission were weakly associated with neurological outcome in an OHCA population undergoing therapeutic hypothermia. Further studies need to elucidate whether norepinephrine-induced increases in perfusion pressure and cardiac index may contribute to adverse neurologic outcome following OHCA.

ANZCOR Guideline 11.7: Post resuscitation therapy

Basic life support


The purpose of the study is to analyze the influence of the fatigue caused by a water rescue on the cardiopulmonary resuscitation (CPR) performance. Methods: The sample of our research is composed of a group of 60 lifeguards (30 men and 30 women) who have been trained at the Universities of A Coruña and Vigo. Two tests were conducted: the first test involved the execution of 5 min of CPR (rested), and the second one in performing water rescue and subsequent CPR (exhausted) for 5 minutes. The quality of the CPR at rest and at fatigue condition was compared. The recording instrument was the Laerdal Resusci Anne manikin. The time of the water rescue was also registered. Results: Gender does not significantly influence CPR, either at rest or at fatigue condition. However, the fatigue caused by rescue has a significant influence on the total quantity of chest compressions: rested (380 ± 38.64); exhausted (411 ± 56.09; P < .001) and ventilations: rested (24 ± 2.97); exhausted (26 ± 3.92; P < .001). Also in correct chest compressions: rested (285 ± 82.67); exhausted (246 ± 122.08; P = .02) and ventilations: rested (14 ± 7.09); exhausted (9 ± 6.67; P < .001). As far as the water rescue is concerned, men are faster (261 ± 34.58 s) when compared to women (326 ± 99.87 seconds; P = .001). Conclusion: The accumulated fatigue during a water rescue performed by lifeguards reduces the quality of chest compressions and ventilations on the CPR.


Objectives: Irukandji syndrome is a distressing condition characterised by pain, hypertension and tachycardia. Some develop cardiac failure and there have been two reported deaths. Magnesium sulphate has become the standard of care despite minimal evidence. The aim of this study was to investigate if magnesium would reduce analgesic requirement and length of stay for patients with Irukandji syndrome. Methods: This was a double-blind, randomised controlled clinical trial. Patients with Irukandji syndrome who required parenteral opioid analgesia were randomised to receive either 10 mmol of magnesium as a bolus, and then a 5 mmol/h magnesium infusion for 6 h or saline. Fentanyl patient-controlled analgesia was commenced to allow patients to self-regulate their pain relief. The primary outcome measure of the study was comparison of total analgesic requirements between the two groups. The secondary outcome measure was to compare length of stay. Results The study ran from November
2003 to May 2007. Thirty-nine patients were enrolled in the study; 26 were male with a median age of 28. Twenty-two received magnesium. There was no significant difference in the morphine equivalent dose used, peak CK, peak troponin, peak pulse, peak blood pressure, peak mean arterial pressure (MAP), percentage MAP rise and length of stay for those receiving magnesium compared with placebo. Conclusion: Our study did not demonstrate a benefit in the use of magnesium in the treatment of Irukandji syndrome. As such the current use of magnesium needs to be reconsidered until there is good evidence to support its use.

**ANZCOR Guideline 9.4.5 Jellyfish Stings**


Because out-of-hospital cardiac arrests (OHCA) due to a major trauma rarely present with shockable rhythms, the potential benefits of using automated external defibrillators (AEDs) at the scene of traumatic OHCA 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 OHCA 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.

**ANZCOR Guideline 10.4.1 External defibrillation in BLS**


The relationship between chest compression rate and compression depth is unknown. In order to characterise this relationship, we performed an observational study in prehospital cardiac arrest patients. We hypothesised that faster compressions are associated with decreased depth.

Materials and methods: In patients undergoing prehospital cardiopulmonary resuscitation by health care professionals, chest compression rate and depth were recorded using an accelerometer (E-series monitor-defibrillator, Zoll, USA). Compression depth was compared for rates <80/min, 80–120/min and >120/min. A difference in compression depth ≥0.5 cm was considered clinically significant. Mixed models with repeated measurements of chest compression depth and rate (level 1) nested within patients (level 2) were used with compression rate as a continuous and as a categorical predictor of depth. Results are reported as means and standard error (SE). Results and discussion: One hundred and thirty-three consecutive patients were analysed (213,409 compressions). Of all compressions 2% were <80/min, 62% between 80 and 120/min and 36% >120/min, 36% were <4 cm deep, 45% between 4 and 5 cm, 19% >5 cm. In 77 out of 133 (58%) patients a statistically significant lower depth was observed for
rates >120/min compared to rates 80–120/min, in 40 out of 133 (30%) this difference was also clinically significant. The mixed models predicted that the deepest compression (4.5 cm) occurred at a rate of 86/min, with progressively lower compression depths at higher rates. Rates >145/min would result in a depth <4 cm. Predicted compression depth for rates 80–120/min was on average 4.5 cm (SE 0.06) compared to 4.1 cm (SE 0.06) for compressions >120/min (mean difference 0.4 cm, P < 0.001). Age and sex of the patient had no additional effect on depth. **Conclusions:** This study showed an association between higher compression rates and lower compression depths. Avoiding excessive compression rates may lead to more compressions of sufficient depth.


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.

20. Sullivan JL and Chapman FW. *Will medical examination gloves protect rescuers from defibrillation voltages during hands-on defibrillation?* Resuscitation 2012; 83 (12): 1467-72

Continuing compressions during a defibrillation shock has been proposed as a method of reducing pauses in cardiopulmonary resuscitation (CPR) but the safety of this procedure is unproven. The medical examination gloves worn by rescuers play an important role in protecting the rescuer yet the electrical characteristics of these gloves are unknown. This study examined the response of medical examination gloves to defibrillation voltages. Methods Part 1 of this study measured voltage - current curves for a small sample (8) of gloves. Part 2 tested more gloves (460) to determine the voltage required to produce a specific amount of current flow. Gloves were tested at two current levels: 0.1 mA and 10 mA. Testing included four glove materials (chloroprene, latex, nitrile, and vinyl) in a single layer and double-gloved. Results: All gloves tested in part 1 allowed little current to flow (< mA) as the voltage was increased until breakdown occurred, at which point current flow increased precipitously. In part 2, 118 of 260 (45%) single gloves and 93 of 120 (77%) double gloves allowed at least 0.1 mA of current flow at voltages within the external defibrillation voltage range. Also, 6 of 80 (7.5%) single gloves and 5 of 80 (6.2%) double gloves allowed over 10 mA. **Conclusions:** Few of the gloves tested limited the current to levels proven to be safe. A lack of sensation during hands-on defibrillation does not guarantee that a safety margin exists. As such, we encourage rescuers to minimize rather than eliminate the pause in compressions for defibrillation.
Education, implementation and teams

The expanding role of emergency medicine in the care of potential organ donors presents unique ethical challenges. This article introduces emergency providers to the ethical challenges of organ donation, including issues of patient autonomy and consent, public perception and trust, goals of care, and the determination of death.

To investigate the level of basic life support (BLS) skill retention of medical interns 6 and 12 months after BLS education and analyse the correlation between clinical experience of cardiopulmonary resuscitation (CPR) and BLS skill retention. Materials and methods: The baseline performance of BLS skills in medical doctors during their internship was tested immediately after the BLS provider course. The subjects were divided into two groups, which were tested using the same method after 6 months or after 12 months. Data on the subjects’ CPR experience were collected through CPR records—specifically, the number of CPR experiences and the feedback given by the CPR team leaders. To evaluate BLS skill retention, baseline BLS skill performance was compared with the skill performances measured after 6 or 12 months. Results: Fifty-six subjects were enrolled in the 6 month group and 36 in the 12 month group. For non-compression skills, the points for skills declined from 12 to 6 points in the 6 month group and from 12 to 6 points in the 12 month group and the declines in both groups were statistically significant. For compression skills, in the 12 month group, the hands-off time improved from 9.9 s to 8.7 s, with statistical significance. In the multivariate linear regression test, the number of times feedback was given had a statistical relationship with improvement in hands-off time in the 12 month group (coefficient 0.58, 95% CI 0.12 to 1.05). Conclusions: In medical doctors, the compression skills were well preserved, but the retention of non-compression skills was poor.

For persons who have an out-of-hospital cardiac arrest, the probability of receiving bystander-initiated cardiopulmonary resuscitation (CPR) may be influenced by neighborhood characteristics. Methods: We analyzed surveillance data prospectively submitted from 29 U.S. sites to the Cardiac Arrest Registry to Enhance Survival between October 1, 2005, and December 31, 2009. The neighborhood in which each cardiac arrest occurred was determined from census-tract data. We classified neighborhoods as high-income or low-income on the basis of a median household income threshold of $40,000 and as white or black if more than 80% of the census tract was predominantly of one race. Neighborhoods without a predominant racial composition were classified as integrated. We analyzed the relationship between the median income and racial composition of a neighborhood and the performance of bystander-initiated CPR. Results: Among 14,225 patients with cardiac arrest, bystander-initiated CPR was provided to 4068 (28.6%). As compared with patients who had a cardiac arrest in high-income white neighborhoods, those in low-income black
neighborhoods were less likely to receive bystander-initiated CPR (odds ratio, 0.49; 95% confidence interval [CI], 0.41 to 0.58). The same was true of patients with cardiac arrest in neighborhoods characterized as low-income white (odds ratio, 0.65; 95% CI, 0.51 to 0.82), low-income integrated (odds ratio, 0.62; 95% CI, 0.56 to 0.70), and high-income black (odds ratio, 0.77; 95% CI, 0.68 to 0.86). The odds ratio for bystander-initiated CPR in high-income integrated neighborhoods (1.03; 95% CI, 0.64 to 1.65) was similar to that for high-income white neighborhoods. Conclusions: In a large cohort study, we found that patients who had an out-of-hospital cardiac arrest in low-income black neighborhoods were less likely to receive bystander-initiated CPR than those in high-income white neighborhoods. (Funded by the Centers for Disease Control and Prevention and others.)


Get With the Guidelines (GWTG-R) is a data registry and quality improvement program for in-hospital cardiac arrest (IHCA). It is unknown if duration of hospital participation in GWTG-R is associated with IHCA outcomes. Methods: We analyzed adults with IHCA from 362 hospitals participating in GWTG-R between 2000 and 2009. Using logistic regression with generalized estimating equations to account for clustering on hospital, we determined the association between duration of hospital participation in GWTG-R and patient outcomes after IHCA, adjusted for patient and arrest characteristics and secular trend. Using these methods, we also evaluated the association between duration of participation and factors previously correlated with survival after IHCA, including ECG monitored status, after-hours arrest, and time to defibrillation. Results: Of 104,732 patients with IHCA, 17,646 patients (16.9%) survived to discharge. Duration of hospital participation in GWTG-R was associated with IHCA event survival (per year of participation, odds ratio [OR] 1.02; 95% CI 1.00–1.04; p = 0.046) but not survival to discharge (OR 1.02; 95% CI 0.99–1.04; p = 0.18). Among factors previously correlated with IHCA survival, duration of participation was associated with time to defibrillation ≤2 min (per year of participation, OR 1.06; 95% CI 1.03–1.10; p < 0.001), but not ECG monitored status (OR 1.00; 95% CI 0.93–1.06; p = 0.90) or survival of after-hours arrest (OR 1.01; 95% CI 0.99–1.03; p = 0.41). Among ventricular tachycardia or ventricular fibrillation (VT/VF) arrests, time to defibrillation attenuated the association between duration of hospital participation and outcomes. Conclusion: Duration of hospital participation in GWTG-R was significantly associated with survival of the IHCA event, but not with survival to discharge. In VT/VF arrests, this association may have been mediated by improvements in time to defibrillation.


Globally, one third of deaths each year are from cardiovascular diseases, yet no strong evidence supports any specific method of CPR instruction in a resource-limited setting. We hypothesized that both existing and novel CPR training programs significantly impact skills of hospital-based healthcare providers (HCP) in Botswana. Methods: HCP were prospectively randomized to 3 training groups: instructor led, limited instructor with manikin feedback, or self-directed learning. Data was collected prior to training, immediately after and at 3 and 6 months. Excellent CPR was prospectively defined as having at least 4 of 5 characteristics: depth, rate, release, no flow fraction, and no excessive ventilation. GEE was performed to account for within subject correlation. Results: Of 214 HCP trained, 40% resuscitate ≥1/month, 28% had previous formal CPR training, and 65% required additional skills remediation to pass using AHA criteria. Excellent CPR skill acquisition was significant (infant: 32% vs. 71%, p < 0.01; adult 28% vs. 48%, p < 0.01). Infant CPR skill retention was significant at 3 (39% vs. 70%, p < 0.01) and 6 months (38% vs. 67%, p < 0.01), and adult CPR skills were retained to 3 months (34% vs. 51%, p = 0.02). On multivariable analysis, low cognitive score and need for skill
remediation, but not instruction method, impacted CPR skill performance. Conclusions: HCP in resource-limited settings resuscitate frequently, with little CPR training. Using existing training, HCP acquire and retain skills, yet often require remediation. Novel techniques with increased student: instructor ratio and feedback manikins were not different compared to traditional instruction.

**Paediatric advanced life support**


The aim of this study was to determine the best airway device among the laryngeal mask, I-gel and the laryngeal tube used by healthcare professional groups with different levels of experience with paediatric airway management. Method: Three groups of healthcare professionals were separately provided with brief supervised training in using the three devices. Afterwards the participants were asked to place the airway device. For every participant, the positioning of each device was recorded. The success rate and timing of insertion were measured. Furthermore, each insertion was scored for the ease of insertion, clinical and fibre-optic verification of the position and successful ventilation. Results: A total of 66 healthcare providers (22 paramedics, 22 nurse anaesthetists and 22 anaesthesia residents) participated in the study. The median time of insertion of both the laryngeal mask and the tube was significantly longer than for the I-gel for all professional groups (p<0.001). The success rate with the I-gel was higher than that with the laryngeal mask or tube (p<0.001). Except for the laryngeal mask, there were no differences among the professional groups regarding the fibre-optic evaluation. Conclusions: In terms of both the time required for successful placement and the rate of successful placement, the I-gel is superior to the laryngeal mask and tube in paediatric resuscitation simulations by healthcare professional groups with different levels of experience with paediatric airway management.

**ANZCOR Guideline 12.6: Techniques in Paediatric Advanced Life Support**


Background: We investigated which factors are associated with successful paediatric endotracheal intubation (ETI) on the first attempt in emergency department (EDs) from multicentre emergency airway registry data. Methods: We created a multicentre registry of intubations at 13 EDs and performed surveillance over 5 years. Each intubator filled out a data form after an intubation. We defined paediatric patients as patients younger than 10 years of age. We assessed the specialty and level of training of intubator, the method, the equipment, and the associated adverse events. We analysed the intubation success rates on the first attempt (first-pass success, FPS) based on these variables. Results: A total of 430 ETIs were performed on 281 children seen in the ED. The overall FPS rate was 67.6%, but emergency medicine (EM) physicians showed a significantly greater success rate of 74.4%. In the logistic regression analysis, the intubator’s specialty was the only independent predictive factor for paediatric FPS. In the subgroup analysis, the EM physicians used the rapid sequence intubation/intubation (RSI) method and Macintosh laryngoscope more frequently than physicians of other specialties. ETI-related adverse events occurred in 21 (7.2%) out of the 281 cases. The most common adverse event in the FPS group was mainstem bronchus intubation, and vomiting was the most common event in the non-FPS group. The incidence of adverse events was lower in the FPS group than in the non-FPS group, but this difference was not statistically significant. Conclusions: The intubator’s specialty was the major factor associated with FPS in emergency department paediatric ETI. The overall ETI FPS rate among paediatric patients was 67.6%, but the EM physicians had a FPS rate of 74.4%. A well structured airway skill training program, and more actively
using the RSI method are important and this could explain these differences.


Arterial hyperoxia after resuscitation has been associated with increased mortality in adults. The aim of this study was to test the hypothesis that post-resuscitation hyperoxia and hypocapnia are associated with increased mortality after resuscitation in pediatric patients. Methods: We performed a prospective observational multicenter hospital-based study including 223 children aged between 1 month and 18 years who achieved return of spontaneous circulation after in-hospital cardiac arrest and for whom arterial blood gas analysis data were available. Results: After return of spontaneous circulation, 8.5% of patients had hyperoxia (defined as PaO2 > 300 mmHg) and 26.5% hypoxia (defined as PaO2 < 60 mmHg). No statistical differences in mortality were observed when patients with hyperoxia (52.6%), hypoxia (42.4%), or normoxia (40.7%) (p = 0.61). Hypocapnia (defined as PaCO2 < 30 mmHg) was observed in 13.5% of patients and hypercapnia (defined as PaCO2 > 50 mmHg) in 27.6%. Patients with hypercapnia or hypocapnia had significantly higher mortality (59.0% and 50.0%, respectively) than patients with normocapnia (33.1%) (p = 0.002). At 24 h after return of spontaneous circulation, neither PaO2 nor PaCO2 values were associated with mortality. Multiple logistic regression analysis showed that hypercapnia (OR, 3.27; 95% CI, 1.62–6.61; p = 0.001) and hypocapnia (OR, 2.71; 95% CI, 1.04–7.05; p = 0.04) after return of spontaneous circulation were significant mortality factors. Conclusions: In children resuscitated from cardiac arrest, hyperoxemia after return of spontaneous circulation or 24 h later was not associated with mortality. On the other hand, hypercapnia and hypocapnia were associated with higher mortality than normocapnia.


The proposed introduction of the CAB (circulation, airway, breathing) sequence for cardiopulmonary resuscitation has raised some perplexity within the pediatric community. We designed a randomized trial intended to verify if and how much timing of intervention in pediatric cardiopulmonary resuscitation is affected by the use of the CAB vs. the ABC (airway, breathing, circulation) sequence. Patients and methods: 340 volunteers, paired into 170 two-person teams, performed 2-rescuer healthcare provider BLS with both a CAB and ABC sequence. Their performances were audio–video recorded and times of intervention in the two scenarios, cardiac and respiratory arrest, were monitored. Results: The CAB sequence compared to ABC prompts quicker recognition of respiratory (CAB vs. ABC = 17.48 ± 2.19 vs. 19.17 ± 2.38 s; p < 0.05) or cardiac arrest (CAB vs. ABC = 17.48 ± 2.19 vs. 41.67 ± 4.95; p < 0.05) and faster start of ventilatory maneuvers (CAB vs. ABC = 19.13 ± 1.47 s vs. 22.66 ± 3.07; p < 0.05) or chest compressions (CAB vs. ABC = 19.27 ± 2.64 vs. 43.40 ± 5.036; p < 0.05). Conclusions: Compared to ABC the CAB sequence prompts shorter time of intervention both in diagnosing respiratory or cardiac arrest and in starting ventilation or chest compression. However, this does not necessarily entail prompter resumption of spontaneous circulation and significant reduction of neurological sequelae, an issue that requires further studies.


Performance of high quality CPR is associated with improved resuscitation outcomes. This study investigates code leader ability to recall CPR error
during post-event interviews when CPR recording/audiovisual feedback-enabled defibrillators are deployed. Patients and methods: Physician code leaders were interviewed within 24 h of 44 in-hospital pediatric cardiac arrests to assess their ability to recall if CPR error occurred during the event. Actual CPR quality was assessed using quantitative recording/feedback-enabled defibrillators. CPR error was defined as an overall average event chest compression (CC) rate <95/min, depth <38 mm, ventilation rate >10/min, or any interruptions in CPR >10 s. We hypothesized that code leaders would recall error when it actually occurred ≥75% of the time when assisted by audiovisual alerts from a CPR recording/feedback-enabled defibrillator (analysis by χ²).

Results: 810 min from 44 cardiac arrest events yielded 40 complete data sets (actual and interview); ventilation data was available in 24. Actual CPR error was present in 3/40 events for rate, 4/40 for depth, 32/40 for interruptions >10 s, and 17/24 for ventilation frequency. In post-event interviews, code leaders recalled these errors in 0/3 (0%) for rate, 0/4 (0%) for depth, and 19/32 (59%) for interruptions >10 s. Code leaders recalled these CPR quality errors less than 75% of the time for rate (p = 0.06), for depth (p < 0.01), and for CPR interruption (p = 0.04). Quantification of errors not recalled: missed rate error median = 94 CC/min (IQR 93–95), missed depth error median = 36 mm (IQR 35.5–36.5), missed CPR interruption >10 s median = 18 s (IQR 14.4–28.9). Code leaders did recall the presence of excessive ventilation in 16/17 (94%) of events (p = 0.07). Conclusion: Despite assistance by CPR recording/feedback-enabled defibrillators, pediatric code leaders fail to recall important CPR quality errors for CC rate, depth, and interruptions during post-cardiac arrest interviews.

Resuscitation of the newborn

This retrospective case-control study aimed to examine the development of oxidative stress in asphyxiated infants delivered at more than 37 weeks of gestation. Thirty-seven neonates were stratified into 3 groups: the first group experienced hypothermia (n = 6); the second received hypothermia cooling cup treatment for 3 days, normothermia (n = 16); and the third was the control group (n = 15). Serum total hydroperoxide (TH), biological antioxidant potential, and oxidative stress index (OSI) (calculated as TH/biological antioxidant potential) were measured within 3 hours after birth. Serum TH and OSI levels gradually increased after birth in hypothermia and normothermia cases. At all time points, serum TH and OSI levels were higher in hypothermia and normothermia cases than in control cases. Serum TH and OSI levels were higher in normothermia cases than in hypothermia cases at days 3, 5, and 7. This study demonstrated that hypothermia attenuated the development of systemic oxidative stress in asphyxiated newborns.

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. Method: 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.

**Acute coronary syndromes**


Accelerated diagnostic pathways for risk stratification of patients presenting to the emergency department with potential acute coronary syndromes may identify very-low-risk patients safe for early discharge to outpatient care. Patients presenting with potential acute coronary syndrome to the emergency department were prospectively enrolled between November 2007 and April 2010. Patient characteristics in conjunction with 0- and 2-hour biomarkers and electrocardiograms were analyzed according to a 2-hour thrombolysis in myocardial infarction (TIMI) score and 9 other accelerated diagnostic pathways. The primary outcome was acute coronary syndrome by 30 days. Of 1,000 patients, 362 (36.2%) had a primary outcome. A pathway comprising electrocardiogram, prior ischemic heart disease, 0/2-hour troponin/creatine kinase MB fraction/myoglobin identified the highest proportion (25.0%) as low risk, with 96.1% sensitivity for the primary outcome. A pathway comprising electrocardiogram, history of ischemic heart disease, typical vs atypical symptoms, 0/2-hour troponin was the safest, with 99.7% sensitivity for the primary outcome, but only 9.0% were low risk. A pathway comprising the TIMI score with 0/2-hour troponin and electrocardiograms identified 15.5% as low risk, with a sensitivity of 99.2% for the primary outcome. This compares with standard care in which none were for outpatient care but, 3.3% had a primary outcome post-discharge within 30 days. In this relatively high-risk population, a 2-hour TIMI score safely identified significant numbers of patients suitable for early discharge to outpatient care.


The aim was to investigate the circadian and weekly variation in Chinese young patients with acute myocardial infarction (AMI). This was a 10-year retrospective cohort study. We studied patients (>18 to <45 years of age) with a first attack of AMI from the emergency departments of 3 university teaching hospitals in Taiwan from January 1, 2001, to December 31, 2010. We analyzed patients in the standard circadian fashion using 6-hour intervals (00:01-06:00, 06:01-12:00, 12:01-18:00, and 18:01-24:00). We also did an analysis by day of week. The database had 505 patients with AMI with complete data. The percentage of total AMIs that occurred in the 6-hour intervals were as follows: 00:01 to 06:00, 30.9%; 06:01 to 12:00, 23.4%; 12:01 to 18:00, 25.9%; and 18:01 to 24:00, 19.8%. The percentage of AMIs between 00:01 and 06:00 was significant higher compared with that in the other three 6-hour intervals (df = 3, χ2 = 91.7, P < .001). However, there was no significant weekly variation for these patients in the present study. There was a significant circadian variation with a peak from 00:01 to 06:00 in Chinese young patients with AMI. However, there was no significant weekly variation in these patients. The circadian periodicity may create new possibilities for disease prevention and medication.
The aim of this study was to identify sex differences in the early chain of care for patients with chest pain. This is a retrospective study performed at 3 centers including all patients admitted to the emergency department because of chest pain, during a 3-month period in 2008, in the municipality of Goteborg. Chest pain or discomfort in the chest was the only inclusion criterion. There were no exclusion criteria. Data were retrospectively collected from ambulance and medical records and electrocardiogram (ECG), echocardiography, and laboratory databases. A total of 2588 visits (1248 women and 1340 men) made by 2393 patients were included. When adjusting for baseline variables, female sex was significantly associated with a prolonged delay time (defined as above median) between (a) admission to hospital and admission to a hospital ward (odds ratio [OR], 1.59; 95% confidence interval [CI], 1.25-2.03), (b) first physical contact and first dose of aspirin (OR, 2.22; 95% CI, 1.30-3.82), and (c) admission to hospital and coronary angiography (OR, 2.50; 95% CI, 1.29-5.13). Delay time to the first ECG recording did not differ significantly between women and men. Among patients hospitalized due to chest pain, when adjusting for differences at baseline, female sex was associated with a prolonged delay time until admission to a hospital ward, to administration of aspirin, and to performing a coronary angiography. There was no difference in delay to the first ECG recording.

Approximately 330,000 ST-elevation myocardial infarctions (STEMI) occur yearly in the United States. Emergent reperfusion is the cornerstone of STEMI therapy and the key to restoration of coronary blood flow in an infarct-related vessel. Reperfusion methods include thrombolysis, primary percutaneous coronary intervention, or both methods combined. Selection of the appropriate reperfusion strategy is essential, along with having an efficient system of care capable of delivering these therapies. Timely reperfusion is highly dependent on a well-structured care system designed to meet the needs of each individual community. This article reviews the data behind different reperfusion strategies and introduces successful systems-of-care models.

Many institutions have developed outpatient observation units as an alternative to short-stay inpatient admissions. In this article, we highlight evidence to support the efficacy of EDOU care for chest pain and identify areas in which additional research is needed. Evidence-based protocols and collaborative approaches to care have potential to achieve similar clinical and improved economic outcomes compared with hospital admission. The potential for the EDOU to provide the right care for the right patient at the right time is only beginning to be realized, with significant advances in health care delivery anticipated in the near future.

Diagnosis of ST-segment elevation myocardial infarction has long been considered time sensitive. Several other electrocardiogram abnormalities,
sometimes referred to as “STEMI-equivalents”, should also alert the clinician to conditions similarly requiring aggressive intervention. The de Winter/ST/T complex, ST-segment elevation in lead aVR, Wellens’ phenomenon, posterior wall myocardial infarction, and pathologic ST changes in the presence of left bundle branch block and pacemakers are all discussed in this article.

Acute coronary syndromes result in a significant burden of morbidity and mortality in the United States. This spectrum of acute coronary thrombosis (including unstable angina, non-ST-segment elevation myocardial infarction, and ST-elevation myocardial infarction) has been well studied in large clinical trials. This review details the initial management of patients presenting with possible acute coronary syndromes in the context of care from the emergency department to the cardiac care unit. The importance of a rapid and focused evaluation, risk stratification, and appropriate therapies are discussed.

The 12-lead electrocardiogram (ECG) remains the cornerstone of prompt diagnosis of STEMI; Furthermore, the 12-lead ECG provides the primary indication for emergent reperfusion therapy in the STEMI patient. In certain cases, a patient’s ECG can resemble STEMI yet manifest ST-segment elevation from a non-coronary-based syndrome; these entities are termed the STEMI mimics and include benign early repolarization, acute pericarditis, and left ventricular aneurysm, to name only a few. In other situations, the patient’s ECG makes it difficult or impossible to determine whether STEMI is present, the so-called STEMI confounders and include left bundle branch block pattern, left ventricular hypertrophy pattern, and the ventricular paced pattern. The goal with STEMI mimics and confounders is to maximize rapid, accurate diagnosis while avoiding delays in treatment of alternative causes of ST-segment elevation.

Myocardial infarction (MI) can be recognised by clinical features, including electrocardiographic (ECG) findings, elevated values of biochemical markers (biomarkers) of myocardial necrosis, and by imaging, or may be defined by pathology. It is a major cause of death and disability worldwide. MI may be the first manifestation of coronary artery disease (CAD) or it may occur, repeatedly, in patients with established disease. Information on MI rates can provide useful information regarding the burden of CAD within and across populations, especially if standardized data are collected in a manner that distinguishes between incident and recurrent events. From the epidemiological point of view, the incidence of MI in a population can be used as a proxy for the prevalence of CAD in that population. The term ‘myocardial infarction’ may have major psychological and legal implications for the individual and society. It is an indicator of one of the leading health problems in the world and it is an outcome measure in clinical trials, observational studies and quality assurance programmes. These studies and programmes require a precise and consistent definition of MI.
In the past, a general consensus existed for the clinical syndrome designated as MI. In studies of disease prevalence, the World Health Organization (WHO) defined MI from symptoms, ECG abnormalities and cardiac enzymes. However, the development of ever more sensitive and myocardial tissue-specific cardiac biomarkers and more sensitive imaging techniques now allows for detection of very small amounts of myocardial
injury or necrosis. Additionally, the management of patients with MI has significantly improved, resulting in less myocardial injury and necrosis, in spite of a similar clinical presentation. Moreover, it appears necessary to distinguish the various conditions which may cause MI, such as ‘spontaneous’ and ‘procedure-related’ MI. Accordingly, physicians, other healthcare providers and patients require an up-to-date definition of MI. In 2000, the First Global MI Task Force presented a new definition of MI, which implied that any necrosis in the setting of myocardial ischaemia should be labelled as MI. These principles were further refined by the Second Global MI Task Force, leading to the Universal Definition of Myocardial Infarction Consensus Document in 2007, which emphasized the different conditions which might lead to an MI. This document, endorsed by the European Society of Cardiology (ESC), the American College of Cardiology Foundation (ACCF), the American Heart Association (AHA), and the World Heart Federation (WHF), has been well accepted by the medical community and adopted by the WHO. However, the development of even more sensitive assays for markers of myocardial necrosis mandates further revision, particularly when such necrosis occurs in the setting of the critically ill, after percutaneous coronary procedures or after cardiac surgery. The Third Global MI Task Force has continued the Joint ESC/ACCF/AHA/WHF efforts by integrating these insights and new data into the current document, which now recognizes that very small amounts of myocardial injury or necrosis can be detected by biochemical markers and/or imaging.

Objective: To investigate whether a high-sensitivity troponin assay, shown to improve early detection of acute myocardial infarction (AMI), permits accelerated rule-in/rule-out of AMI. Methods: Patients who presented to the emergency department within 4 h of the onset of chest pain suggestive of acute coronary syndrome were prospectively recruited from November 2007 to April 2010. Blood samples were taken at 0, 1, 2 and 12–24 h after presentation and were analysed for clinically applied troponin I and for high-sensitivity troponin T (hsTnT). The dynamic change in hsTnT levels between time points was measured. The primary outcome was admission diagnosis of AMI. Results: Of the 385 patients recruited, 82 (21.3%) had AMI. The sensitivity of hsTnT by 2 h was 95.1% (88.7–98.1%), specificity 75.6% (73.8–76.5%), positive predictive value 53.8% (50.2–55.5%) and negative predictive value 98.3% (96.0–99.3%). The sensitivity was not statistically different between peak values at 2 h and 24 h. Adding ECG results reduced the false negative rate to 1.2%. The additional application of ≥20% delta criterion over the 2 h period for 0–2 h samples increased specificity to 92.4% (90.2–94.3%) but reduced sensitivity to 56.1% (48.0–63.2%). Conclusion: hsTnT taken at 0 and 2 h after presentation, together with ECG results, could identify patients suitable for early stress testing with a false negative rate for AMI of 1.2%. Further trials of such an approach are warranted. The specificity of hsTnT for diagnosing AMI could be improved by the use of a delta of ≥20%, but at the cost of major reductions in sensitivity.

Widespread conservative management of low-risk chest pain has motivated the development of a rapid triage strategy based on CT coronary angiography (CTCA) in the Emergency Department (ED). Recently, three prominent trials using this technology in the ED setting have presented results in support of its routine use. However, these studies fail to show the incremental prognostic value of CTCA over clinical and biomarker-based risk-stratification strategies, demonstrate additional downstream costs and interventions, and result in multiple harms associated with radio-contrast and radiation exposure. Observing the widespread overdiagnosis of pulmonary embolism following availability of CT pulmonary angiogram as a practice pattern parallel, CTCA use for low-risk chest pain in the ED should be advanced only with caution.

The management of acute myocardial infarction continues to undergo major changes. Good practice should be based on sound evidence, derived from well-conducted clinical trials. Because of the great number of trials on new treatments performed in recent years, and in view of new diagnostic tests, the ESC decided that it was opportune to upgrade the previous guidelines and appointed a Task Force. It must be recognized that, even when excellent clinical trials have been undertaken, their results are open to interpretation and that treatment options may be limited by resources. Indeed, cost-effectiveness is becoming an increasingly important issue when deciding upon therapeutic strategies. Owing to major changes in the biomarkers available for diagnosis, criteria for acute myocardial infarction have been revised. The current international consensus definition states that the term ‘acute myocardial infarction’ (AMI) should be used when there is evidence of myocardial necrosis in a clinical setting consistent with myocardial ischaemia. The present guidelines pertain to patients presenting with ischaemic symptoms and persistent ST-segment elevation on the electrocardiogram (ECG). Most of these patients will show a typical rise in biomarkers of myocardial necrosis and progress to Q-wave myocardial infarction. Separate guidelines have recently been developed by another Task Force of the ESC for patients presenting with ischaemic symptoms but without persistent ST-segment elevation and for patients undergoing myocardial revascularization in general.


The treatment of acute ST elevation myocardial infarction (STEMI) has greatly improved in the last three decades, especially after the introduction of primary percutaneous coronary intervention (PCI). However, primary PCI is available in selected centres only, thus necessitating transportation of the STEMI patient. Improvement in the logistics of care for these patients is associated with significant improvement of patient outcome. Both the American Heart Association (AHA) and the European Society of Cardiology (ESC) STEMI guidelines recommend pre-hospital infarct diagnosis as a class I recommendation. Despite this, the large majority of STEMI patients are only diagnosed after arrival in the hospital. Therefore, great care should be taken in the initial diagnosis, risk assessment and triage, subsequent transfer and the distance of transportation as well as pre- and in-hospital time delays in these patients.


In a push to treat ST-elevation myocardial infarction (STEMI) patients with primary percutaneous coronary intervention (PCI) within 90min of door-to-balloon time, emergency cardiac catheterization laboratory activation protocols bypass routine clinical assessments, raising the possibility of more frequent catheterizations in patients with no culprit coronary lesion. To determine the incidence, predictors, and prognosis of false-positive STEMI. We followed a prospective cohort of patients diagnosed with STEMI by usual criteria receiving emergency cardiac catheterization with intention of primary PCI between January 2005 and December 2007 at a tertiary care center. False-positive STEMI was defined as absence of a clear culprit lesion on coronary angiography. Of 489 patients who received emergency cardiac catheterization indicated for STEMI, 54 (11.0%, 95% confidence interval [CI] 8.3,13.8) had no culprit lesion on coronary angiography. Independent predictors of false-positive STEMI were absence of chest pain (odds ratio [OR] 18.2, 95% CI 3.7, 90.1), no reciprocal ST-segment changes (OR 11.8, 95% CI 5.14, 27.3), fewer than three cardiovascular risk factors (OR 9.79, 95% CI 4.0, 23.8), and symptom duration longer than 6h (OR 9.2, 95% CI 3.6, 23.7); all p<0.001. Using
predictors, we modeled a risk score that achieved 88% (95% CI 81, 94%) accuracy in identifying patients with negative coronary angiography. Among the false-positive STEMI patients, 48.1% had other serious diagnoses related to their electrocardiographic findings. When the diagnosis of STEMI is in doubt, clinicians may use predictors to quickly reassess the likelihood of an alternative diagnosis.


To rule out acute myocardial infarction (AMI) in chest pain patients constitutes a diagnostic challenge to emergency department (ED) physicians. Study Objectives: To evaluate the diagnostic value of measuring salivary alpha-amylase (sAA) activity for detecting AMI in patients presenting to the ED with acute chest pain. Methods: sAA activity was measured in a prospective cohort of 473 consecutive adult patients within 4 h of onset of chest pain. Comparisons were made between patients with a final diagnosis of AMI and those with non-AMI. Univariate analysis and multiple logistic regression model were used to identify independent clinical predictors of AMI. Results: Initial sAA activity in the AMI group (n = 85; 266 ± 127.6 U/mL) was significantly higher than in the non-AMI group (n = 388; 130 ± 92.8 U/mL, p < 0.001). sAA activity levels were also significantly higher in patients with ST elevation AMI (n = 53) compared to in those with non-ST elevation AMI (n = 32) (300 ± 141.1 vs. 210 ± 74.1 U/mL, p < 0.001). The area under the receiver operating characteristic curve of sAA activity for predicting AMI in patients with acute chest pain was 0.826 (95% confidence interval [CI] 0.782–0.869), with diagnostic odds ratio 10.87 (95% CI 6.16–19.18). With a best cutoff value of 197.7 U/mL, the sAA activity revealed moderate sensitivity and specificity as an independent predictor of AMI (78.8% and 74.5%). Conclusions: High initial sAA activity is an independent predictor of AMI in patients presenting to the ED with chest pain.


Identifying ST-segment elevation myocardial infarctions (STEMIs) in the field can decrease door-to-balloon times. Paramedics may use a computer algorithm to help them interpret prehospital electrocardiograms (ECGs). It is unknown how accurately the computer can identify STEMIs. Objectives. To determine the sensitivity and specificity of prehospital ECGs in identifying patients with STEMI. Methods. Retrospective cross-sectional study of 200 prehospital ECGs acquired using Lifepak 12 monitors and transmitted by one of more than 20 emergency medical services (EMS) agencies to the emergency department (ED) of a Summa Akron City Hospital, a level 1 trauma center between January 1, 2007, and February 18, 2010. The ED sees more than 73,000 adult patients and treats 120 STEMIs annually. The laboratory performs 3,400 catheterizations annually. The first 100 patients with a diagnosis of STEMI and cardiac catheterization laboratory activation from the ED were analyzed. For comparison, a control group of 100 other ECGs from patients without a STEMI were randomly selected from our Medtronic database using a random-number generator. For patients with STEMI, an accurate computer interpretation was “acute MI suspected.” Other interpretations were counted as misses. Specificity and sensitivity were calculated with confidence intervals (CIs). The sample size was determined a priori for a 95% CI of ±10%. Results. Zero control patients were incorrectly labeled “acute MI suspected.” The specificity was 100% (100/100; 95% CI 0.96–1.0), whereas the sensitivity was 58% (58/100; 95% CI 0.48–0.67). This would have resulted in 42 missed cardiac catheterization laboratory activations, but zero inappropriate activations. The most common incorrect interpretation of STEMI ECGs by the computer was “data quality prohibits interpretation,” followed by “abnormal ECG unconfirmed.” Conclusions. Prehospital computer interpretation is not sensitive for STEMI identification and should not be used as a single method for prehospital activation of the cardiac catheterizing laboratory. Because of its high specificity, it may serve as an adjunct to interpretation.
49. Coventry LL, Bremner AP, Jacobs IG and Finn J. Myocardial Infarction: Sex Differences in Symptoms Reported to Emergency Dispatch. Prehosp Emerg Care 2012; Early online (October 18)

Emergency management of myocardial infarction (MI) is time-critical, because improved patient outcomes are associated with reduced time from symptom onset to definitive care. Previous studies have identified that women are less likely to present with chest pain. Objective. We sought to measure the effect of sex on symptoms reported to the ambulance dispatch and ambulance times for MI patients. Methods. The Western Australia Emergency Department Information System (EDIS) was used to identify patients with emergency department (ED) diagnoses of MI (ST-segment elevation MI and non–ST-segment elevation MI) who arrived by ambulance between January 1, 2008, and October 31, 2009. Their emergency telephone calls to the ambulance service were transcribed to identify presenting symptoms. Ambulance data were used to examine ambulance times. Sex differences were analyzed using descriptive and age-adjusted regression analysis. Results. Of 3,329 MI patients who presented to Perth EDs, 2,100 (63.1%) arrived by ambulance. After predefined exclusions, 1,681 emergency calls were analyzed. The women (n = 621; 36.9%) were older than the men (p < 0.001) and, even after age adjustment, were less likely to report chest pain (odds ratio [OR] = 0.70; 95% confidence interval [CI] 0.57, 0.88). After age adjustment, ambulance times did not differ between the male and female patients with chest pain. The women with chest pain were less likely than the men with chest pain to be allocated a “priority 1” (lights and sirens) ambulance response (men 98.3% vs. women 95.5%; OR = 0.39; 95% CI 0.18, 0.87). Conclusion. Ambulance dispatch officers (and paramedics) need to be aware of potential sex differences in MI presentation in order to ensure appropriate ambulance response.

General papers


This study was aimed to explore the effect of intervention in safe intrahospital transport on the incidence of unexpected events (UEs) occurring during the transport of emergency patients. This study was performed in an urban tertiary teaching hospital emergency department (ED) from May 17 to October 30, 2010. Patients older than 15 years who were transported to general wards; intensive care units; and magnetic resonance imaging, intervention, or operation rooms were enrolled. Demographics and data on all UEs related to the devices, clinical situations, and tubes or lines were measured by registered nurses at pre- and postintervention period. The intervention was that acting nurses were required to use a designed transport checklists before the patients were transported. Primary outcomes were the rate of all and serious UEs during the pre- and postintervention periods. Serious UEs were defined as any worsening of a patient's clinical status. Statistical values were measured with 95% confidence intervals (CIs) and compared using Student t tests or χ² tests. In total, there were 680 transports before interventions and 605 transports after interventions. Overall, UEs decreased significantly from a value of 36.8% (95% CI, 33.1-40.5) in the preintervention period to a value of 22.1% (95% CI, 18.9-25.7) in the postintervention period (P = .001). Serious UEs in clinical status also decreased significantly from 9.1% (95% CI, 7.1-11.5) in the preintervention period to a value of 5.2% (95% CI, 3.6-7.4) in the postintervention period (P = .005). A significant reduction in the rate of total and serious UEs during intrahospital transport from the ED was found through using transport checklists.

The aim of the study was to compare the effectiveness of drainage via a single-lumen (5F catheter) central venous catheter (CVC) to a conventional (14-20F catheter) chest tube (CT) for the management of pneumothoraces, including primary spontaneous pneumothorax (PSP), secondary spontaneous pneumothorax (SSP), and traumatic and iatrogenic pneumothoraces. All consecutive patients admitted to the intermediate intensive care unit of a university hospital for pneumothorax were retrospectively screened over an 8-year period. Patients were preferentially treated using CT from 2003 to 2007 and using CVC from 2008 to 2010. Drainage failure was defined as the need for a second drainage procedure or for surgery. Of 212 patients included, 117 (55%) had PSP, 28 (13%) had SSP associated with chronic obstructive pulmonary disease, 19 (9%) had traumatic pneumothorax, and 48 (23%) had iatrogenic pneumothorax. The failure rate was 23% in PSP, 36% in SSP, 16% in traumatic pneumothorax, and only 2% in iatrogenic pneumothorax. After adjustment, iatrogenic pneumothorax was the only factor that had an influence on drainage failure. The failure rate was similar between the 112 patients treated using CVC and the 100 patients treated using CT (18% vs 21%, P = .60). However, the durations of drainage (3.3 ± 1.9 vs 4.6 ± 2.6 days, P < .01) and of hospital stay were significantly shorter in patients treated using CVC as compared with CT. Our findings suggest that drainage via a catheter or via a CT is similarly effective in the management of pneumothorax. We recommend considering drainage via a small-bore catheter as a first-line treatment in patients with pneumothorax, whatever its cause.

The aims of this study are to determine the electrocardiographic (ECG) manifestations of the symptomatic patients with isolated tramadol toxicity and to predict seizures based on ECG parameters. Medical charts of a total of 479 patients with isolated tramadol toxicity were retrospectively evaluated. Their clinical manifestations were recorded, and their ECG parameters including rate, PR interval, QRS duration, corrected QT interval, terminal 40-millisecond frontal plane QRS axis, and the height of R wave and R/S ratio in the lead aVR were measured. The data were analyzed using Kolmogorov-Smirnov test, Mann-Whitney U test, Pearson2, Pearson correlation coefficient (r), and the Student t test. Electrocardiographic heart rate more than 100 beats per minute in 30.6%, QRS 120 milliseconds or more in 7.5%, corrected QT interval more than 440 milliseconds in 24.6%, height of R wave more than 1 mm in lead aVR in 22.1%, R/S ratio more than 0 in lead aVR in 23.5%, terminal 40-millisecond frontal plane QRS axis greater than 120 in 31.7%, and complete or incomplete right bundle-branch block in 4.6% of the patients were detected. There were no statistically significant differences between the patients who had not convulsed and those who had convulsed after admission regarding age, sex, vital signs, and ECG findings at presentation (all P values were >.05). Tramadol toxicity shows ECG changes consistent with sodium channel blockade and potassium channel blockage effects. The risk of development of seizures cannot be predicted based on the changes of ECG parameters at presentation.

53.Hsia RY, Kanzaria HK, Srebotnjak T, Maselli J, McCulloch C and Auerbach AD. Is Emergency Department Closure Resulting in Increased Distance to the Nearest Emergency Department Associated With Increased Inpatient Mortality? Ann Emerg Med 2012; Early online (01 October)
We seek to determine whether patients living in areas affected by emergency department (ED) closure, with subsequent increased distance to the nearest ED, have a higher risk of inpatient death from time-sensitive conditions. Using the California Office of Statewide Health and Planning Development database, we performed a non-concurrent cohort study of hospital admissions in California between 1999 and 2009 for patients admitted for acute myocardial infarction, stroke, sepsis and asthma or chronic obstructive pulmonary disease. We used generalized linear mixed-effects models comparing adjusted inpatient mortality for patients experiencing increased distance to the nearest ED versus no change in distance.
Of 785,385 patient admissions, 67,577 (8.6%) experienced an increase in distance to ED care because of an ED closure. The median change for patients experiencing an increase in distance to the nearest ED was only 0.8 miles, with a range of 0.1 to 33.4 miles. Patients with an increase did not have a significantly higher mortality (adjusted odds ratio 1.04; 95% confidence interval 0.99 to 1.09). In subgroups, we also observed no statistically significant differences in adjusted mortality among patients with acute myocardial infarction, stroke, asthma or chronic obstructive pulmonary disease, and sepsis. We did not observe any significant variations in mortality for time-sensitive conditions in sensitivity analyses that incorporated a lag effect of time after change in distance, allowance for a larger affected population, or removal of ST-segment elevation myocardial infarction from the acute myocardial infarction subgroup. In this large population-based sample, less than 10% of the patients experienced an increase in distance to the nearest ED, and of that group, the majority had less than a 1-mile increase. These small increased distances to the nearest ED were not associated with higher inpatient mortality among time-sensitive conditions.


Objectives: To examine whether the effect of tranexamic acid on the risk of death and thrombotic events in patients with traumatic bleeding varies according to baseline risk of death. To assess the extent to which current protocols for treatment with tranexamic acid maximise benefits to patients.

Design: Pre-specified stratified analysis of data from an international multicentre randomised controlled trial (the CRASH-2 trial) with an estimation of the proportion of premature deaths that could potentially be averted through the administration of tranexamic acid. Participants: 13,273 trauma patients in the CRASH-2 trial who were treated with tranexamic acid or placebo within three hours of injury and trauma patients enrolled in UK Trauma and Audit Research Network, stratified by risk of death at baseline (<6%, 6-20%, 21-50%, >50%). Intervention: Tranexamic acid (1 g over 10 minutes followed by 1 g over eight hours) or matching placebo. Main outcome measure: Odds ratios and 95% confidence intervals for death in hospital within four weeks of injury, deaths from bleeding, and fatal and non-fatal thrombotic events associated with the use of tranexamic acid according to baseline risk of death. Unless there was strong evidence against the null hypothesis of homogeneity of effects (P<0.001), the overall odds ratio was used as the most reliable guide to the odds ratios in all strata. Results: Tranexamic acid was associated with a significant reduction in all cause mortality and deaths from bleeding. In each stratum of baseline risk, there were fewer deaths among patients treated with tranexamic acid. There was no evidence of heterogeneity in the effect of tranexamic acid on all cause mortality (P=0.96 for interaction) or deaths from bleeding (P=0.98) by baseline risk of death. In those treated with tranexamic acid there was a significant reduction in the odds of fatal and non-fatal thrombotic events (odds ratio 0.69, 95% confidence interval 0.53 to 0.89; P=0.005) and a significant reduction in arterial thrombotic events (0.58, 0.40 to 0.83; P=0.003) but no significant reduction in venous thrombotic events (0.83, 0.59 to 1.17; P=0.295). There was no evidence of heterogeneity in the effect of tranexamic acid on the risk of thrombotic events (P=0.74). If the effect of tranexamic acid is assumed to be the same in all risk strata (<6%, 6-20%, 21-50%, >50% risk of death at baseline), the percentage of deaths that could be averted by administration of tranexamic acid within three hours of injury in each group is 17%, 36%, 30%, and 17%, respectively. Conclusions: Tranexamic acid can be administered safely to a wide spectrum of patients with traumatic bleeding and should not be restricted to the most severely injured.


Blunt chest trauma represents a spectrum of injuries to the heart and aorta that vary markedly in character and severity. The setting, signs, and symptoms of chest trauma are often nonspecific, which represents a challenge to emergency providers. Individuals with suspected blunt chest
trauma who have only mild or no symptoms, a normal electrocardiogram (ECG), and are haemodynamically stable typically have a benign course and rarely require further diagnostic testing or long periods of close observation. Individuals with pain, ECG abnormalities, or haemodynamic instability may require rapid evaluation of the heart by echocardiography and the great vessels by advanced imaging.


Syncope is the transient loss of consciousness and postural tone caused by transient cerebral hypoperfusion. It is a common problem that is often alarming to patients and their families. The differential diagnosis of the patient with transient loss of consciousness is broad and workup may be expensive. It is important to identify patients with life-threatening conditions and those with red flags indicating an increased risk of sudden death. An initial approach consisting of a careful history, physical examination, and electrocardiograms is essential. This review covers the general diagnostic approach to the patient with syncope.

ANZCOR Guideline 3: Unconsciousness


Prehospital management affects long-term outcome of patients with severe traumatic brain injury (TBI). This article reviews the current concepts and ongoing controversies of prehospital treatment of severe TBI. Recent findings: Prehospital management focuses on the prevention of secondary brain injury and rapid transport to a neurotrauma center for definitive diagnosis and life-saving emergency treatment such as decompressive craniotomy. There is a broad consensus that adequate airway management, prevention of hypoxia, hypocapnia or hypercapnia, prevention of hypotension and control of hemorrhage represent preclinical therapeutic modalities that may contribute to improved survival in severe TBI. The precise role of prehospital endotracheal intubation, osmotic agents and early therapeutic hypothermia needs to be clarified in the context of time required for transportation, local infrastructure, geographical factors and availability of experienced emergency teams. Summary: Prehospital management of TBI remains challenging. There are no universal objectives suitable to all patients. Randomized, controlled clinical trials are necessary for developing optimal protocols for paramedic and physician emergency medical teams.


Objectives: Delays in the clinical handover of patient care from emergency medical services (EMS) to the ED because of ED crowding are a substantial problem for many EMS systems. This study was conducted to quantify handover delays experienced by the Ambulance Service of New South Wales (ASNSW), and to investigate patient and system factors associated with handover delay. Methods: A retrospective study of EMS dispatch and ambulance patient care records was conducted for all patients transported by ASNSW in January/April/July/October 2009. Patient characteristics and time intervals were summarised using descriptive statistics, with handover delay categorised as <30 min, 30–60 min and ≥60 min. Times are reported as HH:MM:SS. Partial proportional odds models were used to investigate factors associated with delays. Results Of 141 381 transports, 12.5% of patients experienced a handover delay of 30–60 min, and 5% a delay of ≥60 min. The median handover interval was 00:15:46 (IQR 00:08:58–00:24:52, maximum 08:43:13). Patients transported to large hospitals were more likely to experience a delay of ≥30 min (odds ratio [OR] 14.57, 95% CI 11.41–18.60) or ≥60 min (OR 15.75, 95% CI 12.27–20.23) than those transported to small hospitals. Patients in major cities were more likely to experience delays than those in other areas, and patients ≥65 years were more likely to experience delays than
Conclusions: Handover delays are relatively common at the EMS/ED interface in New South Wales, and are most pronounced at large hospitals, in urban areas and during winter.

Cardiovascular emergencies in pregnancy are rare but often catastrophic. This article reviews the diagnosis and management of venous thromboembolism, aortic dissection, acquired heart disease and cardiomyopathy, acute myocardial infarction, and cardiac dysrhythmias in the setting of pregnancy. It also reviews updated resuscitation guidelines for cardiac arrest and perimortem cesarean section.

The requirement for guidance regarding ambulance crews pre-alerting patients into hospital emergency departments (ED) has been well established, but a clear guidance tool that supports a decision to pre-alert a receiving hospital is lacking. Aims: To investigate the impact of a new pre-alert tool on current alerting practice and evaluate its ability to take the place of a prehospital early warning system. Methods: Data were collected for a sample of patients brought by ambulance to the resuscitation area of Aberdeen Royal Infirmary ED over a 7-week period. Basic demographic information plus alert status and guidance prompt status was collected and compared with a pragmatic alert requirement. Analysis of ambulance crew alert decisions and the pre-alert guidance prompt advice was undertaken and compared. Results: Ambulance crew decisions to alert had a sensitivity of 72% (CI 62% to 80%), specificity of 50% (CI 27% to 73%), positive predictive value (PPV) of 90% and negative predictive value (NPV) of 22%. The pre-alert guidance alert prompt had a sensitivity of 99% (CI 94% to 100%), specificity of 64% (CI 39% to 84%), PPV of 95% and NPV of 90%. 28% of patients were under-alerted by ambulance crews, mostly medical patients presenting with chest pain. Conclusions: The pre-alert guidance tool shows face validity and superior ability to advise a pre-alert than ambulance crew decisions. It supplements a practitioners' clinical decision-making and has been regarded as having a positive impact on ED triage and utilisation of resources. Further levels of validity are expected to be achieved with continued audit and ongoing use of this tool.

Aim: We describe improved reporting of paediatric out-of-hospital cardiac arrest (OHCA) by adding coronial findings to a cardiac arrest registry. Methods: Non-traumatic OHCA occurring in paediatric patients aged less than 16 years were identified using the Victorian Ambulance Cardiac Arrest Registry and available coronial findings reviewed. Results: Between the years 2001 and 2009, emergency medical services (EMS) attended 26 974 non-traumatic OHCA of which 390 (1.4%) occurred in children less than 16 years of age. We successfully linked 301 patients with the coronial registry; excluding patients discharged alive from hospital (n=22) and patients with terminal illness (n=16), this represents 86% of OHCA attended by the ambulance. Agreement between the paramedic cause of OHCA and the coronial cause of death was 66.5% (κ 0.16) for presumed cardiac, 74.4% (κ 0.43) for sudden infant death syndrome (SIDS), 81.1% (κ 0.17) for respiratory, 92.7% (κ 0.18) for neurological and 98.3% (κ 0.27) for drug overdose precipitants to OHCA. Undiagnosed congenital heart disease was a rare cause of OHCA (n=3, 1%). Intentional injury was found on autopsy in 13 cases; six cases were clinically thought to be SIDS and two cases presumed cardiac. Co-sleeping was found in 35 cases (39%) of SIDS. Conclusions: This study highlights the limitations associated with ascribing the cause of OHCA on the basis of clinical details. Improved reporting is possible by linkage with coronial data. Such robust data inform EMS service providers but also the wider healthcare system where

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preventive, diagnostic and treatment strategies can be maximised.


Objectives: Prehospital airway management for adult trauma patients remains controversial. We sought to review the frequency that paramedic non-drug assisted intubation or attempted intubation is performed for trauma patients in Ontario, Canada, and determine its association with mortality. Methods: We conducted a retrospective cohort study using the Ontario Trauma Registry’s Comprehensive Data Set for 2002–2009. Eligible patients were greater than 16 years of age, had an initial Glasgow Coma Score of less than 9 and were cared for by ground-based non-critical care paramedics. The primary outcome was mortality. Outcomes were compared between patients undergoing prehospital intubation versus basic airway management. Logistic regression analyses were used to quantify the association between prehospital intubation and mortality. Results: Of the 2229 patients included in the analysis, 671 (30.1%) underwent prehospital intubation. Annual rates of prehospital intubation declined from 33.7% to 14.0% (ptrend<0.0001) over the study period. Unadjusted death rates were 66.0% versus 34.8% in the intubation and basic airway groups, respectively (p<0.0001). Intubation in the prehospital setting was associated with a heightened risk of mortality (adjusted OR 2.8, 95% CI 1.1 to 7.6). Conclusions: Prehospital non-drug assisted intubation for trauma is being performed less frequently in Ontario, Canada. Within our study population, paramedic non-drug assisted intubation or attempted intubation was associated with a heightened risk of mortality.


This study compares clinical outcomes in patients with head trauma, taking pre-injury antiplatelet drugs (aspirin, clopidogrel) and anticoagulants (warfarin). Methods: A prospective observational cohort study of prognosis in head-injured patients was undertaken in the emergency (ED) department of an adult tertiary hospital with a statewide neurosurgical service from 2008 to 2010. A convenience sample of patients taking warfarin, aspirin, clopidogrel or mixed therapy presenting to the ED with head trauma were included and followed-up over 3 – 18 months. Outcomes were severity of brain injury on neuroimaging, intensive care unit admission, intracranial surgery, intracranial complications, death in hospital, altered Glasgow Coma Score (GCS) on hospital discharge, and mortality and function scores on follow-up. Results: Overall, 345 patients were included in the study. Of these, 164, 70, 55 and 56 were taking aspirin, warfarin, clopidogrel and combination agents, respectively, with 250 having neuroimaging in the ED. Neuroimaging was significantly more likely to be undertaken in patients with a more urgent triage score (p<0.001), an abnormal GCS (p=0.004), older patients (p=0.039), and those taking warfarin (p<0.001). In patients receiving neuroimaging and admitted to hospital, the proportion with acute brain injury, poor hospital outcomes or overall poor outcomes were not statistically different between the agent groups. Conclusions: A high proportion of patients taking warfarin underwent neuroimaging, but brain injury and admission rates were comparable between groups. There were no significant differences in short-term outcomes between the groups. The overall mortality is higher for patients on antiplatelet agents than warfarin.


The emergency medical dispatcher (EMD) receiving a call via 911 is the first point of contact within the acute care system and plays an important role in early stroke recognition. Published studies show that the diagnostic accuracy of stroke of EMD needs to be improved. Therefore, the National
Association of Emergency Medical Dispatchers implemented a stroke diagnostic tool modelled after the Cincinnati stroke scale across 3000 cities worldwide. This is the first time a diagnostic tool that requires callers to test physical findings and report those back to the EMD has been implemented. However, the ability of EMD and 911 callers to use this in real time has not been reported. The goal of this pilot study was to determine the feasibility of an EMD applying the Cincinnati stroke scale tool during a 911 call, and to report the time required to administer the tool.


Many children present to emergency departments following head injury (HI), with a small number at risk of avoidable poor outcome. Difficulty identifying such children, coupled with increased availability of cranial CT, has led to variation in practice and increased CT rates. Clinical decision rules (CDRs) have been derived for paediatric HI but there is no published comparison to assist in deciding which to implement. The content of the three of highest quality and accuracy are described and compared. Systematic reviews of paediatric HI CDRs were published in 2009 and 2011. To identify CDRs published since the most recent review, key databases were searched, selecting studies which included CDRs involving children aged 0–18 years with a history of HI. Quality was assessed using the Quality Assessment of Diagnostic Accuracy Studies Tool, and performance evaluated by reported accuracy. Three high quality CDRs were identified: CATCH (Canadian Assessment of Tomography for Childhood Head Injury) CHALICE (Children's Head Injury Algorithm for the Prediction of Important Clinical Events) and PECARN (Paediatric Emergency Care Applied Research Network). All were derived with high methodological standards but differed in key areas, including study population, outcomes and severity of HI. Each stated different predictor variables and only PECARN provided a separate algorithm for young children. CATCH and CHALICE identify children requiring CT and PECARN those who do not. All perform with high sensitivity and low specificity. PECARN is the only validated CDR, and none has undergone impact analysis. These three CDRs should undergo validation and comparison in a single population, with analysis of their impact on practice and financial implications, to aid relevant bodies in deciding which to implement.


We report a case of complete airway obstruction due to aspiration of muddy water. An innovative approach to clear the airway is described, which may be a potentially life saving manoeuver in similar cases of suspected muddy water aspiration.


Patients with suspected acute myocardial infarction (AMI) and stroke commonly present first to the ambulance service. Little is known about experiences of prehospital care which are important for measuring the quality of services for patients with AMI or stroke. Aim: We explored experiences of patients, who had accessed the ambulance service for AMI or stroke, and clinicians regularly treating patients for these conditions in the prehospital setting. Method: A qualitative research design was employed to obtain rich and detailed data to explore and compare participants’ experiences of emergency prehospital care for AMI and stroke. Results: We conducted 33 semi-structured interviews with service users and clinicians and one focus group with five clinicians. Four main themes emerged: communication, professionalism, treatment of condition and the transition from home to hospital. Patients focused on both personal and technical skills. Technical knowledge and relational skills together contributed to a perception of professionalism in ambulance personnel. Patients’ experience was enhanced when physical, emotional and social
needs were attended to and they emphasised effective communication within the clinician - patient relationship to be the key. However, we found a discrepancy between paramedics' perceptions of patients' expectations and patients' lack of knowledge of the paramedic role. Conclusions: Factors that contribute to better patient experience are not necessarily understood in the same way by patients and clinicians. Our findings can contribute to the development of patient experience measures for prehospital care.

Chest pain is one of the most frequent reasons for presentation to the Emergency Department. The possible causes of chest pain are numerous and diverse, but importantly, several conditions, such as acute coronary syndrome, pulmonary embolism and aortic dissection, require urgent management and, in some cases, may be life-threatening. In such situations, a prompt and accurate diagnosis is vital. Two-dimensional echocardiography is a safe, painless and rapid test that can be performed in the Emergency Department and ensure a correct diagnosis as well as identify other complications and help institute appropriate management strategies swiftly. We review the current indications for urgent echocardiography in this article, with reference to international management guidelines where available, when managing patients with suspected acute coronary syndrome, acute pulmonary embolism, acute aortic dissection, acute pericarditis and trauma. We also discuss the differences between comprehensive and FOcussed Cardiac UltraSound (FOCUS) echocardiography studies, along with the associated quality control and medicolegal implications.

In the aftermath of the devastating Haitian earthquake, we became the primary relief service for a large group of severely injured earthquake victims. Finding ourselves virtually isolated with extremely limited facilities and a group of critically injured patients whose needs vastly outstripped the available resources we employed a disaster triage system to organize their clinical care. This report describes the specific injury profile of this group of patients, their clinical course, and the management philosophy that we employed. It provides useful lessons for similar situations in the future.

Helicopter Emergency Medical Services (HEMS) are highly resource-intensive facilities that are well established as part of trauma systems in many high-income countries. We evaluated the cost-effectiveness of a physician-staffed HEMS intervention in combination with treatment at a major trauma centre versus ground ambulance or indirect transport (via a referral hospital) in New South Wales (NSW), Australia. Cost and effectiveness estimates were derived from a cohort of trauma patients arriving at St George Hospital in NSW, Australia during an 11-year period. Adjusted estimates of in-hospital mortality were derived using logistic regression and adjusted hospital costs were estimated through a general linear model incorporating a gamma distribution and log link. These estimates along with other assumptions were incorporated into a Markov model with an annual cycle length to estimate a cost per life saved and a cost per life-year saved at one year and over a patient's lifetime respectively in three patient groups (all patients; patients with serious injury [Injury Severity Score>12]; patients with traumatic brain injury [TBI]). Results showed HEMS to be more costly but more effective at reducing in-hospital mortality leading to a cost per life saved of $1,566,379, $533,781 and $519,787 in all.
patients, patients with serious injury and patients with TBI respectively. When modelled over a patient's lifetime, the improved mortality associated with HEMS led to a cost per life year saved of $96,524, $50,035 and $49,159 in the three patient groups respectively. Sensitivity analyses revealed a higher probability of HEMS being cost-effective in patients with serious injury and TBI. Our investigation confirms a HEMS intervention is associated with improved mortality in trauma patients, especially in patients with serious injury and TBI. The improved benefit of HEMS in patients with serious injury and TBI leads to improved estimated cost-effectiveness.


This paper describes the integration of the GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach into their clinical preventive guideline development process by the new Canadian Task Force on Preventive Health Care. The GRADE approach focused the analytic framework and key questions on patient-important benefits and harms related to screening that incorporated detection, treatment, and follow-up. It also led to an explicit consideration of values and preferences and resource implications on the basis of the recommendations. There are challenges, however, in incorporating the GRADE approach to clinical prevention, as the randomized controlled trials in this field have needed to be very large and of long duration, given the rare occurrence of primary outcome events in asymptomatic individuals. We provide examples of how we met these challenges in relation to developing clinical guidelines for screening for breast cancer, cervical cancer, diabetes, hypertension, and depression in primary care settings. The focus on the patient-important outcomes was helpful in estimating effectiveness of screening approaches and providing explicit detailing of the basis of our recommendations across subgroups.


Syncope is a common problem in children and adolescents. The diagnostic yield for most tests commonly used in the evaluation of pediatric patients with syncope is low. To examine the epidemiology of pediatric patients presenting to United States (US) emergency departments (EDs) with a complaint of syncope and compare their initial management to published guidelines. ED visits from the National Hospital Ambulatory Medical Care Survey for 2003 - 2007 for patients aged 7 - 18 years were analyzed. Outcome variables were diagnostic tests and management of patients presenting with syncope. There were 627,489 (95% confidence interval [CI] 527,237, 727,722) ED visits for syncope (0.9% of all ED visits for patients aged 7 - 18 years). Patients presenting to the ED for syncope were more commonly female (p<0.01), adolescent (13 - 18 years) (p<0.01), covered by private insurance (p=0.01), and more likely to arrive to the ED by ambulance (p<0.01), compared to those presenting with other complaints. Only 58.1% (95% CI 50.3, 66.0%) of syncope patients received an electrocardiogram, and 26.5% (95% CI 18.2, 34.7%) received a computed tomography (CT) or magnetic resonance imaging (MRI) scan as part of their diagnostic work-up. When evaluating pediatric patients presenting with syncope, there should be an increased use of the electrocardiogram to screen for underlying cardiac abnormalities. There should also be a tempered use of CT/ MRI imaging in this population.


Misplacement of right precordial electrocardiogram (ECG) electrodes superiorly is a prevalent procedural error that may lead to false findings of T-wave inversion or QS complexes in V2—possibly triggering wasteful utilization of health care resources. Standard technique for proper placement of
V1–V2 entails initial palpation for the sternal angle, pointing to the second intercostal space (ICS), followed by lead fixation at the fourth ICS. **Study Objective:** Because adherence to this approach may be limited by lack of a visual landmark for the second ICS, we assessed an alternative technique. **Methods:** The evaluated technique involved placement of the patient’s hand up against the base of his/her neck (H→N maneuver) to help demarcate visually a specific point “X” on the chest. **Results:** Of 112 patients studied, “X” landed on the first rib in 2.7%, first ICS in 7.1%, second rib in 56.3%, second ICS in 33.0%, and third rib in 0.9%. Thus, in 89.3% (95% confidence interval 83.6–95.0%) of cases (93.3% of men, 84.6% of women; p=0.13), the second ICS could be identified by H→N via the following simple rule: Utilize “X” if it overlies an ICS; or the immediately subjacent ICS if “X” overlies a rib. **Conclusion:** The H→N maneuver provides a primarily visual approach to identifying the second ICS and, thereby, the fourth ICS for affixing V1–V2. If the present initial experience is confirmed, H→N might merit consideration as an educational tool to promote anatomically correct placement of these precordial leads, a prerequisite to diminishing the incidence of ECG procedure-related “septal ischemia/infarction.”


**OBJECTIVE:** The hypothermia and hemostasis in severe trauma (HYPOSTAT): a new crossroads workshop was convened to evaluate the interplay among hypothermia, hemostasis, and severe trauma/hemorrhage. Trauma is the major cause of death in young individuals in the United States, with uncontrolled hemorrhage representing the major cause of preventable deaths. **DATA SOURCES:** This workshop organized by the National Heart, Lung, and Blood Institute and the US Army Medical Research and Material Command as a forum for exchange of ideas among experts from diverse fields. The specific workshop goals were to (1) identify state-of-the-art and needs in knowledge of biology of hypothermia and hemostasis in the setting of significant traumatic injury; (2) provide an interdisciplinary forum to enhance knowledge regarding early detection of traumatic shock and monitoring of the level and effect of controlled hypothermia in severe trauma settings; and (3) identify future research directions of the role of therapeutic-oriented hypothermia and hemostasis in trauma with severe blood loss. **STUDY SELECTION:** Not applicable. **DATA EXTRACTION:** Expert opinion and literature review. **CONCLUSION:** This document provides a summary of the expert opinion and highlights the recommendations that came out of the discussions at this workshop to guide scientific efforts in basic, translational, and clinical research in this area.


**BACKGROUND:** Injuries are affected by weather conditions, which influence various human activities. However, only a few studies have reported an association between injuries and weather conditions despite the fact that extreme weather conditions can occur more frequently with climate change. The goal of this study was to evaluate the association between outdoor temperature and traumatic and nontraumatic injury using emergency ambulance delivery. **METHODS:** We designed a prognostic study to evaluate the different effects of outdoor temperature depending on types of injury. Using a generalized additive model, we examined the association between outdoor temperatures and injuries in Korea from 2006 to 2008, adjusting for confounders such as relative humidity, day of the week, and long-term time trends. A random effects model was used to estimate combined effects across all areas. **RESULTS:** The city-combined effect estimate for nontraumatic injuries was 1.95% (95% confidence interval, 1.28, 2.62%) corresponding to a 1C increase in mean temperature, whereas the relationship for traumatic injuries was not linear. The risk of nontraumatic injury related to temperature for males and elderly individuals was higher than for females and younger people. **CONCLUSION:** The
risk of injury attributable to outdoor temperature was found to vary according to the injury type. This information may be useful for developing adaptation strategies related to climate change.


Objective. We compared the methicillin-resistant Staphylococcus aureus (MRSA) carrier rate among out-of-hospital care providers with greater than six months’ experience in emergency medical services (EMS) care with that of emergency medical technician (EMT) students with two months or less of observation time as part of their clinical training. Methods. We conducted a prospective study utilizing a convenience sample of out-of-hospital care providers and EMT students in an urban EMS system operating in the Midwest during October and November 2006. One hundred thirty-four out-of-hospital care providers and 152 EMT students were tested for MRSA susceptibility using the cefoxitin disk diffusion method. Results. Contrary to our hypothesis, we did not find a statistically significant difference in MRSA nasal colonization between out-of-hospital care providers (4.5%; 95% confidence interval [CI] 1.0, 8.0) and EMT students (5.3%; 95% CI 1.7, 8.8). A subgroup analysis showed that among out-of-hospital care providers, paramedics had a higher rate of nasal colonization than EMTs (5.6% vs. 2.2%). Conclusion. We found that out-of-hospital care providers and EMT students had higher nasal colonization rates than the reported rate for the U.S. population (0.084% at the time the study was conducted and 1.5% currently). It is imperative that both groups adhere to infection control practices.


Aim of the study: Twitter has over 500 million subscribers but little is known about how it is used to communicate health information. We sought to characterize how Twitter users seek and share information related to cardiac arrest, a time-sensitive cardiovascular condition where initial treatment often relies on public knowledge and response. Methods Tweets published April - May 2011 with keywords cardiac arrest, CPR, AED, resuscitation, heart arrest, sudden death and defib were identified. Tweets were characterized by content, dissemination, and temporal trends. Tweet authors were further characterized by: self-identified background, tweet volume, and followers. Results Of 62,163 tweets (15,324, 25%) included resuscitation/cardiac arrest-specific information. These tweets referenced specific cardiac arrest events (1130, 7%), CPR performance or AED use (6896, 44%), resuscitation-related education, research, or news media (7449, 48%), or specific questions about cardiac arrest/resuscitation (270, 2%). Regarding dissemination (1980, 13%) of messages were retweeted. Resuscitation specific tweets primarily occurred on weekdays. Most users (10,282, 93%) contributed three or fewer tweets during the study time frame. Users with more than 15 resuscitation-specific tweets in the study time frame had a mean 1787 followers and most self-identified as having a healthcare affiliation. Conclusion: Despite a large volume of tweets, Twitter can be filtered to identify public knowledge and information seeking and sharing about cardiac arrest. To better engage via social media, healthcare providers can distil tweets by user, content, temporal trends, and message dissemination. Further understanding of information shared by the public in this forum could suggest new approaches for improving resuscitation related education.

78. Johnson NJ, Salhi RA, Abella BS, Neumar RW, Gaieski DF and Carr BG. Emergency department factors associated with survival after sudden cardiac arrest. Resuscitation 2012; Early online (23 October)

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Sudden cardiac arrest (SCA) is a leading cause of death in the US. Recent innovations in post-arrest care have been demonstrated to increase survival. However, little is known about the impact of emergency department (ED) and hospital characteristics on survival to hospital admission and ultimate outcome. Objective: We sought to describe the incidence of SCA presenting to the ED and to identify ED and hospital characteristics associated with survival to hospital admission. Methods: We identified patients with diagnoses of atraumatic cardiac arrest or ventricular fibrillation (ICD-9 427.5 or 427.41) in the 2007 Nationwide Emergency Department Sample (NEDS), a nationally representative estimate of all ED admissions in the United States. We defined SCA as cardiac arrest in the out-of-hospital or ED settings. We used the NEDS sample design to generate nationally representative estimates of the incidence of SCA that presents to EDs. We performed unadjusted and adjusted analyses to examine the relation between patient, ED, and hospital characteristics and outcome using logistic regression. Our primary outcome was survival to hospital admission. Survival to hospital discharge was a secondary outcome. Data are presented as odds ratios (OR) with 95% confidence intervals (CI). Results: Of the 966 hospitals in the NEDS, 933 (96.6%) reported at least one SCA and were included in the analysis. We identified 38,593 cases of cardiac arrest representing an estimated 174,982 cases nationally. Overall ED SCA survival to hospital admission was 26.2% and survival to discharge was 15.7%. Greater survival to admission was seen in teaching hospitals (OR 1.3 95% CI 1.1–1.5, p = 0.001), hospitals with ≥20,000 annual ED visits (OR 1.3 95% CI 1.1–1.6, p = 0.003), and hospitals with percutaneous coronary intervention capability (OR 1.6 95% CI 1.4–1.8, p < 0.001). Higher SCA volume (>40 annually) was associated with lower survival overall (OR 0.7 95% 0.6–0.9, p = 0.010), but not when transferred patients were excluded from the analysis (OR 0.8 95% CI 0.6–1.1, p = 0.116). Conclusions: An estimated 175,000 cases of SCA present to or occur in US EDs each year. Percutaneous coronary intervention capability, ED volume, and teaching status were associated with higher survival to hospital admission. Emergency departments with higher annual SCA volume had lower survival rates, possibly because they transfer fewer patients. An improved understanding of the contribution of ED care to survival following SCA may be useful in advancing our understanding of how best to organize a system of care to ensure optimal outcomes for patients with SCA.


To evaluate the gonadal hormones in patients with return of spontaneous circulation (ROSC) after cardiac arrest following prospectively good (cerebral-performance category [CPC] 1-2) and poor (CPC 3-5) neurologic outcomes. Methods: The patients in an emergency center who had been admitted to the center's intensive care unit (ICU) after successful resuscitation following out-of-hospital cardiac arrest were prospectively identified and evaluated within the period from April 2008 to March 2011. The gonadal hormones, including progesterone, total estrogen, and testosterone, were measured and analyzed following the good and poor neurologic outcomes. Results: A total of 142 patients were analyzed in this study. Thirty-nine (27.5%) patients had good neurologic outcomes. The gonadal hormones (progesterone, total estrogen, and testosterone) had good vs. poor neurologic outcomes of 1.039 ± 0.694 vs. 1.000 ± 0.892 ng/ml, 107.956 ± 13.163 vs. 117.060 ± 11.344 pg/ml, and 307.380 ± 33.844 vs. 189.020 ± 17.406 ng/dl, respectively. In the multiple logistic-regression analysis, the initial shockable rhythm (5.671 odds ratio [OR], 2.307-13.942 95% confidence interval [CI]), time from arrest to ROSC (0.957 OR, 0.933-0.982 95% CI), and more than 300 ng/dl of testosterone level (3.279 OR, 1.265-8.190 95% CI) were found to be related to good neurologic outcome, respectively. Conclusion: Higher testosterone levels are related to good neurologic outcome at six months after admission in patients with spontaneous circulation after cardiac arrest. The testosterone levels may be useful prognostic tools for the postcardiac-arrest syndrome and could be used for the latter's neuroprotective treatment, but additional randomized controlled studies are needed.
What is mechanically dangerous, potentially infectious and stressful to the cardiovascular system?


Principals: Most people enjoy sexual intercourse without complications, but a significant, if small, number need to seek emergency medical help for related health problems. The true incidence of these problems is not known. We therefore assessed all admissions to our emergency department (ED) in direct relation to sexual intercourse. Methods: All data were collected prospectively and entered into the ED’s centralised electronic patient record database (Qualicare, Switzerland) and retrospectively analysed. The database was scanned for the standardised key words: ‘sexual intercourse’ (German ‘Geschlechtsverkehr’) or ‘coitus’ (German ‘Koitus’). Results: A total of 445 patients were available for further evaluation; 308 (69.0%) were male, 137 (31.0%) were female. The median age was 32 years (range 16–71) for male subjects and 30 years (range 16–70) for female subjects. Two men had cardiovascular emergencies. 46 (10.3%) of our patients suffered from trauma. Neurological emergencies occurred in 55 (12.4%) patients: the most frequent were headaches in 27 (49.0%), followed by subarachnoid haemorrhage (12, 22.0%) and transient global amnesia (11, 20.0%). 154 (97.0%) of the patients presenting with presumed infection actually had infections of the urogenital tract. The most common infection was urethritis (64, 41.0%), followed by cystitis (21, 13.0%) and epididymitis (19, 12.0%). A sexually transmitted disease (STD) was diagnosed in 43 (16.0%) of all patients presenting with a presumed infection. 118 (43.0%) of the patients with a possible infection requested testing for an STD because of unsafe sexual activity without underlying symptoms. Conclusions: Sexual activity is mechanically dangerous, potentially infectious and stressful for the cardiovascular system. Because information on ED presentation related to sexual intercourse is scarce, more efforts should be undertaken to document all such complications to improve treatment and preventative strategies.