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**BACKGROUND:** Identifying persons at risk for sudden cardiac death (SCD) is challenging. A comprehensive evaluation may reveal clues about the clinical, anatomical, genetic, and metabolic risk factors for SCD. **METHODS:** Seventy-one patients who had SCD (25-60 years old) without an initially apparent cause of death were evaluated at the Hennepin County Medical Examiner's office (Minneapolis, MN) from August 2001 to July 2004. We reviewed their clinic records conducted next-of-kin interviews and performed autopsy, laboratory testing, and genetic analysis for mutations in genes associated with the long QT syndrome. **RESULTS:** Mean age was 49.5 +/- 7 years, 86% were male, and 2 subjects had history of coronary heart disease (CHD). Coronary risk factors were highly prevalent in comparison to individuals of the same age group in this community (eg, smoking 61%, hypertension 27%, and hyperlipidemia 25%) but inadequately treated. On autopsy, 80% of the subjects had high-grade coronary stenoses. Acute coronary lesions and previous silent myocardial infarction (MI) were found in 27% and 34%, respectively. Furthermore, 32% of the subjects had recently smoked cigarettes, and 50% had ingested analgesics. Possible deleterious mutations of the ion channel genes were detected in 5 subjects (7%). Of these, 4 were in the sodium channel gene SCN5A. **CONCLUSIONS:** Most of the persons who had SCD in the community had severe subclinical CHD; including undetected previous MI. Traditional coronary risk factors were prevalent and undertreated. Mutations in the long QT syndrome genes were detected in a few subjects. These findings imply that improvements in the detection and treatment of subclinical CHD in the community are needed to prevent SCD.

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**BACKGROUND:** Good neurologic outcome after cardiac arrest is hard to achieve. Interventions during the resuscitation phase and treatment within the first hours after the event are critical. Experimental evidence suggests that therapeutic hypothermia is beneficial, and a number of clinical studies on this subject have been published. **OBJECTIVES:** We performed a systematic review and meta-analysis to assess the effectiveness of therapeutic hypothermia in patients after cardiac arrest. Neurologic outcome, survival and adverse events were our main outcome parameters. We aimed to perform individual patient data analysis if data were available, and to from subgroups according to the cardiac arrest situation. **SEARCH**
STRATEGY: We searched the following databases: the Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library, 2007 Issue 1); MEDLINE (1971 to January 2007); EMBASE (1987 to January 2007); CINAHL (1988 to January 2007); PASCAL (2000 to January 2007); and BIOSIS (1989 to January 2007). SELECTION CRITERIA: We included all randomized controlled trials assessing the effectiveness of the therapeutic hypothermia in patients after cardiac arrest without language restrictions. Studies were restricted to adult populations cooled with any cooling method applied within six hours of cardiac arrest. DATA COLLECTION AND ANALYSIS: Validity measures, the intervention, outcome parameters and additional baseline variables were entered into the database. Meta-analysis was only done for a subset of comparable studies with negligible heterogeneity. For these studies individual patient data were available. MAIN RESULTS: Four trials and one abstract reporting on 481 patients were included in the systematic review. Quality of the included studies was good in three out of five included studies. For the three comparable studies on conventional cooling methods all authors provided individual patient data. With conventional cooling methods patients in the hypothermia group were more likely to reach a best cerebral performance categories score of one or two (CPC, five point scale; 1=good cerebral performance, to 5=brain death) during hospital stay (individual patient data; RR, 1.55; 95% CI 1.22 to 1.96) and were more likely to survive to hospital discharge (individual patient data; RR, 1.35; 95% CI 1.10 to 1.65) compared to standard post-resuscitation care. Across all studies there was no significant difference in reported adverse events between hypothermia and control. AUTHORS' CONCLUSIONS: Conventional cooling methods to induce mild therapeutic hypothermia seem to improve survival and neurologic outcome after cardiac arrest. Our review supports the current best medical practice as recommended by the International Resuscitation Guidelines.


BACKGROUND: Unlike Resuscitation Guidelines (GL) 2000, GL2005 advise resuming cardiopulmonary resuscitation (CPR) immediately after defibrillation. We hypothesized that immediate CPR resumption promotes earlier recurrence of ventricular fibrillation (VF). METHODS AND RESULTS: This study used data of a prospective per-patient randomized controlled trial. Automated external defibrillators used by first responders were randomized to either (1) perform postshock analysis and prompt rescuers to a pulse check (GL2000), or (2) resume CPR immediately after defibrillation (GL2005). Continuous recordings of ECG and impedance signals were collected from all patients with an out-of-hospital cardiac arrest to whom a randomized automated external defibrillator was applied. We included patients with VF as their initial rhythm in whom CPR onset could be determined from the ECG and impedance signals. Time intervals are presented as median (Q1-to-Q3). Of 361 patients, 136 met the inclusion criteria: 68 were randomly assigned to GL2000 and 68 to GL2005. Rescuers resumed CPR 30
(21-to-39) and 8 (7-to-9) seconds, respectively, after the first shock that successfully terminated VF (P<0.001); VF recurred after 40 (21-to-76) and 21 (10-to-80) seconds, respectively (P=0.001). The time interval between start of CPR and VF recurrence was 6 (0-to-67) and 8 (3-to-61) seconds, respectively (P=0.88). The hazard ratio for VF recurrence in the first 2 seconds of CPR was 15.5 (95% confidence interval, 5.63 to 57.7) compared with before CPR resumption. After more than 8 seconds of CPR, the hazard of VF recurrence was similar to before CPR resumption. CONCLUSIONS: Early CPR resumption after defibrillation causes early VF recurrence. Clinical Trial Registration-- clinicaltrials.gov Identifier: ISRCTN72257677.


OBJECTIVE: To assess the impedance cardiogram recorded by an automated external defibrillator during cardiac arrest to facilitate emergency care by lay persons. Lay persons are poor at emergency pulse checks (sensitivity 84%, specificity 36%); guidelines recommend they should not be performed. The impedance cardiogram (dZ/dt) is used to indicate stroke volume. Can an impedance cardiogram algorithm in a defibrillator determine rapidly circulatory arrest and facilitate prompt initiation of external cardiac massage? DESIGN: Clinical study. SETTING: University hospital. PATIENTS: Phase 1 patients attended for myocardial perfusion imaging. Phase 2 patients were recruited during cardiac arrest. This group included non-arrest controls. INTERVENTIONS: The impedance cardiogram was recorded through defibrillator/electrocardiographic pads oriented in the standard cardiac arrest position. MEASUREMENTS AND MAIN RESULTS: Phase 1: Stroke volumes from gated myocardial perfusion imaging scans were correlated with parameters from the impedance cardiogram system (dZ/dt(max) and the peak amplitude of the Fast Fourier Transform of dZ/dt between 1.5 Hz and 4.5 Hz). Multivariate analysis was performed to fit stroke volumes from gated myocardial perfusion imaging scans with linear and quadratic terms for dZ/dt(max) and the Fast Fourier Transform to identify significant parameters for incorporation into a cardiac arrest diagnostic algorithm. The square of the peak amplitude of the Fast Fourier Transform of dZ/dt was the best predictor of reduction in stroke volumes from gated myocardial perfusion imaging scans (range = 33-85 mL; p = .016). Having established that the two pad impedance cardiogram system could detect differences in stroke volumes from gated myocardial perfusion imaging scans, we assessed its performance in diagnosing cardiac arrest. Phase 2: The impedance cardiogram was recorded in 132 “cardiac arrest” patients (53 training, 79 validation) and 97 controls (47 training, 50 validation): the diagnostic algorithm indicated cardiac arrest with sensitivities and specificities (+- exact 95% confidence intervals) of 89.1% (85.4-92.1) and 99.6% (99.4-99.7; training) and 81.1% (77.6-84.3) and 97% (96.7-97.4; validation). CONCLUSIONS: The impedance cardiogram algorithm is a significant marker of circulatory collapse. Automated defibrillators with an integrated impedance cardiogram could improve emergency care by lay persons, enabling rapid and appropriate initiation of external cardiac massage.

Early defibrillation programs by the use of automated external defibrillators (AEDs) located in high-attendance public places may improve survival and neurologic outcome of patients undergoing sudden cardiac arrest (SCA). We planned a prospective cohort study to assess the effectiveness of a public-access defibrillation program based on positioning of AEDs in churches and training of lay volunteers in Basic Life Support Defibrillation during a single-day 5-hour training session. The CHURCH project aims to promote a widespread diffusion of AEDs, to train a large number of lay volunteers in Basic Life Support Defibrillation, and to increase population awareness on the opportunities for sudden death prevention. The rationale of the study rests on a survey commissioned by the Diocese of Milan that found a high prevalence of elderly subjects (44.5% were >60 years old) attending holy services in the morning hours, when sudden death incidence peaks. The catchment areas of the 12 parishes included in the trial as of June 2008 include a population of 140,000. The projected incidence of AED-treatable SCA, based on the presence of trained volunteers in the churches during day hours, at the CHURCH participating sites was estimated at 8 episodes per year. To estimate an overall 30% mortality reduction from SCA after AED placement at the study sites with respect to conventional SCA management by the Emergency Medical Service, 25 SCA episodes will have to be treated during the 4-year study period. The CHURCH project might be of interest and applicable in every country where high-attendance worship places are present.


Objective: Many of the factors that affect survival from out-of-hospital cardiac arrest are not relevant in patients who arrest after arrival of emergency medical services (EMS). Because all arrests that occur after arrival of EMS are witnessed and care is immediate, one might expect survival to be very high. Several studies have described communities’ experiences of arrest after arrival but few have compared survival rates stratified by rhythm and witness status. The purpose of this paper was to describe the characteristics of patients who arrested after arrival of EMS and to compare survival in this population to those who had witnessed and unwitnessed arrests before EMS arrival. Methods: We conducted a retrospective cohort study in King County, WA, USA. Descriptive statistics were calculated in patients whose arrests were not witnessed, in patients whose arrests were witnessed by citizens, and in those whose arrests were witnessed by EMS personnel. Results: The majority of bystander- and EMS-witnessed arrests were initially in ventricular fibrillation (VF), but EMS-witnessed arrests were more likely to initially have been in pulseless electrical activity (PEA) than bystander-witnessed events. Patients whose arrests were
witnessed by EMS had the greatest likelihood of survival compared to patients whose arrests were not witnessed or were witnessed by bystanders. Patients whose arrests were witnessed by EMS and were initially in VF had the highest rates of survival (59%). Conclusions: Patients whose arrests were witnessed by EMS were more likely to have survived their cardiac arrests than those who arrested before EMS arrived. We suggest that survival rates from VF arrests that occur after EMS arrival should be widely reported in order to measure overall EMS performance since many factors such as response times, bystander actions, and witness status are equalized in this subset of patients.


Aim: We examined the relationship between time from collapse to arrival of emergency medical services (EMS) and survival to hospital discharge for out-of-hospital ventricular fibrillation cardiac arrests in order to determine meaningful interpretations of this association. Methods: We calculated survival rates in 1-min intervals from collapse to EMS arrival. Additionally, we used logistic regression to determine the absolute probability of survival per minute of delayed EMS arrival. We created a logistic regression model with spline terms for the time variable to examine the decline in survival in intervals that are hypothesized to be physiologically relevant. Results: The observed data showed survival declined, on average, by 3% for each minute that EMS was delayed following collapse. Survival rates did not decline appreciably if the time between collapse and arrival of EMS was 4 min or less but they declined by 5.2% per minute between 5 and 10 min. EMS arrival 11-15 min after collapse showed a less steep decline in survival of 1.9% per minute. The spline model that incorporated changes in slope in the time interval variable modeled this relationship more accurately than a model with a continuous term for time (p = 0.01). Conclusions: The results of our analyses show that survival from out-of-hospital cardiac arrest does not decline at a constant rate following collapse. Models that incorporate changes that reflect the physiological alterations that occur following cardiac arrests are a more accurate way to describe changes in survival rates over time than models that include only a continuous term for time.


BACKGROUND: Previous studies have suggested that prehospital spine immobilization provides minimal benefit to penetrating trauma patients but takes valuable time, potentially delaying definitive trauma care. We hypothesized that penetrating trauma patients who are spine immobilized before transport have higher mortality than non-immobilized patients. METHODS: We performed a retrospective analysis of penetrating trauma patients in the National Trauma Data Bank
Multiple logistic regression was used with mortality as the primary outcome measure. We compared patients with versus without prehospital spine immobilization, using patient demographics, mechanism (stab vs. gunshot), physiologic and anatomic injury severity, and other prehospital procedures as covariates. Subset analysis was performed based on Injury Severity Score category, mechanism, and blood pressure. We calculated a number needed to treat and number needed to harm for spine immobilization.

RESULTS: In total, 45,284 penetrating trauma patients were studied; 4.3% of whom underwent spine immobilization. Overall mortality was 8.1%. Unadjusted mortality was twice as high in spine-immobilized patients (14.7% vs. 7.2%, p < 0.001). The odds ratio of death for spine-immobilized patients was 2.06 (95% CI: 1.35-3.13) compared with non-immobilized patients. Subset analysis showed consistent trends in all populations. Only 30 (0.01%) patients had incomplete spinal cord injury and underwent operative spine fixation. The number needed to treat with spine immobilization to potentially benefit one patient was 1,032. The number needed to harm with spine immobilization to potentially contribute to one death was 66.

CONCLUSIONS: Prehospital spine immobilization is associated with higher mortality in penetrating trauma and should not be routinely used in every patient with penetrating trauma.

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Introduction: Bag-valve-mask ventilation is recommended as the initial airway management option for paramedics during cardiopulmonary resuscitation, although this technique requires considerable skill and is associated with the risk of stomach insufflation, regurgitation, and aspiration. The present two-phase study investigated the efficacy and safety of the laryngeal tube (LT-D) used by paramedics as the sole technique for ventilation in out-of-hospital cardiac arrest. Methods: Paramedics staffing the emergency services' ambulances were selected for the study and trained in the use of the LT-D (phase I). They were then requested to use the device in patients requiring out-of-hospital cardiopulmonary resuscitation without prior bag-valve-mask ventilation. Patients were evaluated with regard to successful placement and effective ventilation using the airway. On arrival at the scene, the emergency physician replaced the LT-D with an endotracheal tube and assessed the incidence of regurgitation and injuries to the airways (phase II). Results: Forty patients were enrolled into this study. One was excluded from analysis because of protocol violation. Insertion of the LT-D was successful and ventilation was effective in 33 patients (85%). Ventilation was not possible in six patients (15%) because of cuff rupture (n = 3) or massive regurgitation and aspiration before LT-D insertion (n = 3). No patient regurgitated after tube placement. No airway injuries were observed. The participants rated ventilation using the LT-D as effective. Conclusion: The LT-D is feasible and effective for airway management and ventilation when used by paramedics in out-of-hospital cardiopulmonary resuscitation and can be recommended as the sole technique in such situations.

OBJECTIVES: Many survivors of cardiac arrest are left with considerable long-term impairments due to a transient ischemic state of the brain. Neuropsychologists identified a wide range of neuropsychological deficits in these patients besides the well-known amnesic syndrome. To date, there is no complete and unbiased documentation of the affected brain areas in vivo. We aimed to identify the brain tissue atrophy underlying the observed neuropsychological deficits in a case-control study. METHODS: We measured gray matter loss by voxel-based morphometry of 3-T structural magnetic resonance images in a sample of 12 patients who had had cardiac arrest with successful subsequent resuscitation in comparison with 12 individually age- and sex-matched control subjects. Such data are rare because many of these patients wear cardiac pacemakers. RESULTS: We found extensive reductions of gray matter volumes in the anterior, medial, and posterior cingulate cortex, the precuneus, the insular cortex, the posterior hippocampus, and the dorso-medial thalamus in tight correlation with neuropsychological impairments, namely, amnestic deficits and apathy. CONCLUSION: The identified neuro-anatomical pattern of brain tissue loss substantiates the reports of wide-ranging neuropsychological impairments in patients after cardiac arrest.


Background:- Using automated external defibrillators (AEDs) that implement the Guidelines 2000 resuscitation protocol constrains administration of cardiopulmonary resuscitation (CPR) to <50% of AED connection time. We tested a different AED protocol aimed at increasing the CPR administered to patients with out-of-hospital cardiac arrest. Methods and Results:- In a randomized controlled trial, patients with out-of-hospital cardiac arrest requiring defibrillation were treated with 1 of 2 AED protocols. In the control protocol, based on Guidelines 2000, sequences of up to 3 stacked countershocks were delivered, with rhythm analyses initially and after the first and second shocks. The study protocol featured 1 minute of CPR before the first shock, shorter CPR interruptions before and after each shock, and no stacked shocks. The primary end point was survival to hospital admission. Of 5107 out-of-hospital cardiac arrest patients connected to an AED, 1238 required defibrillation, and 845 were included in the final analysis. Study patients (n=421) had shorter pre-shock pauses (9 versus 19 seconds; P<0.001), had shorter postshock pauses (11 versus 33 seconds; P<0.001), and received more CPR (61% versus 48%; P<0.001) and fewer shocks (2.5 versus 2.9; P<0.001) than control patients (n=424). Similar proportions survived to hospital admission (43.2% versus 42.7%; P=0.87), survived to hospital discharge (13.3% versus 10.6%; P=0.19), achieved return of spontaneous
circulation before physician arrival (47.0% versus 48.6%; *P*=0.65), and survived to 1 year (*P*=0.77). Conclusions: Following prompts from AEDs programmed with a protocol similar to Guidelines 2005, firefighters shortened pauses in CPR and improved overall hands-on time, but survival to hospital admission of patients with ventricular fibrillation out-of-hospital cardiac arrest did not improve. 

Clinical Trial Registration: http://www.clinicaltrials.gov. Unique identifier: NCT00139542., (C) 2010 American Heart Association, Inc.


The aim of this study was to compare conventional laryngeal mask airway sizing by weight with sizing by age in over- or underweight children. We studied 26 overweight (body mass index > 85th centile) and 26 underweight (body mass index < 15th centile) children. After general anaesthesia was induced, laryngeal mask airways sized by the patient's weight and by an ideal weight (estimated from the patient's age according to standardised tables) were inserted consecutively. In overweight children, oropharyngeal leak pressure was significantly greater when the laryngeal mask was sized by the patient's actual weight. On the other hand in underweight children, it was significantly greater when sized by the ideal weight. In conclusion, laryngeal mask airway sizing according to the manufacturer's weight-based recommendation is to be preferred in overweight children, but laryngeal mask airway size by an ideal weight estimated from the patient's age is a better choice in underweight children.


BACKGROUND: It is unclear whether dissemination of automated external defibrillators (AEDs) in public places can improve the rate of survival among patients who have had an out-of-hospital cardiac arrest. METHODS: From January 1, 2005, through December 31, 2007, we conducted a prospective, population-based, observational study involving consecutive patients across Japan who had an out-of-hospital cardiac arrest and in whom resuscitation was attempted by emergency responders. We evaluated the effect of nationwide dissemination of public-access AEDs on the rate of survival after an out-of-hospital cardiac arrest. The primary outcome measure was the 1-month rate of survival with minimal neurologic impairment. A multivariate logistic-regression analysis was performed to assess factors associated with a good neurologic outcome. RESULTS: A total of 312,319 adults who had an out-of-hospital cardiac arrest were included in the study; 12,631 of these patients had ventricular fibrillation and had an arrest that was of cardiac origin and that was witnessed by bystanders. In 462 of these patients (3.7%), shocks were administered by layperson with the use of public-access AEDs, and the
proportion increased, from 1.2% to 6.2%, as the number of public-access AEDs increased (P<0.001 for trend). Among all patients who had a bystander-witnessed arrest of cardiac origin and who had ventricular fibrillation, 14.4% were alive at 1 month with minimal neurologic impairment; among patients who received shocks from public-access AEDs, 31.6% were alive at 1 month with minimal neurologic impairment. Early defibrillation, regardless of the type of provider (bystander or emergency-medical-services personnel), was associated with a good neurologic outcome after a cardiac arrest with ventricular fibrillation (adjusted odds ratio per 1-minute increase in the time to administration of shock, 0.91; 95% confidence interval, 0.89 to 0.92; P<0.001). The mean time to shock was reduced from 3.7 to 2.2 minutes, and the annual number of patients per 10 million population who survived with minimal neurologic impairment increased from 2.4 to 8.9 as the number of public-access AEDs increased from fewer than 1 per square kilometer of inhabited area to 4 or more.

CONCLUSIONS: Nationwide dissemination of public-access AEDs in Japan resulted in earlier administration of shocks by laypersons and in an increase in the 1-month rate of survival with minimal neurologic impairment after an out-of-hospital cardiac arrest.


PURPOSE: The study aimed to determine the factors predictive of sustained return of spontaneous circulation (ROSC) in children with out-of-hospital cardiac arrest (OHCA) of non-cardiac origin. METHODS: Eighty children were included in this retrospective study. The variables that lead to sustained ROSC and those that do not lead to sustained ROSC were analyzed. Survival analyses, including chance of achieving sustained ROSC and sum duration of ROSC, were conducted according to the duration of in-hospital cardiopulmonary resuscitation (CPR). RESULTS: Etiologies of non-cardiac OHCA differed significantly across different age groups (P < .001). Only 8.8% of children had initial arrest rhythms that were shockable. Predictors of sustained ROSC included the initial cardiac rhythm (P = .002), a shorter period between collapse and the first chest compression (P = .002), a shorter in-hospital CPR duration (P = .004), and prehospital CPR (P = .007). In children where ROSC was initially sustained, those with in-hospital CPR of more than 20 minutes, ROSC was sustained for less time (P < .001). CONCLUSIONS: Few children with non-cardiac OHCA present with shockable cardiac rhythms. Furthermore, long-term ROSC is difficult to maintain in children who receive in-hospital CPR for more than 20 minutes.
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Nielsen PH, Maeng MMDP, et al Primary Angioplasty Versus Fibrinolysis in Acute Myocardial Infarction: Long-Term Follow-Up in the Danish Acute Myocardial Infarction 2 Trial  *Circulation* 2010;121(13):1484-91  
Background: The Danish Acute Myocardial Infarction 2 (DANAMI-2) study found that primary angioplasty (primary percutaneous coronary intervention [pPCI]) compared with fibrinolysis reduced 30-day adverse events in patients with ST-segment elevation myocardial infarction. The present study investigated whether the benefit of pPCI was maintained at a long-term follow-up. Methods and Results: We randomly assigned 1572 patients with ST-segment elevation myocardial infarction-1129 patients at referral hospitals and 443 patients at invasive hospitals-to pPCI or fibrinolysis. Median time from randomization to arrival in the catheterization laboratory for patients admitted to referral hospitals was 67 minutes, with 96% of patients arriving in the catheterization laboratory within 120 minutes. The primary study end point was a composite of death or reinfarction. Median follow-up time was 7.8 years. For the primary end point, 8-year cumulative incidence (1-Kaplan-Meier) was 34.8% in the pPCI group and 41.3% in the fibrinolysis group (hazard ratio, 0.78; 95% confidence interval, 0.66 to 0.92). Reinfarction rates were reduced in the pPCI group (11.7% versus 18.5%; hazard ratio, 0.60; 95% confidence interval, 0.46 to 0.77). Among patients randomized at referral hospitals, pPCI reduced reinfarction (13% versus 18.5%; hazard ratio, 0.66; 95% confidence interval, 0.49 to 0.89) and mortality (26.7% versus 33.3%; hazard ratio, 0.78; 95% confidence interval, 0.63 to 0.97). Conclusions: The benefit of pPCI over fibrinolysis was maintained at a long-term follow-up. pPCI reduced the risk of reinfarction in the overall cohort and reduced reinfarction and mortality among patients randomized at referral hospitals. This result reinforces that pPCI should be offered to ST-segment elevation myocardial infarction patients when inter-hospital transport to an invasive hospital can be completed within 120 minutes.

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Aim: Inexperienced health-care-providers may encounter severe problems to ventilate an unconscious child. Designing a ventilating device that could indicate how to open an upper airway correctly may be beneficial. Neutral position in young children and slight head extension in older children is recommended, although the optimal head angle is not clear. Thus, we compared effects of neutral head position and extension, measuring head-position angles and ventilation parameters.  
Methods: Sixty-one children scheduled for tonsillectomy were enrolled, and were ventilated with pressure-controlled ventilation after anaesthesia induction. Results: Children were divided into two groups: 1-5 years old (pre-school children, n = 38) and 6-10 years old (school children, n = 23). In neutral (mean ± SD: 1.3 ± 6.0) vs. head-extension position (13.2 ± 6.0; P < 0.001) in pre-school children, tidal volumes (132 ± 44,137 ± 49 ml), peak-expiratory flow (300 ± 90 vs. 310 ± 100 ml s-1)
and expiratory airway resistance (20 ± 8 vs. 18 ± 6 cmH2O s l-1) were comparable (P = NS). In neutral (-0.4 ± 5.4) vs. head-extension position (15.7 ± 6.4; P < 0.001) in school children, expiratory airway resistance (17 ± 7 vs. 13 ± 5 cmH2O s l-1; P = 0.048) differed, while tidal volume (224 ± 93 vs. 230 ± 92 ml) and peak-expiratory flow (427 ± 181 vs. 381 ± 144 ml s-1) were comparable (P = NS). Conclusion: Head-extension and neutral head-position angles differed in pre-school and school children. In pre-school children, neutral head position or head extension with an angle of -1° or 13°, and in school children head extension of 16°, may be used to achieve optimal ventilation of an unprotected airway.


INTRODUCTION: External cardiac mechanical stimulation is one of the fastest resuscitative manoeuvres possible in the emergency setting. Precordial thump (PT), initially reported for treatment of atrio-ventricular block, has been subsequently described to cardiovert also ventricular tachycardia (VT) and fibrillation (VF). PT efficacy, mechanics and mechanisms remain poorly characterized. SOURCES OF DATA: Appropriate MESH and free terms were searched on PubMed, Embase and the Cochrane Library. Cross-referencing from articles and reviews, and forward search using SCOPUS and Google scholar have also been performed. Pre-set inclusion and exclusion criteria were applied to retrieved references on PT, which were then reviewed, summarized and interpreted. AREAS OF AGREEMENT: PT is not effective in treating VF, and of limited use for VT, although it has a very good safety profile (97% no changed/improved rhythm). If delivered, PT should be applied as early as possible after cardiac arrest, and cardio-pulmonary resuscitation (CPR) should begin with no delay if not effective. AREAS OF CONTROVERSY: A relatively large fraction of reported positive outcomes (both for PT and the less forceful but serially applied precordial percussion) in witnessed asystole should be considered when critically reviewing present CPR recommendations. In addition, mechanisms, energy requirements and timing are analysed and discussed. GROWING POINTS AND AREAS TIMELY FOR DEVELOPING RESEARCH: The 2005 ALS guidelines recommend PT delivery only by healthcare professionals trained in the technique. The use of training aids should therefore be explored, regardless of whether they are based on stand-alone devices or integrated within resuscitation mannequins.
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**STUDY OBJECTIVE:** Survival after out-of-hospital cardiac arrest depends on the links in the chain of survival. The Utstein elements are designed to assess these links and provide the basis for comparing outcomes within and across communities. We assess whether these measures sufficiently predict survival and explain outcome differences. **METHODS:** We used an observational, prospective data collection, case-series of adult persons with non-traumatic out-of-hospital cardiac arrest from December 1, 2005, through March 1, 2007, from the multisite, population-based Resuscitation Outcomes Consortium Epistry-Cardiac Arrest. We used logistic regression, receiver operating curves, and measures of variance to estimate the extent to which the Utstein elements predicted survival to hospital discharge and explained outcome variability overall and between 7 Resuscitation Outcomes Consortium sites. Analyses were conducted for all emergency medical services-treated cardiac arrests and for the subset of bystander-witnessed patient arrests because of presumed cardiac cause presenting with ventricular fibrillation or ventricular tachycardia. **RESULTS:** Survival was 7.8% overall (n=833/10,681) and varied from 4.6% to 14.7% across Resuscitation Outcomes Consortium sites. Among bystander-witnessed ventricular fibrillation or ventricular tachycardia, survival was 22.1% overall (n=323/1459) and varied from 12.5% to 41.0% across sites. The Utstein elements collectively predicted 72% of survival variability among all arrests and 40% of survival variability among bystander-witnessed ventricular fibrillation. The Utstein elements accounted for 43.6% of the between-site survival difference among all arrests and 22.3% of the between-site difference among the bystander-witnessed ventricular fibrillation subset. **CONCLUSION:** The Utstein elements predict survival but account for only a modest portion of outcome variability overall and between Resuscitation Outcomes Consortium sites. The results underscore the need for ongoing investigation to better understand characteristics that influence cardiac arrest survival.

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**OBJECTIVE:** To determine the long-term impact of a medical emergency team on survival and to assess the utility of administrative data to monitor outcomes. **DESIGN:** Prospective study of cardiac arrests and survival. Retrospective study of administrative data. **SETTING:** University affiliated tertiary referral hospital in Melbourne, Australia. **PATIENTS:** All patients admitted to hospital in three 6-month periods between 2002-2007 (prospective) and 1993-2007 (retrospective). **INTERVENTION:** Implementation of a medical emergency team in November 2002. **MEASUREMENTS AND MAIN RESULTS:** In
the prospective analysis, rates of unexpected cardiac arrest and hospital mortality (referenced to 1000 patient-care days) were measured before (July-August 2002) and after (December 2002-May 2003, December 2004-May 2005, December 2006-May 2007) the introduction of the medical emergency team. Cardiac arrest rates decreased progressively from 0.78 per 1000 (95% confidence interval, 0.50-1.16) to 0.25 per 1000 (95% confidence interval, 0.15-0.39, p < .001), and hospital mortality from 0.58 per 1000 (95% confidence interval, 0.35-0.92) to 0.30 per 1000 (95% confidence interval, 0.20-0.46, p < .05); cardiac arrest rates achieved statistical significance at 2 yrs and hospital mortality at 4 yrs. Using administrative data adjusted for age, sex, case-mix, and comorbidity, hazard ratios for mortality for the three post implementation periods were statistically lower than for the 10 yrs pre implementation (0.85, 0.74, 0.65). The intensity of calling (calls/1000 patient-days) inversely correlated with cardiac arrest rate, unexpected mortality rate, and total hospital mortality rate. CONCLUSIONS: The introduction of a medical emergency team was associated with a progressive decline of unexpected cardiac arrests within 2 yrs, and of unexpected mortality within 4 yrs. This suggests that changes to organizational practice take time and benefits may not be immediately obvious. Such changes are reflected in total hospital mortality measured from administrative data and make monitoring simpler in the longer term. Finally, efforts to increase calling of emergency teams should reduce cardiac arrests and mortality.


Context: High resting blood pressure (BP) is among the best studied and established risk factors for cardiovascular disease. However, little is known about the relationship between BP under acute stress, such as in acute chest pain, and subsequent mortality. Objective: To study long-term mortality related to supine BP in patients admitted to the medical intensive care unit (ICU) for acute chest pain. Design, Setting, and Participants: Data from the RIKS-HIA (Registry of Information and Knowledge About Swedish Heart Intensive Care Admissions) was used to analyze the mortality in relation to supine admission systolic BP in 119,151 participants who were treated at the ICU for the symptom of chest pain from 1997 through 2007. Results from this prospective cohort study were presented according to systolic BP quartiles: Q1, less than 128 mm Hg; Q2, from 128 to 144 mm Hg; Q3, from 145 to 162 mm Hg; and Q4, at or above 163 mm Hg. Main Outcome Measure Total mortality. Results: Mean (SD) follow-up time was 2.47 (1.5) years (range, 1-10 years). One-year mortality rate by Cox proportional hazard model (adjusted for age, sex, smoking, diastolic BP, use of antihypertensive medication at admission and discharge, and use of lipid-lowering and antiplatelet medication at discharge) showed that participants in Q4 had the best prognosis (hazard ratio [HR], 0.76; 95% confidence interval [CI], 0.72-0.80, Q4 compared with Q2; corresponding risks for Q1 were HR, 1.46; 95% CI, 1.39-1.52, and for Q3, HR, 0.83; 95% CI, 0.79-0.87). Patients in Q4 had a 21.7% lower absolute risk compared with Q2, patients in
Q3 had a 15.2% lower risk than in Q2, and patients in Q1 had a 40.3% higher risk for mortality than in Q2. The worse prognosis in Q2 compared with Q4 was independent of body mass index and previous diagnoses and similar when analysis was restricted to patients with a final diagnosis of angina or myocardial infarction (HR, 0.75; 95% CI, 0.71-0.80, Q4 compared with Q2). Conclusion: Among patients admitted to the ICU for chest pain, there is an inverse association between admission supine systolic BP and 1-year mortality rate.


OBJECTIVE: To identify the barriers to implementation of mild therapeutic hypothermia for adult survivors of cardiac arrest. Despite scientific evidence to support therapeutic hypothermia for resuscitated cardiac arrest patients, it is inconsistently and at times inadequately used. DESIGN: Qualitative study, using semi-structured interviews. SETTING: A stratified random sample of 14 sites from an established network of 43 hospitals, including both community and tertiary care centers in Southern Ontario, Canada. PARTICIPANTS: Twenty-one intensive care unit and emergency department physicians and nurses. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: Purposive sampling was used to interview individuals who were most likely to be involved in the implementation and evaluation of the hypothermia protocol. All interviews were conducted by telephone by a clinician and a qualitative researcher. Interviews were recorded electronically and transcribed unless the participant declined to have the interview recorded. Untranscribed interviews were recorded as field notes and as direct quotations. New interviews were conducted until thematic saturation occurred. The analysis was completed through three phases of coding. Respondents identified lack of familiarity and availability of concrete therapeutic hypothermia protocols and process issues as the most frequent barriers. Process concerns included availability of equipment, equipment costs, and high workload demands for emergency nurses. Other barriers identified were variable nursing awareness, variable staff uptake, lack of agreement with supporting evidence, lack of interdisciplinary collaboration between the intensive care unit and emergency department, lack of inter-professional education between nurses and physicians, and challenges inherent in applying an intervention infrequently. CONCLUSIONS: This study demonstrated that the systematic adoption of a new intervention, therapeutic hypothermia, is met with interdependent generic, local, and individual barriers. A working awareness of the types of barriers that exist at multiple sites will assist in targeting specific knowledge translation strategies to improve adherence to evidence-based practice.


PURPOSE OF REVIEW: The last 5 years have witnessed an explosion in interest regarding cardiac arrhythmias and air pollution. The data have been strongest with respect to ventricular arrhythmias but there is accumulating evidence that air pollution is also associated with supraventricular arrhythmias. RECENT FINDINGS: There is clear epidemiological evidence linking air pollution and cardiac mortality. Whether the cardiac mortality was from myocardial ischemia, congestive heart failure or arrhythmic, or all of these pathways, is not clear from the epidemiological data. There is a large body of evidence that air pollution can modify autonomic tone. More recent data, utilizing patients with cardiac disease and implantable cardioverter defibrillators (ICDs), have clarified the association of air pollution and arrhythmias. Data are also accumulating that air pollution may be associated with atrial arrhythmias. SUMMARY: The incremental risk of air pollution in triggering arrhythmias or other acute cardiac events is greatest for those patients with underlying cardiac disease. Cardiovascular patients and those at high risk of cardiovascular disease should be educated about the risks for triggering of arrhythmias and other cardiac events by air pollution. These patients should monitor the local forecasted Air Quality Index and follow the recommendations to reduce exposures and limit activities.


PURPOSE OF REVIEW: The aim of this review is to provide a summary of the principal sex-related differences in the presentation, clinical course, and treatment of cardiac arrhythmias as well as the current understanding of the mechanisms underlying these differences. RECENT FINDINGS: The mechanisms behind the sex differences in arrhythmias are not well understood yet. Recent studies in animals have provided some insight to explain the molecular basis by which sex hormones may be responsible for the female predisposition to long QT syndromes as well as the higher male predisposition to lethal arrhythmias after myocardial infarction. Recently discovered preferential transmission of long QT syndrome alleles to
daughters as compared with sons, as well as sex differences in the activity of membrane transporters and in recently
discovered myocardial cytochrome P450 enzymes, may explain the predisposition of women to acquired and drug-induced
long QT syndrome and torsades de pointes. Important sex differences in the use of implantable cardioverter defibrillators
and cardiac resynchronization therapy have also been reported. Women appear to be underrepresented among patients
who receive implantable cardioverter defibrillators and cardiac resynchronization therapy devices. However, despite higher
rates of adverse mechanical events, they seem to benefit at least as much as men from these therapies. SUMMARY: Sex-
related differences should be taken into account to provide optimal diagnosis and treatment to patients with cardiac
arrhythmias. Further studies are needed to explain the mechanisms behind these differences.

25/.
The use of therapeutic hypothermia (TH) in acute care medicine has evolved over the past 2 centuries, and its use over the
past decade has increased in emergency departments, intensive care units, and operating rooms. Therapeutic hypothermia
has several potential clinical applications based on its putative mechanisms of action. It appears to improve oxygen supply to
ischemic areas of the brain and decreases intracranial pressure. Mild-to-moderate TH (33 degrees C +/- 1 degrees C) after
resuscitation from cardiac arrest is neuro-protective, and also acts on the cardiovascular system with evidence of a decrease
in heart rate and increase in systemic vascular resistance. Therapeutic hypothermia decreases cardiac output by 7% for each
1 degrees C decrease in core body temperature, but maintains the stroke volume and the mean arterial pressure. Despite a
growing amount of data, this life-saving technique is underutilized in hospitals worldwide. The purpose of this
comprehensive review is to show the evolution and the clinical use of TH as it pertains to acute care practitioners.

26/.
Snake bite is a common and frequently devastating environmental and occupational disease, especially in rural areas of
tropical developing countries. Its public health importance has been largely ignored by medical science. Snake venoms are
rich in protein and peptide toxins that have specificity for a wide range of tissue receptors, making them clinically challenging
and scientifically fascinating, especially for drug design. Although the full burden of human suffering attributable to snake
bite remains obscure, hundreds of thousands of people are known to be envenomed and tens of thousands are killed or
maimed by snakes every year. Preventive efforts should be aimed towards education of affected communities to use proper
footwear and to reduce the risk of contact with snakes to a minimum through understanding of snakes’ behaviour. To treat
envenoming, the production and clinical use of antivenom must be improved. Increased collaboration between clinicians,
epidemiologists, and laboratory toxinologists should enhance the understanding and treatment of envenoming.
Atrial fibrillation (AF) is the most common sustained arrhythmia, affecting more than 2.2 million Americans. ACC/AHA/ESC guidelines for the management of patients with AF recommend amiodarone for maintaining sinus rhythm. Dronedarone is a derivative of amiodarone indicated for the treatment of AF. To provide an overview of dronedarone with a focus on the phase III trials and discuss unresolved questions of dronedarone. A literature search was conducted via the PubMed database using the keyword "dronedarone." Search was limited to human trials in English. The FDA website was searched for briefing documents and subcommittee meetings on dronedarone. Clinicaltrials.gov was searched with the keyword dronedarone for upcoming or unpublished clinical trials. Five phase III trials are available for dronedarone: ANDROMEDA, EURIDIS/ADONIS, ATHENA, ERATO, and DIONYSIS. EURIDIS/ADONIS and ATHENA demonstrated a reduction AF recurrence with dronedarone compared to placebo. The ANDROMEDA trial recruited patients with recent hospitalization for heart failure and was terminated due to an excess of deaths in the dronedarone group. The DIONYSIS trial was a comparative effectiveness trial that demonstrated less efficacy for dronedarone but improved tolerability compared to amiodarone. Dronedarone represents an option in the management of AF in select patients. Dronedarone is not appropriate in patients with recently decompensated heart failure or those treated with strong CYP3A4 inhibitors or medications prolonging the QT interval. Dronedarone appears to have improved tolerability at the expense of decreased efficacy when compared to amiodarone. Questions remain on the long-term safety, use in patients with heart failure, retreatment after dronedarone or amiodarone failure, and comparative efficacy with a rate control strategy. [References: 30]

ANIMAL / MANIKIN / CADAVER/ MODELS OF CARDIAC ARREST STUDIES

BACKGROUND: To investigate the feasibility and efficacy of earlier induction of hypothermia already during the 'no-flow' period of cardiac arrest with non-invasive surface cooling or invasive aortic flush cooling. METHODS: This was a prospective randomized experimental study that included 14 pigs, Large White breed (30-38 kg), with ventricular fibrillation cardiac arrest plus blanket surface and an invasive cold saline flush cooling. The endpoint was a decline in brain temperature (T(br)) at 35 min after cardiac arrest. RESULTS: With surface cooling, T(br) decreased from 38.7+/-.2 degrees C to 37.4+/-.8
degrees C (P=0.02) and with invasive cooling T(br) decreased from 38.8+/-.13 degrees C to 19.0+/-.2.8 degrees C within 216+/-.23 s (P=0.02) and increased back to 33.0+/-.6 degrees C at 35 min of cardiac arrest (P=0.02 vs. T(br) at 15 min, P=0.002 vs. T(br) at 35 min in the surface cooling groups). CONCLUSION: Invasive cooling by aortic flush with cold saline rapidly induces deep cerebral hypothermia, whereas non-invasive surface cooling only marginally decreases brain temperature.


Introduction: Recent adult reports have demonstrated sub-optimal performance of basic cardiopulmonary resuscitation (CPR) skills in advanced training scenarios and real life arrest situations. We studied the adequacy of chest compressions performed by advanced trained pediatric providers in code scenarios. Methods: We designed a prospective observational study of pediatric providers performing external closed-chest compressions on a child mannequin that is designed to assess adequacy based on depth and rate of chest compressions. The study was conducted from 2008 to 2009 in which 42 subjects were screened and enrolled for participation. Each subject underwent a basic life support scenario that included two minutes of uninterrupted external closed-chest compressions that were assessed for adequacy based on depth and rate. Results: For 42 subjects, 168 total 30-s time segments were available for analysis. Chest compressions were performed at a median rate of 110 (interquartile range (IQR) of 75-145) compressions per minute (cpm). No significant decay in rate of chest compressions was noted over the two-minute evaluation. Chest compression depth was adequate in 9.4% of total delivered chest compressions. No statistical significance was found on the job exposure to CPR and delivery of effective chest compressions. Conclusion: Advanced training of pediatric providers does not ensure adequate delivery of chest compressions. Rate standards and adequate depth of chest compressions are infrequently achieved and both may need more emphasis in CPR training and attention during resuscitations.


Background: Neonatal Resuscitation Program (NRP) guidelines recommend chest compression depths of 1/3 the anterior-posterior (AP) chest depth. Appropriateness of this recommendation has not been rigorously assessed. Objective: To compare the efficacy and safety of neonatal chest compression depths of 1/4, 1/3, and 1/2 AP chest depth during cardiopulmonary resuscitation. Design/methods: Anterior-posterior internal and external chest depth, heart dimensions, and non-cardiac thoracic tissue depth were measured from neonatal chest CTs. Using these measurements, residual internal
chest depth, the remaining depth of the chest between the sternum and spine after external compression, was calculated for compression depths of 1/4, 1/3 and 1/2 anterior-posterior chest depth. Compression sufficient to compress the chest to <10 mm of residual internal chest depth was defined as over-compression. Using a mathematic model, an estimated ejection fraction (EF) was calculated for each chest compression depth. Compression inadequate to obtain a predicted 50% EF was defined as under-compression. Descriptive statistics, Fisher's exact test and Student's t-test were used to analyze data, where appropriate. Results: Fifty-four neonatal chest CT scans were evaluated. Estimated chest compression induced EF increased incrementally with increasing chest compression depth (EF was 51 ± 3% with 1/4 AP chest depth vs 69 ± 3% with 1/3 AP chest depth, and 106% with 1/2 AP chest depth, p < 0.001). Under-compression was predicted in 29/54 patients with 1/4 AP compression depth, but none of the patients with 1/3 or 1/2 AP compression depth, p < 0.001. Over-compression, or lack of adequate residual chest depth, was predicted in 49/54 patients with 1/2 AP compression depth, but none of the patients with 1/4 or 1/3 AP compression depth, p < 0.001. Conclusions: Mathematical modeling based upon neonatal chest CT scan dimensions suggests that current NRP chest compression recommendations of 1/3 AP chest depth should be more effective than 1/4 compression depth, and safer than 1/2 AP compression depth.


Intranasal balloon catheters circulated with cold saline have previously been used for the induction and maintenance of selective brain cooling in pigs with normal circulation. In the present study, we investigated the feasibility of therapeutic hypothermia initiation, maintenance and rewarming using such intranasal balloon catheters with or without addition of intravenous ice-cold fluids during and after cardiac arrest treatment in pigs. Cardiac arrest was induced in 20 anaesthetised pigs. Following 8 min of cardiac arrest and 1 min of cardiopulmonary resuscitation (CPR), cooling was initiated after randomisation with either intranasal cooling (N) or combined with intravenous ice-cold fluids (N+S). Hypothermia was maintained for 180 min, followed by 180 min of rewarming. Brain and oesophageal temperatures, haemodynamic variables and intracranial pressure (ICP) were recorded. Brain temperatures reductions after cooling did not differ (3.8 ± 0.7 °C in the N group and 4.3 ± 1.5 °C in the N+S group; P=0.47). The corresponding body temperature reductions were 3.6 ± 1.2 °C and 4.6 ± 1.5 °C (P=0.1). The resuscitation outcome was similar in both groups. Mixed venous oxygen saturation was lower in the N group after cooling and rewarming (P=0.024 and 0.002, respectively) as compared with the N+S group. ICP was higher after rewarming in the N group (25.2 ± 2.9 mmHg; P=0.01) than in the N+S group (15.7 ± 3.3 mmHg). Intranasal balloon catheters can be used for therapeutic hypothermia initiation, maintenance and rewarming during CPR and after successful resuscitation in pigs.
32/.  
OBJECTIVE: The current standard of manual chest compression during cardiopulmonary resuscitation requires pauses for rhythm analysis and shock delivery. However, interruptions of chest compression greatly decrease the likelihood of successful defibrillations, and significantly better outcomes are reported if this interruption is avoided. **We therefore undertook a prospective randomized controlled animal study in an electrically induced ventricular fibrillation pig model to assess the effects of timing of defibrillation on the manual chest compression cycle on the defibrillation threshold.**  
DESIGN: Prospective, randomized, controlled animal study. SETTING: University-affiliated research laboratory. SUBJECTS: Yorkshire-X domestic pigs (Sus scrofa). INTERVENTIONS: In eight domestic male pigs weighing between 24 and 31 kg, ventricular fibrillation was electrically induced and untreated for 10 secs. Manual chest compression was then performed and continued for 25 secs with the protection of an isolation blanket. The depth and frequency of chest compressions were guided by a cardiopulmonary resuscitation prompter. Animals were randomized to receive a biphasic electrical shock in five different compression phases with a predetermined energy setting. A control phase was chosen at a constant 2 secs after discontinued chest compression. A grouped up-down defibrillation threshold testing protocol was used to compare the success rate at different coupling phases. After a recovery interval of 4 mins, the sequence was repeated for a total of 60 test shocks for each animal.  
MEASUREMENTS AND MAIN RESULTS: No difference in coronary perfusion pressure before delivering of the shock was observed among the six study phases. The defibrillation success rate, however, was significantly higher when shocks were delivered in the upstroke phase of manual chest compression.  
CONCLUSION: Defibrillation efficacy is maximal when electrical shock is delivered during the upstroke phase of manual chest compression.

33/.  
Aims of study: We have previously demonstrated that early intra-nasal cooling improved post-resuscitation neurological outcomes. **The present study utilizing a porcine model of prolonged cardiac arrest investigated the effects of intra-nasal cooling initiated at the start of cardiopulmonary resuscitation (CPR) on resuscitation success.** Our hypothesis was that rapid nasal cooling initiated during "low-flow" improves return of spontaneous resuscitation (ROSC).  
Methods In 16 domestic male pigs weighing 40 ± 3 kg, VF was electrically induced and untreated for 15 min. Animals were randomized to either head cooling or control. CPR was initiated and continued for 5 min before defibrillation was attempted. Coincident with starting CPR, the hypothermic group was cooled with a RhinoChill(TM) device which produces evaporative cooling in the nasal cavity.
of pigs. No cooling was administrated to control animals. If ROSC was not achieved after defibrillation, CPR was resumed for 1 min prior to the next defibrillation attempt until either successful resuscitation or for a total of 15 min. Main results: Seven of eight animals in the hypothermic group (87.5%) and two of eight animals in control group (25%) (p = 0.04) were successfully resuscitated. At ROSC, brain temperature was increased from baseline by 0.3 °C in the control group, and decreased by 0.1 °C in the hypothermic animals. Pulmonary artery temperature was above baseline in both groups.

Conclusion: Intra-nasal cooling initiated at the start of CPR significantly improves the success of resuscitation in a porcine model of prolonged cardiac arrest. This may have occurred by preventing brain hyperthermia.


Introduction: Transport of patients with ongoing cardiopulmonary resuscitation (CPR) occurs frequently. It may not be possible to obtain rapid hospital access while maintaining CPR quality, because the ambulance’s high speed can cause increased vibration and vehicle movement. We aimed to assess how the speed of ambulance affects chest compressions.

Materials and methods: Five cycles of CPR were performed to the Resusci Anne manikin with the PC skill reporting system by experienced emergency medical technicians in ambulance traveling at one of four different speeds: stationary, 30, 60, or 90 km/h. Performance and acceleration data of chest compressions at different speeds were compared using repeated measures analysis of variance (ANOVA). Results Fractions of chest compressions with adequate depth, duty cycles, average rates of chest compressions, and no flow fractions showed significant differences among different speeds (p = 0.026, <0.001, <0.001, 0.005, respectively), while average depth of chest compressions did not. Accelerations of 2 Hz component and ratios of 3-12 Hz to 0-2 Hz components showed significant differences among different speeds (p = 0.001 for all). None of the outcome variables showed a significant difference between the two types of ambulance. Conclusions: The speed of ambulance affects some aspects in the quality of chest compression during transport. Chest compressions with excessive depth, the average rate of chest compressions, and no-flow fraction increase as the speed of ambulance increase. Increase in the speed of ambulance also causes relative increase of high frequency acceleration in the chest compression, which represents unnecessary movement and force applied.

Objective: Infant CPR guidelines recommend two-finger chest compression with a lone rescuer and two-thumb with two rescuers. Two-thumb provides better chest compression but is perceived to be associated with increased ventilation hand-off time. We hypothesized that lone rescuer two-thumb CPR is associated with increased ventilation cycle time, decreased ventilation quality and fewer chest compressions compared to two-finger CPR in an infant manikin model. Design: Crossover observational study randomizing 34 healthcare providers to perform 2 min CPR at a compression rate of 100 min⁻¹ using a 30:2 compression:ventilation ratio comparing two-thumb vs. two-finger techniques. Methods: A Laerdal(TM) Baby ALS Trainer manikin was modified to digitally record compression rate, compression depth and compression pressure and ventilation cycle time (two mouth-to-mouth breaths). Manikin chest rise with breaths was video recorded and later reviewed by two blinded CPR instructors for percent effective breaths. Data (mean ± SD) were analyzed using a two-tailed paired t-test. Significance was defined qualitatively as p \( \leq 0.05 \).

Result: Mean % effective breaths were 90 ± 18.6% in two-thumb and 88.9 ± 21.1% in two-finger, \( p = 0.65 \). Mean time (s) to deliver two mouth-to-mouth breaths was 7.6 ± 1.6 in two-thumb and 7.0 ± 1.5 in two-finger, \( p < 0.0001 \). Mean delivered compressions per minute were 87 ± 11 in two-thumb and 92 ± 12 in two-finger, \( p = 0.0005 \). Two-thumb resulted in significantly higher compression depth and compression pressure compared to the two-finger technique. Conclusion: Healthcare providers required 0.6 s longer time to deliver two breaths during two-thumb lone rescuer infant CPR, but there was no significant difference in percent effective breaths delivered between the two techniques. Two-thumb CPR had 4 fewer delivered compressions per minute, which may be offset by far more effective compression depth and compression pressure compared to two-finger technique.


Aim of the study: Post-resuscitation myocardial dysfunction is one of the leading causes of early death after initial success of resuscitation; the mechanisms of post-resuscitation myocardial dysfunction remain controversial. We hypothesize that ischemia injury, rather than reperfusion injury is the major cause of post-resuscitation myocardial dysfunction. We proposed to investigate the separate effects of ischemia and reperfusion injury on post-resuscitation myocardial dysfunction. Methods: Thirty-three Langendorff - perfused isolated rat hearts were subjected to 15 min of global ischemia followed by 120 min of reperfusion. Pentazocine was utilized as a myocardial protective agent, either before ischemia or during reperfusion. All hearts were randomized into 3 groups: (1) "ischemia protection", in which pentazocine was infused 10 min prior to global ischemia.
ischemia, (2) "reperfusion protection", in which pentazocine was infused during 2 h of reperfusion and (3) "control", with no pentazocine infusion. Left ventricular (LV) functions were measured by the maximal rate of LV pressure rise (dP/dtmax) and decline (-dP/dtmax), the maximal LV diastolic pressure (LVDP). The incidences of post-ischemic arrhythmias were measured. Results: When pentazocine was administered before onset of ischemia, the LV systolic and diastolic functions were significantly greater, and the post-ischemic arrhythmias were significantly less in comparison to those with reperfusion protection (p < 0.05) and the control group (p < 0.05). Conclusions: In this model, the severity of post-ischemic myocardial dysfunction was less when the heart was protected during ischemia. Ischemia injury may therefore be the major cause of post-resuscitation myocardial dysfunction.

CASE SERIES / CASE STUDIES/ LETTERS/EDITORIALS

37/.

Aim: Death from trauma is caused by disastrous injuries on scene; bleeding shock or acute respiratory failure (ARDS) induced by trauma and massive blood transfusion. Extracorporeal membrane oxygenation (ECMO) can be effective in severe cardiopulmonary failure, but preexisting bleeding is still a contraindication for its use. We report our first experiences in application of initially heparin-free ECMO in severe trauma patients with resistant cardiopulmonary failure and coexisting bleeding shock retrospectively and describe blood coagulation management on ECMO. Methods: From June 2006 to June 2009 we treated adult trauma patients (n = 10, mean age: 32 ± 14 years, mean ISS score 73 ± 4) with percutaneous veno-venous (v-v) ECMO for pulmonary failure (n = 7) and with veno-arterial (v-a) ECMO in cardiopulmonary failure (n = 3). Diagnosis included polytrauma (n = 9) and open chest trauma (n = 1). We used a new miniaturised ECMO device (PLS-Set, MAQUET Cardiopulmonary AG, Hechingen, Germany) and performed initially heparin-free ECMO. Results: Prior to ECMO median oxygenation ratio (OR) was 47 (36-90) mmHg, median paCO2 was 67 (36-89) mm Hg and median norepinephrine demand was 3.0 (1.0-13.5) mg/h. Cardiopulmonary failure was treated effectively with ECMO and systemic gas exchange and blood flow improved rapidly within 2 h on ECMO in all patients (median OR 69 (52-263) mm Hg, median paCO2 41 (22-85) mm Hg. 60% of our patients had recovered completely. Conclusions: Initially heparin-free ECMO support can improve therapy and outcome even in disastrous trauma patients with coexisting bleeding shock.

Background: The application of non-technical skills (NTSs) in health care has previously been described in other health-care educational programmes. NTSs are behavioural principles such as leadership, task distribution and communication. The aim of this study was to identify NTSs suitable for improving team performance in multi-professional cardiac arrest teams, and to describe barriers to the use and implementation of such NTSs by using a qualitative method. Methods: Individual semi-structured interviews were conducted with 11 Danish Advanced Life Support instructors during the period April 2006 to November 2006. Interviews were focused on barriers and recommendations for teamwork in the cardiac arrest team, optimal policy for improvement of resuscitation training and clinical practice, use of cognitive aids and adoption of European Resuscitation Council (ERC) Guidelines 2005. Interviews and data analysis were supported by a template describing 25 NTSs derived from other educational programmes in health care. Results: A framework with five categories relating to NTSs was identified: leadership, communication, mutual performance monitoring, maintenance of standards and guidelines and task management. Important barriers that were identified were inexperienced team leaders, task overload and hierarchic structure in the teams’ inability to maintain focus on chest compressions. Conclusion: Interview participants pointed out that NTSs of teams could improve the treatment of cardiac arrest, but several barriers to this exist. Improving resuscitation training should include considerations regarding team leader experience, structured communication, mandatory use of cognitive aids, avoidance of task overload and mutual performance monitoring to avoid unnecessary interruptions in chest compressions.

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Background: Treating cardiac arrest is linked to the mutual performance of several health-care individuals' task coordination. Non-technical skills, including communication, leadership and team interaction, could improve sequencing the tasks in the cardiac arrest algorithm. Non-technical skills have been a part of crew resource management training, created to improve safety in aviation. This study aimed, first, to establish crew resource management and non-technical skill-based learning objectives and behavioural markers for the performance of multi-professional resuscitation teams; second, to develop a checklist and to evaluate the validity and reliability of the checklist; and, finally, to develop a simulation-based course including the checklist on behavioural markers, as a tool for learning and assessment. Method: A seven-step procedure was used. Findings from interviews with Advanced Life Support instructors and analysis of critical incidents were used to create learning objectives, assessment tools and course curriculum. Reliability and validity were tested by assessing digital versatile disc (DVD)-recorded simulated cardiac arrests. Results: A checklist with 22 behavioural markers based on nine learning objectives was developed and embedded in an 8-h full-scale simulation course. Inter-rater reliability of the checklist (intra-class correlation) was 0.9. Concurrent validity (intra-class correlation) was 0.93. Rate of agreement (0.58-0.91) and kappa values (0.03-0.82) on single items varied. Conclusion: A full-scale simulation course and a checklist with 22 behavioural markers were developed. Good inter-rater reliability and concurrent validity of the checklist were demonstrated. Single items on the checklist need refinement to improve accuracy.

41/. 
**Cho GC, Sohn YD et al.** The effect of basic life support education on laypersons' willingness in performing bystander hands only cardiopulmonary resuscitation. *Resuscitation* 2010; In Press, Corrected Proof.

Background: Recently, hands only CPR (cardiopulmonary resuscitation) has been proposed as an alternative to standard CPR for bystanders. The present study was performed to identify the effect of basic life support (BLS) training on laypersons' willingness in performing standard CPR and hands only CPR. Methods: The participants for this study were non-medical personnel who applied for BLS training program that took place in 7 university hospitals in and around Korea for 6 months. Before and after BLS training, all the participants were given questionnaires for bystander CPR, and 890 respondents were included in the final analyses. Results: Self-assessed confidence score for bystander CPR, using a visual analogue scale from 0 to 100, increased from 51.5 ± 30.0 before BLS training to 87.0 ± 13.7 after the training with statistical significance (p 0.001). Before the training, 19% of respondents reported willingness to perform standard CPR on a stranger, and 30.1% to perform hands only CPR. After the training, this increased to 56.7% of respondents reporting willingness to perform standard CPR,
and 71.9%, hands only CPR, on strangers. Before and after BLS training, the odds ratio of willingness to perform hands only CPR versus standard CPR were 1.8 (95% CI 1.5-2.3) and 2.0 (95% CI 1.7-2.6) for a stranger, respectively. Most of the respondents, who reported they would decline to perform standard CPR, stated that fear of liability and fear of disease transmission were deciding factors after the BLS training.

Conclusions: The BLS training increases laypersons' confidence and willingness to perform bystander CPR on a stranger. However, laypersons are more willing to perform hands only CPR rather than to perform standard CPR on a stranger regardless of the BLS training.


The importance of immediate cardiopulmonary resuscitation (CPR) and defibrillation after cardiac arrest is established. The 2005 European Resuscitation Council (ERC) guidelines were altered to try to improve survival after cardiac arrest. This observational study compares the errors in basic life support (BLS) performance after training using the 2000 or 2005 guidelines. First-year healthcare students at the University of Birmingham, United Kingdom, were taught adult BLS in a standardised 8-h course: an historical group with previous ERC guidelines (Old), the other with 2005 ERC guidelines (New). 2537 (Old 1773; New 764) students were trained and assessed in BLS. There was no difference in overall error rate between Old and New (5.53% vs. 6.70% (p > 0.05)) or adherence to the sequence of the respective BLS algorithm. The New group ("hands in centre of the chest") had significantly more erroneous hand positions compared to the Old group (5.23% vs. 1.64%, p < 0.001). The 2005 ERC guidelines do not significantly improve correct BLS performance. Removal of hand placement measurement results in a significant increase in hand position errors. The clinical benefit of an increased number of compressions impaired by worsened hand positioning is unknown and requires further study.


This paper examines the historical rise of both cardiopulmonary resuscitation (CPR) and the do-not-resuscitate (DNR) order and the wisdom of their continuing status in U.S. hospital practice and policy. The practice of universal presumed consent to CPR and the resulting DNR policy are the products of a particular time and were responses to particular problems. In order to keep the excesses of technology in check, the DNR policies emerged as a response to the in-hospital universal presumed consent to CPR. We live with this historical concretion, which seems to perpetuate a false culture that the patient's wishes must be followed. The authors are critical of the current U.S. climate, where CPR and DNR are viewed as two among a panoply of patient choices, and point to UK practice as an alternative. They conclude that physicians in the United States should radically rethink approaches to CPR and DNR.

The do-not-resuscitate order, introduced nearly a half century ago, continues to raise questions and controversy among health care providers and patients. In today’s society, the expectation and availability of medical interventions, including at the end of life, have rendered the do-not-resuscitate order particularly relevant. The do-not-resuscitate order is the only order that requires patient consent to prevent a medical procedure from being performed; therefore, informed code status discussions between physicians and patients are especially important. Epidemiologic studies have informed our understanding of resuscitation outcomes; however, patient, provider, and institutional characteristics account for great variability in the prevalence of do-not-resuscitate orders. Specific strategies can improve the quality of code status conversations and enhance end-of-life care planning. In this article, we review the history, epidemiology, and determinants of do-not-resuscitate orders, as well as frequently encountered questions and recommended strategies for discussing this important topic with patients.


It is widely believed in neonatology and obstetrics that there are situations in which it is inappropriate to attempt newborn resuscitation, and other times when newborn resuscitation is obligatory despite parental refusal. In each case, an ethical justification for the decision needs to be identified. This essay is intended to provide guidance in deciding when resuscitation should be attempted, and in identifying ethical considerations that should be taken into account. It specifically addresses the issue of extreme prematurity, including an analysis of current recommendations, the data, relevant rights of patient and parents, and a discussion of the relative merits of withholding resuscitation vs providing resuscitation and possibly withdrawing intensive care later. In addition to extreme prematurity, the considerations presented are also relevant to a wider spectrum of newborn problems, including Trisomy 13, Trisomy 18, and severe congenital anomalies.
A STUDY FOR THE BOYS AND A STUDY FOR THE GIRLS....


Background: The role of trigger factors in acute cardiovascular events has been much studied in the past few years. A recent study analysed changes in the rates of cardiac emergencies in Bavaria (Germany) during the last Football World Cup. The authors reported a 2.7-fold increase in the incidence of cardiac emergencies in the 12 h before and after football matches involving the German team, which sparked the debate on the necessity of the introduction of ad hoc cardiovascular preventive measures. Methods: We studied 25 159 hospital admissions for acute myocardial infarction (AMI) among the Italian population during three international football competitions: the World Cup 2002, the European Championship 2004 and the World Cup 2006. Poisson regression was used to estimate the relative risk of hospital admission for AMI on the days when football matches involving the Italian team were disputed, compared with the other days of the three competitions. Furthermore, we reviewed the available published studies regarding the association between football matches and the risk of cardiovascular events. Results We did not find an increase in the rates of admission for AMI on the days of football matches involving Italy in either the single competitions or the three competitions combined (relative risk 1.01; 95% confidence interval 0.98-1.05). We identified 10 studies published on this topic. With the exception of the recently published German study and two small Swiss studies, all relative risk estimates were between 0.7 and 1.3. Conclusions: The cardiovascular effects of watching football matches are likely to be, if anything, very small.


To investigate the association of chocolate consumption with measured blood pressure (BP) and the incidence of cardiovascular disease (CVD). Dietary intake, including chocolate, and BP were assessed at baseline (1994-98) in 19 357 participants (aged 35-65 years) free of myocardial infarction (MI) and stroke and not using antihypertensive medication of the Potsdam arm of the European Prospective Investigation into Cancer and Nutrition. Incident cases of MI (= 166) and stroke (= 136) were identified after a mean follow-up of 8 years. Mean systolic BP was 1.0 mmHg lower in the top quartile compared with the bottom quartile of chocolate consumption. The relative risk of the combined outcome of MI and stroke
for top vs. bottom quartiles was 0.61 (95% CI 0.44-0.87; linear trend = 0.014). Baseline BP explained 12% of this lower risk (95% CI 3-36%). The inverse association was stronger for stroke than for MI. Chocolate consumption appears to lower CVD risk, in part through reducing BP. The inverse association may be stronger for stroke than for MI. Further research is needed, in particular randomized trials.