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Barjaktarevic I, Bobe L, Evans LE, Klapholz A, Calandriello A, Dinan W. Multiple Cardio-Pulmonary Resuscitation Attempts In A Community Hospital: How Well Do We Recognize Futility? *Am J Respir Crit Care Med* 2010;181(1_MeetingAbstracts):A6696

**RATIONALE:** Appropriate futility assessment is necessary in management of critically ill patient. Unfortunately, well-defined concept of futility with its objective criteria, predicting factors and assessment guidelines is still missing. In a search of common factors predicting a poor outcome, we analyzed a cohort of patients who had cardio-respiratory arrest in a community hospital with a special focus on the group of patients who survived a cardiac arrest but whose medical problems led to subsequent arrests.

**METHODS:** In this retrospective study we reviewed cardio-pulmonary resuscitation (CPR) database during the period of one year at Cabrini Medical Center, Manhattan, NY. Proportions were compared with chi-squared or Fisher’s Exact test where appropriate.

**RESULTS:** Ninety-eight patients had cardio-respiratory arrest over a period of one year. Twenty-two of these patients had more than one cardio-respiratory arrest, contributing to forty-four per cent of total of one-hundred-thirty-five separate CPR attempts registered in hospital database. Overall survival at the discharge of patients who had one cardio-respiratory arrest (thirty-one per cent) was significantly better (p<0.01) compared to survival at the discharge of patients who had more than one cardio-respiratory arrest (four per cent). Eighteen per cent of patients who survived the arrest had their status changed to “do not resuscitate” after successful reinstitution of spontaneous circulation. **CONCLUSION:** Patients who survived a cardio-respiratory arrest but whose hospital course led to subsequent arrests have significantly decreased chances of favorable outcome compared to patients with one cardio-respiratory arrest. Aggressive medical management is most often necessary in management of arrest survivors but subsequent CPR attempts in this patient population may be considered highly futile and approach should be strongly considered.

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There is a substantial mortality rate in patients admitted alive after out-of-hospital cardiac arrest. The primary objective of our study was to examine trends in in-hospital survival in out-of-hospital cardiac arrest survivors in Canada between 1994 and 2004. The secondary objective was to examine predictors of in-hospital survival in these patients. Data on hospital admissions from April 1, 1994, to March 31, 2004, were obtained from the Health Person-oriented Information Database, maintained by Statistics Canada.

We included all patients with a primary diagnosis of cardiac arrest who survived to hospital admission. We assessed survival to hospital discharge in all patients admitted alive. In Canada, 13,263 patients survived community arrest between 1994 and 2004. The
annual incidence of hospital admission after out-of-hospital cardiac arrest decreased by 33%, from 5.37 per 100,000 in 1994 to 3.63 per 100,000 in 2004 (P < .0001 for trend). Subsequently, 5,045 patients (38.03%) survived to hospital discharge. The survival rate did not change during the duration of the study. Invasive coronary artery disease management was associated with a greatly increased chance of survival (odds ratio 21.98, 95% CI 17.62-27.42). Also male gender, heart failure, and acute myocardial ischemia were independent positive predictors of survival to hospital discharge; greater age and comorbidities were negative predictors of survival. Finally, there were significant interprovincial variations in survival rates. Our study, the largest of its kind, has 4 main findings. Firstly, between 1993 and 2004, there was a significant and steady decline in admission rates after community cardiac arrest. Second, there was no change in the in-hospital survival rates. Thirdly, invasive management of coronary artery disease was associated with a greatly improved chance of survival, and finally, there were important regional variations in survival rates.

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Present practice guidelines recommend sedative-analgesic and neuromuscular blocking administration during therapeutic hypothermia in comatose patients after cardiac arrest. However, none suggests the best administration protocol. In this study, we evaluated intensivists' preferences regarding administration. A systematic literature review was conducted to identify clinical studies published between 1997 and July 2009. Selected articles had to meet the following criteria: use of hypothermia to improve neurologic outcome after cardiac arrest, and specific mention of the sedative protocol used. We checked drugs and dose used, the reason for their administration, and the specific type of neurologic and neuromuscular monitoring used. We identified 44 studies reporting protocols used in 68 intensive care units (ICUs) from various countries. Midazolam, the sedative used most often, was used in 39 ICUs at doses between 5 mg/h and 0.3 mg/kg/h. Propofol was used in 13 ICUs at doses up to 6 mg/kg/h. Eighteen ICUs (26%) did not report using any analgesic. Fentanyl was the analgesic used the most, in 33 ICUs, at doses between 0.5 and 10g/kg/h, followed by morphine in 4 ICUs. Neuromuscular blocking drugs were routinely used to prevent shivering in 54 ICUs and to treat shivering in 8; in 1 ICU, their use was discouraged. Pancuronium was used the most, in 24 ICUs, followed by cisatracurium in 14. Four ICUs used neuromuscular blocking drug administration guided by train-of-four monitoring and 3 ICUs used continuous monitoring of cerebral activity. There is great variability in the protocols used for anesthesia and analgesia during therapeutic hypothermia. Very often, the drug and the dose used do not seem the most appropriate. Only 3 ICUs routinely used electroencephalographic monitoring during paralysis. It is necessary to reach a consensus on how to treat this critical care population.
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Intravenous amiodarone and procainamide are both used as therapies for refractory supraventricular tachycardia (SVT). However, no studies have compared the efficacy and safety of these agents in pediatric patients. All patients treated with intravenous amiodarone or procainamide during 25 consecutive months for the following mechanisms of SVT were included: orthodromic reciprocating tachycardia, intra-atrial reentrant tachycardia, and ectopic atrial tachycardia; junctional ectopic tachycardia was excluded. Treatment response was categorized as full success, partial success, or failure. Partial success was defined as clinical improvement and/or arrhythmia control but not meeting full success criteria. Adverse events were classified as major (requiring resuscitation) or minor (management changes). There were 40 episodes of SVT in 37 patients (median age, 34 days; 24 with congenital heart disease). Amiodarone was the initial therapy in 26 cases and procainamide in 14 cases. If partial and full success are combined, procainamide was successful in 71% of cases compared with 34% for amiodarone (P=0.046). If partial success is considered a treatment failure, procainamide was successful in 50% compared with 15% for amiodarone (P=0.029). Ten patients received the second medication after the first failed. Success was achieved in 5 of 8 amiodarone-to-procainamide crossovers compared with 1 of 2 procainamide-to-amiodarone crossovers. One major and 10 minor adverse events occurred in amiodarone patients versus 6 minor adverse events in procainamide patients (P=NS). Conclusions In this cohort, procainamide achieved greater success compared with amiodarone in the management of recurrent SVT without statistically significant differences in adverse event frequency.

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Hypothermia in near-drowning victims is a serious problem that impacts clinical decision-making. The purpose of this trial was to determine the reliability of tympanic temperature measurements compared to oral temperature measurements after immersion in water. After ethical approval was obtained, we studied oral and tympanic temperature in 25 volunteer swimmers (aged 18 - 49 years). Sublingual (Fixotherm; Tradesell Europe, Egiharting, Germany) and tympanic (First Temp Genius; Sherwood Medical, Sulzbach, Germany) temperature measurements were performed before entering the water, after 45 min of immersion in water, and 15 min after leaving the water. During the immersion phase, the ears were temporarily immersed. A control group (the same 25 volunteers) had to swim for the same amount of time without ever immersing their heads in the water. The trial was performed in an indoor swimming pool at 28°C water and 30°C air temperature. The oral temperature did not change over time in either group.
The tympanic temperature was significantly lower after immersion compared to baseline in the ‘immersed’ group (33.7°C vs. 37.5°C, p < 0.001), increased significantly in the recovery period, but remained significantly lower than baseline (36.0°C vs. 37.5°C, p < 0.001). At baseline, the oral temperature was lower compared to the tympanic temperature. This relationship reversed after immersion and remained reversed until the end of the trial in the immersion group. The control group maintained oral temperatures lower than tympanic throughout the study; furthermore, the control group had no clinically relevant change in oral or tympanic temperature over the time (tympanic temperature: 37.4°C vs. 37.2°C, p = 0.06). Our data suggest that in water-related accidents such as near drowning, the values of body (core) temperature obtained via use of infrared ear thermometry are unreliable, and should not be used for clinical decision-making.

6/
We reviewed videos of 61 extremely preterm infants taken immediately after birth. The majority cried (69%) and breathed (80%) without intervention. Most preterm infants are not apnoeic at birth.

7/
Performance of prehospital ECGs expedites identification of ST-elevation myocardial infarction and reduces door-to-balloon times for patients receiving reperfusion therapy. To fully realize this benefit, emergency medical service performance must be measured and used in feedback reporting and quality improvement. METHODS AND RESULTS: This quasi-experimental design trial tested an approach to improving emergency medical service prehospital ECGs using feedback reporting and quality improvement interventions in two cities' emergency medical service agencies and receiving hospitals. All patients aged ≥30 years, calling 9-1-1 with possible acute coronary syndrome, were included. In total, 6994 patients were included: 1589 patients in the baseline period without feedback and 5405 in the intervention period when there were feedback reports and quality improvement interventions. Mean age was 66+/−17 years, and women represented 51%. Feedback and quality improvement increased prehospital ECG performance for patients with acute coronary syndrome from 76% to 93% (P≤0.0001) and for patients with ST-elevation myocardial infarction from 77% to 99% (P≤0.0001). Aspirin administration increased from 75% to 82% (P=0.001), but the median total emergency medical service run time remained the same at 22 minutes. The proportion of patients with door-to-balloon times of ≤90 minutes increased from 27% to 67% (P=0.006). CONCLUSIONS: Feedback reports and quality improvement improved prehospital...
ECG performance for patients with acute coronary syndrome and ST-elevation myocardial infarction and increased aspirin administration without prehospital transport delays. Improvements in door-to-balloon times were also seen.

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The purpose of this study was to report the efficacy of intravenous amiodarone alone or in combination with digoxin in neonates and small infants with life-threatening supraventricular tachyarrhythmia (SVT). METHODS: We retrospectively analyzed 9 neonates and small infants with life-threatening or resistant SVT who were treated with intravenous amiodarone alone or in combination with digoxin. RESULTS: This report consists of 8 patients with reentrant SVT and 1 with atrial flutter. On admission, 7 patients had a congestive heart failure and 3 of whom had cardiovascular collapse. Intravenous rapid bolus of adenosine caused a sustained sinus rhythm in 4 patients. These patients were given digoxin initially, but recurrence of persistent tachyarrhythmia necessitated the use of intravenous amiodarone in all these patients. Amiodarone was given initially to the other 4 patients in whom adenosine caused only temporary conversion to the sinus rhythm. It was effective in 2 patients. In the other 2, digoxin was added to therapy for tachycardia control. Amiodarone alone or in combination with digoxin effectively controlled reentrant SVT in all patients. This combined treatment caused ventricular rate control in patient with atrial flutter, and conversion to the stable sinus rhythm was achieved at approximately 8 months. CONCLUSIONS: Intravenous amiodarone alone or in combination with digoxin was found to be safe and effective in controlling refractory and life-threatening SVT in neonates and small infants.

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Guidelines for advanced life support of cardiac arrest (CA) emphasize continuous and effective chest compressions as one of the main factors of cardiopulmonary resuscitation (CPR) success. The use of an automated load distributing chest compression device for CPR is promising but initial studies on survival show contradictory results. The aim of this study was to evaluate the effects of AutoPulse on blood pressure (BP) in out-of-hospital CA patients. METHODS: This prospective study included adult patients presenting with in refractory out-of-hospital CA. Invasive arterial BP produced by AutoPulse was compared to BP generated by manual CPR (active compression-decompression). Systolic, diastolic and mean BP and end-tidal carbon dioxide were recorded before and after initiating the automated band device for each patient. The comparison of diastolic BP produced by manual CPR versus automated chest compressions was the primary end point. RESULTS: Hemodynamics in 29 patients are reported and analyzed.
Median diastolic BP increased after starting AutoPulse from 17[11-25] mmHg to 23[18-28] mmHg (P < 0.001). Median systolic BP increased from 72[55-105] mmHg to 106[78-135] mmHg (P = 0.02). Mean BP increased from 29[25-38] mmHg to 36[30-15] mmHg (P = 0.002). On the other hand, End-Tidal CO₂ did not increase significantly with AutoPulse (21[13-36] vs. 22[12-35] mmHg, P = 0.80).

CONCLUSIONS: In patients with out-of-hospital CA, the use of AutoPulse is associated with an increased diastolic BP compared to manual chest compressions. While its benefit to survival has yet to be demonstrated, the increase in diastolic and mean BP is a promising outcome for AutoPulse use.


OBJECTIVES: While the short-term (<7-day) safety and efficiency of electrical cardioversion for emergency department (ED) patients with atrial fibrillation or flutter have been established, the 30-day outcomes with respect to stroke, thrombo-embolic events, or death have not been investigated. METHODS: A two-center cohort of consecutive ED patients undergoing cardioversion for atrial fibrillation or flutter between January 1, 2000, and September 30, 2007, was retrospectively investigated. This cohort was probabilistically linked with both a regional ED database and the provincial health registry to determine which patients had a subsequent ED visit or hospital admission, stroke, or thrombo-embolic event or died within 30 days. In addition, trained reviewers performed a detailed chart abstraction on 150 randomly selected patients, with emphasis on demographics, vital signs, medical treatment, and predefined adverse events. Haemodynamically unstable patients or those whose condition was the result of an underlying acute medical diagnosis were excluded. Data were analyzed by descriptive methods. RESULTS: During the study period, 1,233 patients made 1,820 visits for atrial fibrillation or flutter to the ED. Of the 400 eligible patients undergoing direct-current cardioversion (DCCV), no patients died, had a stroke, or had a thrombo-embolic event in the following 30 days (95% confidence interval [CI] = 0.0 to 0.8% for all outcomes). A total of 141 patients were included in the formal chart review, with five patients (3.5%, 95% CI = 0.5% to 6.6%) failing cardioversion, six patients (4.3%, 95% CI = 0.9% to 7.6%) having a minor adverse event that did not change disposition, and five patients (3.5%, 95% CI = 0.5% to 6.6%) admitted to hospital at the index visit. CONCLUSIONS: Cardioversion of patients with atrial fibrillation or flutter in the ED appears to have a very low rate of long-term complications.

To describe the use and feasibility of therapeutic hypothermia after pediatric cardiac arrest. DESIGN: Retrospective cohort study. SETTING: Pediatric tertiary care university hospital. PATIENTS: Infants and children (age 1 wk to 21 yrs) without complex congenital heart disease with return of spontaneous circulation after in-hospital or out-of-hospital cardiac arrest from 2000 to 2006. INTERVENTION: None. MEASUREMENTS AND MAIN RESULTS: We studied 181 patients after cardiac arrest, of which 91% were asphyxial in etiology (vs. cardiac) and 52% occurred in-hospital. Overall survival to hospital discharge was 45%. Forty patients received therapeutic hypothermia; all were admitted during or after 2002. Sixty percent of patients in the therapeutic hypothermia group had an initial temperature <35 degrees C. The median therapeutic hypothermia target temperature was 34.0 degrees C (33.5-34.8 degrees C), was reached by 7 hrs (5-8 hrs) after admission in patients who were not hypothermic on admission, and was maintained for 24 hrs (16-48 hrs). Re-warming lasted 6 hrs (5-8 hrs). In the therapeutic hypothermia group, temperature <32 degrees C occurred in 15% of patients and was associated with higher hospital mortality (29% vs. 11%; p = .02). Patients treated with therapeutic hypothermia differed from those treated with standard therapy, with more un-witnessed cardiac arrest (p = .04), more doses of epinephrine to achieve return of spontaneous circulation (p = .03), and a trend toward more out-of-hospital cardiac arrests (p = .11). After arrest, therapeutic hypothermia patients received more frequent electrolyte supplementation (p < .05). Standard therapy patients were twice as likely as therapeutic hypothermia patients to have a fever (>38 degrees C) after arrest (37% vs. 18%; p = .02) and trended toward a higher rate of re-arrest (26% vs. 13%; p = .09). Rates of red blood cell transfusions, infection, and arrhythmias were similar between groups. There was no difference in hospital mortality (55.0% therapeutic hypothermia vs. 55.3% standard therapy; p = 1.0), and 78% of the therapeutic hypothermia survivors were discharged home (vs. 68% of the standard therapy survivors; p = .46). In multivariate analysis, mortality was independently associated with initial hypoglycemia or hyperglycemia, number of doses of epinephrine during resuscitation, asphyxial etiology, and longer duration of cardiopulmonary resuscitation, but not treatment group (odds ratio for mortality in the therapeutic hypothermia group, 0.47; p = .2). CONCLUSIONS: This is the largest study reported on the use of therapeutic mild hypothermia in pediatric cardiac arrest to date. We found that therapeutic hypothermia was feasible, with target temperature achieved in <3 hrs overall. Temperature below target range was associated with increased mortality. Prospective study is urgently needed to determine the efficacy of therapeutic hypothermia in pediatric patients after cardiac arrest.

OBJECTIVES: Recently, a novel cooling pad was developed for rapid induction of mild hypothermia after cardiac arrest. The aim of this study was to evaluate the cooling efficacy of three different pad designs for in-hospital cooling.

METHODS: Included in this prospective interventional study were patients with esophageal temperature (Tes) > 34°C on admission. The cooling pad consists of multiple cooling units, filled with a combination of graphite and water, which is pre-cooled to -18°C (design A) or to -9°C (designs B and C) before use. The designs of the cooling pad differed in number, shape, and thickness of the cooling units, with weights of 9.7 kg (design A), 5.3 kg (design B), and 6.2 kg (design C). All three designs were tested in sequential order and were changed according to the results found in the previous trial. Cooling was started after admission until Tes = 34°C, when the cooling pad was removed. The target temperature of Tes = 32-34°C was maintained for 24 hours. Data are presented as medians and interquartile ranges (IQRs = 25%-75%) or proportions.

RESULTS: Cooling rates were 3.4 degrees C/hour (IQR = 2.5-3.7) with design A (n = 12), 2.8 degrees C/hour (IQR = 1.6-3.3) with design B (n = 7), and 2.9 degrees C/hour (IQR = 1.9-3.6) with design C (n = 10; p = 0.5). To reach 34°C, the cooling pad had to be exchanged with a new one due to melting and therefore depleting cooling capacity in three patients with design A, in five patients with design B, and in no patient with design C (p = 0.004).

CONCLUSIONS: With adequate design and storage temperature, the cooling pad proved to be efficient for rapid in-hospital cooling of patients resuscitated from cardiac arrest.


Objectives: The annual incidence of out-of-hospital cardiac arrest (OOHCA) in the United States is approximately 6 per 10,000 population and survival remains low. Relatively little is known about the performance characteristics of a two-tiered emergency medical services (EMS) system split between fire-based basic life support (BLS) dispersed from fixed locations and hospital-based advanced life support (ALS) dispersed from non-fixed locations. The objectives of this study were to describe the incidence of OOHCA in Denver, Colorado, and to define the prevalence of survival with good neurologic function in the context of this particular EMS system.

Methods: This was a retrospective cohort study using standardized abstraction methodology. A two-tiered hospital-based EMS system for the County of Denver and 10 receiving hospitals were studied. Consecutive adult patients who experienced non-traumatic OOHCA from January 1, 2003, through December 31, 2004, were enrolled. Demographic, prehospital arrest characteristics, treatment data, and survival data using the Utstein template were collected. Good neurologic survival was defined by a Cerebral Performance Categories (CPC) score of 1 or 2.

Results: During the study period, 1,985 arrests occurred. Of these, 715
(36%) had attempted resuscitation by paramedics and constitute our study sample. The median age was 65 years (interquartile range = 52201378 years), 69% were male, 41% had witnessed arrest, 25% had bystander cardiopulmonary resuscitation (CPR) performed, and 30% had ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT) as their initial rhythm. Of the 715 patients, 545 (76%) were transported to a hospital, 223 (31%) had return of spontaneous circulation (ROSC), 175 (25%) survived to hospital admission, 58 (8%) survived to hospital discharge, and 42 (6%, 95% confidence interval [CI] = 4% to 8%) had a good neurologic outcome. Conclusions: Out-of-hospital cardiac arrest survival in Denver, Colorado, is similar to that of other United States communities. This finding provides the basis for future epidemiologic and health services research in the out-of-hospital and ED settings in our community.


Background: Previous studies established that a level of partial pressure end-tidal carbon dioxide (pEtCO₂) of 10 mm Hg divided patients undergoing advanced life support (ALS) into those likely to be resuscitated (values > 10 mm Hg) and those likely to die during ALS (values < 10 mm Hg). Objective: The study tested the significance of a sudden increase in the PETCO2 in signaling the return of spontaneous circulation (ROSC) during ALS. Material and Methods: (pEtCO₂) values were continuously recorded during ALS in out-of-hospital patients with cardiac arrest. Constant ventilation was maintained by an automatic device. There were 108 patients, representing two extreme outcomes of ALS, who were subdivided into two groups. The first group included 59 patients with a single ROSC followed by a stable spontaneous circulation. The second group included 49 patients with no signs of ROSC. Results: ROSC was associated with a sudden increase in (pEtCO₂) that remained significantly higher than before ROSC. PETCO2 did not rise during the entire ALS in the second group of patients without ROSC and was lower than in the first group of patients. Conclusions: In constantly ventilated patients, (pEtCO₂) is significantly higher (about 10 mm Hg) after ROSC than before ROSC. A sudden increase in (pEtCO₂) exceeding 10 mm Hg may indicate ROSC. Consequently, the rule of 10 mm Hg may be extended to include a sudden increase in continuously recorded (pEtCO₂) by more than 10 mm Hg as an indicator of the possibility of ROSC.


Recent studies have shown that a new emergency medical services (EMS) protocol for treating patients who suffer out-of-hospital cardiac arrest (OHCA), cardio-cerebral resuscitation (CCR), significantly improves survival compared to standard advanced life
support (ALS). However, due to their different physiology, it is unclear if all elders, or any subsets of elders who are OHCA victims, would benefit from the CCR protocol. OBJECTIVES: The objectives of this analysis were to compare survival by age group for patients receiving CCR and ALS, to evaluate their neurologic outcome, and to determine what other factors affect survival in the subset of patients who do receive CCR. METHODS: An analysis was performed of 3,515 OHCAs occurring between January 2005 and September 2008 in the Save Hearts in Arizona Registry. A total of 1,024 of these patients received CCR. Pediatric patients and arrests due to drowning, respiratory, or traumatic causes were excluded. The registry included data from 62 EMS agencies, some of which instituted CCR. Outcome measures included survival to hospital discharge and cerebral performance category (CPC) scores. Logistic regression evaluated outcomes in patients who received CCR versus standard ALS across age groups, adjusted for known potential confounders, including bystander cardiopulmonary resuscitation (CPR), witnessed arrest, EMS dispatch-to-arrival time, ventricular fibrillation (Vfib), and agonal respirations on EMS arrival. Predictors of survival evaluated included age, sex, location, bystander CPR, witnessed arrest, Vfib/ventricular tachycardia (Vtach), response time, and agonal breathing, based on bivariate results. Backward stepwise selection was used to confirm predictors of survival. These predictors were then analyzed with logistic regression by age category per 10 years of age. RESULTS: Individuals who received CCR had better outcomes across age groups. The increase in survival for the subgroup with a witnessed Vfib was most prominent on those<40 years of age (3.7% for standard ALS patients vs. 19% for CCR patients, odds ratio [OR]=5.94, 95% confidence interval [CI]=1.82 to 19.26). This mortality benefit declined with age until the >or=80 years age group, which regained the benefit (1.8% vs. 4.6%, OR=2.56, 95% CI=1.10 to 5.97). Neurologic outcomes were also better in the patients who received CCR (OR=6.64, 95% CI=1.31 to 32.8). Within the subgroup that received CCR, the factors most predictive of improved survival included witnessed arrest, initial rhythm of Vfib/Vtach, agonal respirations upon arrival, EMS response time, and age. Neurologic outcome was not adversely affected by age. CONCLUSIONS: Cardiac-cerebral resuscitation is associated with better survival from OHCA in most age groups. The majority of patients in all age groups who survived to hospital discharge and who could be reached for follow-up had good neurologic outcome. Among patients receiving CCR for OHCA, witnessed arrest, Vfib/Vtach, agonal respirations, and early response time are significant predictors of survival, and these do not change significantly based on age.

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The ASPIRE trial (AutoPulse Assisted Prehospital International Resuscitation) was multicenter exception from consent clinical trial that compared mechanical cardiopulmonary resuscitation (CPR) with a device (AutoPulse-CPR) to traditional manual CPR (manual-CPR) in out-of-hospital cardiac arrest. Enrollment was suspended early due to safety concerns. One site (site C) made a potentially
important protocol change midtrial, and enrollment at that site was noted to be independently associated with outcome. The study used a post hoc reanalysis of source data and documentation using standard statistical approaches evaluating for possible secular, temporal, and trial design, factors that may have related to the trial’s outcome. The protocol change at site C also appears to have resulted in a delay in application of AutoPulse-CPR. Before and after the protocol change survival in patients receiving AutoPulse-CPR decreased from 19.6% to 4% (P = .024). Logistic regression analysis showed site C was significantly different (P = .008) from the remaining sites with respect to survival. Unlike site C, the other sites actually showed an increase over time in the primary end point of 4-hour survival (P = .008) favorable to AutoPulse-CPR. There did not appear to be significant safety (P = .42) nor efficacy concerns (P = .17) at these sites. The difference in survival that caused early suspension of ASPIRE appears to have been limited to one site after its protocols change. At the time the trial was suspended, the outcomes of patients at the other sites appear to have been trending in favor of the intervention.

17/
BACKGROUND: From 1994 to 2005, the Pediatric Perioperative Cardiac Arrest Registry collected data on 373 anesthesia-related cardiac arrests (CAs) in children, 34% of whom had congenital or acquired heart disease (HD). METHODS: Nearly 80 North American institutions that provide anesthesia for children voluntarily enrolled in the Pediatric Perioperative Cardiac Arrest Registry. A standardized data form for each peri-operative CA in children 18 years old or younger was submitted anonymously. We analyzed causes of and outcomes from anesthesia-related CA in children with and without HD. RESULTS: Compared with the 245 children without HD, the 127 children with HD who arrested were sicker (92% vs 62% ASA physical status III-V; P < 0.01) and more likely to arrest from cardiovascular causes (50% vs 38%; P = 0.03), although often the exact cardiovascular cause of arrest could not be determined. Mortality was higher in patients with HD (33%) than those without HD (23%, P = 0.048) but did not differ when adjusted for ASA physical status classification. More than half (54%) of the CA in patients with HD were reported from the general operating room compared with 26% from the cardiac operating room and 17% from the catheterization laboratory. The most common category of HD lesion in patients suffering CA was single ventricle (n = 24). At the time of CA, most patients with congenital HD were either unrepaired (59%) or palliated (26%). Arrests in patients with aortic stenosis and cardiomyopathy were associated with the highest mortality rates (62% and 50%), although statistical comparison was precluded by small sample size for some HD lesions. Children with HD were sicker compared with those without HD at the time of anesthesia-related CA and had a higher mortality after arrest. These arrests were reported most frequently from the general operating room and were likely to be from cardiovascular causes. The identification of causes of and factors relating to anesthesia-related CA suggests possible strategies for prevention.
Several techniques (such as cooling and covering) are recommended in the first aid management of burn injured patients, both for lay persons and for EMS. Few studies have examined the rates of compliance with these recommendations. This study is a burn registry query performed in a suburban academic medical center with a regional burn unit. Patients seen by the burn service between January 2008 and February 2009 were included. Demographics, injury characteristics, rates of implementation of first aid, and method of transport to medical care (self vs ambulance) were recorded. Rates of implementation are reported as proportions with confidence intervals (CIs) and rates of implementation in those transported by self vs ambulance and work-related vs non-work-related burns are compared using [chi]2 tests. Two hundred eleven burn patients were entered in the registry during the study period. Mean age was 27.0 (SD, 22.1) years, 44.3% were female, 95.2% were thermal burns, and 29.9% were transported by ambulance; 72.7% (95% CI, 66-78%) reported cooling their burn before presentation for medical care. Of those, 39.9% reported using tap water to cool their burn (95% CI, 33.4-46.8%), whereas 25.2% used ice (95% CI, 18.4-33.5%), and 8.9% used a cooling blanket (95% CI, 5-15%). Only 22.2% reported having applied a dressing before arrival in the hospital (95% CI, 16.9-28.5%). There were no significant differences between the groups who transported themselves to care in comparison with those who were brought in by ambulance in terms of cooling with water (P = .516), cooling with ice (P = .063), or application of dressing (P = .506). Further, no differences existed between those reporting cooling of the burn and those who did not in terms of patient characteristics. Rates of first aid administered for burn injury by lay persons before arrival at a burn center are high. A substantial percentage of people continue to use ice to cool their burns despite evidence of its potential detrimental nature. There is no difference in the rates of first aid implementation in those who did and did not contact EMS. The initial call to EMS might be used to instruct lay persons in appropriate burn first aid while awaiting the ambulance.

Background: Studies examining survival outcomes after in-hospital cardiopulmonary arrest (CPA) among intensive care unit (ICU) patients requiring medications for hemodynamic support are limited. Methods: We identified 49,656 adult patients with a first CPA occurring in an ICU between January 1, 2000 and August 26, 2008 within the National Registry of Cardiopulmonary Resuscitation. Survival outcomes of patients requiring hemodynamic support immediately prior to CPA were compared to those of patients who did not receive hemodynamic support (pressors), using multivariable logistic regression analysis to adjust for differences in
demographics and clinical characteristics. Pressor medications included epinephrine, norepinephrine, phenylephrine, dopamine, dobutamine, and vasopressin. Results: The overall rate of survival to hospital discharge was 15.9%. Patients receiving pressors prior to CPA were less likely to survive to discharge (9.3% vs 21.2%, p<0.0001). After multivariable adjustment, patients on pressors before pulseless CPA were 55% less likely to survive to discharge (adjusted OR=0.45, 95% CI: 0.42-0.48). Age[≥65] years (adjusted OR=0.77; 95%CI: 0.73-0.82), non-White race (adjusted OR=0.58; 95%CI=0.54-0.62) and mechanical ventilation (adjusted OR=0.60; 95%CI= 0.56-0.63) were also variables that can be identified prior to CPA that were independently associated with lower survival. More than half of survivors were discharged to rehabilitation or extended care facilities. Only 3.9% of patients who had CPA despite pressors were discharged home from the hospital, as compared to 8.5% of patients with a CPA not on pressors (adjusted OR=0.53; 95% CI: 0.49-0.59). Conclusions: While overall survival of ICU patients was 15.9%, patients requiring pressors with a CPA were half as likely to survive to discharge and to be discharged home than patients not on pressors. This study provides robust estimates of CPR outcomes of critically ill patients, and may assist clinicians to "inform consent" for this procedure.

NON-SYSTEMATIC REVIEWS / OPINION

20/
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The treatment of patients poisoned with drugs and pharmaceuticals can be quite challenging. Diverse exposure circumstances, varied clinical presentations, unique patient-specific factors, and inconsistent diagnostic and therapeutic infrastructure support, coupled with relatively few definitive antidotes, may complicate evaluation and management. The historical approach to poisoned patients (patient arousal, toxin elimination, and toxin identification) has given way to rigorous attention to the fundamental aspects of basic life support—airway management, oxygenation and ventilation, circulatory competence, thermoregulation, and substrate availability. Selected patients may benefit from methods to alter toxin pharmacokinetics to minimize systemic, target organ, or tissue compartment exposure (either by decreasing absorption or increasing elimination). These may include syrup of ipecac, oro-gastric lavage, activated single- or multi-dose charcoal, whole bowel irrigation, endoscopy and surgery, urinary alkalinization, saline diuresis, or extracorporeal methods (haemodialysis, charcoal haemoperfusion, continuous veno-venous haemofiltration, and exchange transfusion). Pharmaceutical adjuncts and antidotes may be useful in toxicant-induced hyperthermias. In the context of analgesic, anti-inflammatory, anticholinergic, anticonvulsant, anti-hyperglycemic, antimicrobial, anti-neoplastic, cardiovascular, opioid, or sedative-hypnotic agents overdose, N-acetylcysteine, physostigmine, L-carnitine, dextrose, octreotide, pyridoxine, dexrazoxane, leucovorin, glucarpidase, atropine, calcium, digoxin-specific antibody fragments, glucagon, high-dose insulin euglycemia therapy, lipid emulsion, magnesium, sodium bicarbonate, naloxone, and flumazenil are specifically reviewed. In
summary, patients generally benefit from aggressive support of vital functions, careful history and physical examination, specific laboratory analyses, a thoughtful consideration of the risks and benefits of decontamination and enhanced elimination, and the use of specific antidotes where warranted. Data supporting antidotes effectiveness vary considerably. Clinicians are encouraged to utilize consultation with regional poison centers or those with toxicology training to assist with diagnosis, management, and administration of antidotes, particularly in unfamiliar cases.

21/
Experiences in treating wartime casualties in Iraq and Afghanistan have already led to changes in civilian trauma care practices. While advances in the care of civilian musculoskeletal injuries are likely as a result of ongoing military basic and clinical research, major advances in resuscitative care have already been realized. Early liberal use of tourniquets to control bleeding from combat-associated extremity trauma has led to decreased mortality. Military experience has demonstrated that use of temporary intravascular shunts is effective for mitigating ischemic injury from vascular trauma until definitive repair can be accomplished. Hemostatic dressings have improved the surgeon's hemorrhage control armamentarium. Clinical experience with hypotensive resuscitation has led to refinement and improvement in the technique. Use of recombinant factor VIIa has improved hemorrhage control in the context of brain injury and coagulopathy and increasing the ratio of plasma to red cells during early shock resuscitation has improved survival.

22/
Survival from out-of-hospital cardiac arrest. Cardiac arrest is an important public health problem and often occurs in the out-of-hospital setting in patients without a prior history of heart disease. Very few communities or emergency medical service (EMS) systems report survival rates for out-of-hospital cardiac arrest. Among those who do, survival rates vary substantially between cities, due in large part to community differences in the chain of survival. To improve survival in cardiac arrest, care must be optimized at each point along the cardiac arrest continuum, including a rapid emergency response, provision of cardiopulmonary resuscitation (CPR) by bystanders, delivery of high-quality chest compressions with minimal interruptions by first responders, rapid defibrillation, and optimization of postresuscitation care, including therapeutic hypothermia. Important current initiatives to improve cardiac arrest survival include hands-only CPR delivered by laypersons prior to the arrival of EMS, dispatcher-assisted CPR, and implementation of hospital-based therapeutic hypothermia protocols to improve postresuscitation care. Optimizing cardiac arrest
survival requires a team effort between EMS directors, emergency physicians, cardiologists, hospital leadership, and the public.

23/
It is recognized that the quality of cardiopulmonary resuscitation (CPR) is an important predictor of outcome from cardiac arrest yet studies consistently demonstrate that the quality of CPR performed in real life is frequently sub-optimal. Mechanical chest-compression devices provide an alternative to manual CPR. This review will consider the evidence and current indications for the use of these devices. Recent findings: Physiological and animal data suggest that mechanical chest-compression devices are more effective than manual CPR. However, there is no high quality evidence showing improved outcomes in humans. There are specific circumstances where it may not be possible to perform manual CPR effectively for example, during ambulance transport to hospital, en-route to and during cardiac catheterization, prior to organ donation and during diagnostic imaging where using these devices may be advantageous. Summary: There is insufficient evidence to recommend the routine use of mechanical chest-compression devices. There may be specific circumstances when CPR is difficult or impossible where mechanical devices may play an important role in maintaining circulation. There is an urgent need for definitive clinical and cost effectiveness trials to confirm or refute the place of mechanical chest-compression devices during resuscitation.

ANIMAL / MANIKIN / CADAVER/ MODELS OF CARDIAC ARREST STUDIES

24/
PURPOSE: Epinephrine is frequently administered as an essential drug for cardiopulmonary resuscitation (CPR) in clinical situations. Unfortunately, epinephrine elicits unfavorable effects, for example pulmonary edema, both during and after CPR. We hypothesized that administration of landiolol during CPR with epinephrine would reduce the degree of pulmonary edema and improve survival. Therefore using a rat CPR model, we investigated the effect of landiolol with epinephrine on pulmonary and cardiac injury following CPR. METHODS: Twelve male Sprague-Dawley rats were allocated to Group-E (0.02 mg/kg epinephrine) and thirteen animals to Group-EL (0.02 mg/kg epinephrine with 0.5 mg/kg landiolol). After tracheotomy, cardiac arrest was induced by obstructing the endotracheal tube. We measured the lung wet-to-dry (W/D) weight ratio to evaluate the degree of pulmonary edema 2 h after CPR. The haematocrit (Hct) difference between before and after CPR (Hct-D) was calculated. We measured the plasma levels of troponin-I (T-I) to evaluate the degree of cardiac injury. RESULTS: The lung W/D weight ratio in Gr.-E (6.4 +/- 1.06, mean +/- SD) was
significantly higher than that for Gr.-EL (4.9 +/- 0.80, p < 0.01). Hct-D was significantly higher in Gr E (10.2 +/- 3.1%) than in Gr EL (5.2 +/- 3.5%, p < 0.01). We observed no difference in survival or difference of T-I. (Gr E: 2.62 +/- 0.51 ng/ml, Gr EL: 3.43 +/- 2.72 ng/ml).

CONCLUSION: Administration of landiolol during CPR with epinephrine prevented the development of pulmonary edema and the increase in Hct during and after CPR.

25/

Cardiopulmonary resuscitation is associated with high mortality and poor neurological recovery. Cardiopulmonary resuscitation can cause ischemia-reperfusion injury of the whole body and brain. We assessed the hypothesis that controlled reperfusion of the whole body with cardiopulmonary bypass would limit reperfusion injury after 15 minutes of normothermic cardiac arrest with better survival and neurological recovery. Methods: Eleven pigs were exposed to normothermic ischemia for 15 minutes by inducing ventricular fibrillation, followed by cardiopulmonary resuscitation (control group, n = 4) or 60 minutes of cardiopulmonary bypass (treatment group, n = 7). Conditions of reperfusion and the reperfusate were controlled with cardiopulmonary bypass. Animals were observed for up to 7 days, and neurological assessment (Neurological Deficit Score: 0, normal; 500, brain death), magnetic resonance imaging, and brain histology were performed. Results: All animals in the control group died after 20 minutes of cardiopulmonary resuscitation (n = 4). All (n = 7) survived in the treatment group. Clinically apparent neurological recovery occurred within 24 hours; 1 fully conscious pig could not walk. The Neurological Deficit Score was 98 +/- 31 in all animals (n = 7) after 24 hours and decreased to 0 after 48 hours in 4 of 5 eligible animals; 1 animal had a Neurological Deficit Score of 110 after 3 days. Brain histology revealed hypoxic and apoptotic neurons with an inconclusive correlation regarding neurological recovery. Conclusion: Clinically apparent neurological recovery after a period of 15 minutes of cardiac arrest occurred with cardiopulmonary bypass instead of cardiopulmonary resuscitation for reperfusing the whole body. This approach contrasts with cardiopulmonary resuscitation, in which resuscitation has been reported as successful after only 3 to 5 minutes of cardiac arrest. Cardiopulmonary bypass might be a key to improve survival and neurological recovery after cardiac arrest.

26/

Gastric inflation is a significant issue when ventilation is performed in cases of unprotected airway. The objective of this study was to compare the amounts of gastric insufflation and tidal volumes produced by a hose-extended bag-valve-mask (BVM) device
supplemented by an interposed reservoir bag with a similar BVM without the reservoir in a simulated human model. Fourteen academic dental staff members performed 10 ventilations on a manikin using the reservoir-supplemented device in comparison to the control BVM in a randomized order. Lung compliance was adjusted to 45 (high) and 4.5 mL/mbar (low), and the lower esophageal sphincter pressure (LOSP) simulator to a pressure of 15 and 3 mbar, respectively, in different settings. Lower tidal volumes were observed with the new device than with the control BVM at high compliance with LOSP of 15 mbar (median 506 vs. 787 mL, respectively; p = 0.0002) and LOSP of 3 mbar (median 544 vs. 794 mL, respectively; p = 0.0006), as well as during ventilation at low lung compliance and LOSP of 3 mbar (median 131 vs. 163 mL, respectively; p = 0.0342). No differences were detected at low lung compliance and LOSP of 15 mbar (median 175 vs. 194 mL; p = 0.3804). Gastric inflation almost exclusively occurred in case of low lung compliance, being markedly lower with the new device than with the control device at 15 mbar LOSP (300 vs. 2225 mL, respectively; p = 0.0006), and at 3 mbar LOSP (1138 vs. 3050 mL, respectively; p = 0.0001). Application of the hose-extended bag-valve-mask device supplemented with a reservoir bag reduces tidal volumes. Marked reduction of gastric inflation by use of this device becomes effective under conditions with low lung compliance.

27/
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. 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 90km/h. Performance and acceleration data of chest compressions at different speeds were compared using repeated measures analysis of variance (ANOVA). 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 2Hz component and ratios of 3 12Hz to 2Hz 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. 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.

The optimal oxygen concentration for newborn resuscitation is still discussed. Oxygen administration during re-oxygenation may induce short- and long-term pathologic changes via oxidative stress and has been associated to later childhood cancer. The aim was to study changes in oxidative stress-associated markers in liver and lung tissue of newborn pigs after acute hypoxia followed by re-oxygenation for 30 min with 21, 40, or 100% oxygen compared with room air or to ventilation with 100% oxygen without preceding hypoxia. Nine hours after resuscitation, we found a dose-dependent increase in the matrix metalloproteinase gelatinase activity in liver tissue related to percentage oxygen supply by resuscitation (100% versus 21%; p = 0.002) pointing at more extensive tissue damage. Receiving 100% oxygen for 30 min without preceding hypoxia decreased the expression of VEGFR2 and TGFBR3 mRNA in liver tissue, but not in lung tissue. MMP-, VEGF-, and TGF[beta]-superfamily are vital for the development, growth, and functional integrity of most tissues and our data rise concern about both short- and long-term consequences of even a brief hyperoxic exposure.


The purpose of this study was to determine (1) the role of emergency cardiopulmonary bypass (CPB) after prolonged cardiac arrest and failed cardiopulmonary resuscitation, and (2) the use of systemic hyperkalemia during CPB to convert intractable ventricular fibrillation (VF). Thirty-one pigs (34 +/- 2 kg) underwent 15 minutes of cardiac arrest after induced VF, followed by 10 minutes of cardiopulmonary resuscitation-advanced life support. Peripheral CPB was used if cardiopulmonary resuscitation failed to restore stable circulation. Damage was assessed by evaluating hemodynamics, biochemical variables (creatine kinase-MB, neuron-specific enolase), neurologic deficit score, and brain magnetic resonance imaging. Results: Cardiopulmonary resuscitation alone was successful in only 19% (6 of 31 pigs). Cardiopulmonary bypass was initiated in 81% of animals (25 of 31 pigs) either for hypotension (5 of 25 pigs) or intractable VF (20 of 25 pigs). Defibrillation was successful in 7 of 20 animals during the first 10 minutes after initiating CPB. Ventricular fibrillation persisted more than 10 minutes in 13 of 20 pigs, and animals were treated either with repeated defibrillation (6 of 13 pigs) or with a potassium bolus (7 of 13 pigs) to induce transient cardiac arrest. Overall survival at 24 hours was 84% with cardiopulmonary resuscitation (100% of pigs with hypotension; 71% in CPB-VF < 10 minutes). Despite CPB, fatal myocardial failure occurred after VF duration of more than 10 minutes in all pigs treated with electrical defibrillation, whereas hyperkalemia
allowed 100% cardioversion and 86% survival. Biochemical variables remained elevated in all groups. Similarly, severe brain injury was present in all animals as confirmed by neurologic deficit score (197 +/- 10) and magnetic resonance imaging. Conclusions: Emergency CPB after prolonged cardiac arrest improves survival and allows systemic hyperkalemia to convert intractable VF, but fails to reduce neurologic damage.

30/
The study aimed to clarify the difficulties concerning insertion of advanced airway devices during cardiac arrest. In an observational study using manikins, we examined the airway management techniques of 19 teams at the Osaka Senri medical rally. For ex-post verification, we recorded chest compression and ventilation using the Resusci Anne Advanced Skill Trainer (Laerdal, Norway) and recorded actions of the teams using a video camera. Only a small proportion of teams did not adopt advanced airway management (4 teams, 21.1%). Thirteen teams selected tracheal intubation. None showed chest compression interruptions during intubation manipulation, and the median duration of chest compression interruption during confirmation of post-intubation was 6.4 seconds. The median duration of ventilation interruption during intubation was 45.5 seconds. When teams were evaluated for the duration of direct laryngoscopy, that is, so-called duration of intubation, the median duration was 19 seconds, which constituted a large underestimate compared with the duration of ventilation interruption. This represents an underestimation of about 27 seconds. We considered the issues to be identified for shortening the duration of ventilation interruption. From this study, it is clear that the strategy of Guideline 2005 that was designed to minimize chest compression interruption has permeated deeply. The recommendation that the duration of intubation manipulation should not exceed 30 seconds has had various interpretations, but it is important to focus on the duration of ventilation interruption.

31/
Introduction: Multifaceted approaches using simulation and human factors methods may optimize in-hospital sudden cardiac arrest (SCA) response. The Arrhythmia Simulation/Cardiac Event Nursing Training-Automated External Defibrillator phase (ASCENT-AED) study used in situ medical simulation to compare traditional and AED-supplemented SCA first-responder models. Methods: The study was conducted at an academic 719-bed hospital with institutional review board approval. Two simulation scenarios were
developed and featured either respiratory arrest with perfusing bradycardia or ventricular fibrillation (VF) arrest. Study floors were equipped with either a semi-automated defibrillator (SD) only (control) or with both SD and AED (experimental); subjects functioned as solitary first responders and did not receive resuscitation training. Results: Fifty nurses were enrolled on control (n = 25) and experimental (n = 25) floors. The groups’ non-blinded performances exhibited the following differences during VF scenario: slower calls for help by the control group [mean time to completion of 25 +/- 17 seconds versus 18 +/- 11 seconds for the experimental group (P < 0.05)] and fewer subjects in the control group performing chest compressions [44.0% versus experimental group's 95.8% (P < 0.001)]. Eighty-eight percent of the control group defibrillated the manikin at an average of 155 +/- 59 seconds, with 32.0% of those subjects using semi-automated rhythm analysis; 100% (not significant [NS]) of experimental group defibrillated at 154 +/- 72 seconds (NS) with 100% AED analysis (P < 0.001). Fewer control group subjects (28.0%) were observed during the bradycardia scenarios to perform appropriate chest compressions than the AED-supplemented subjects [69.6% (P = 0.01)]; non-indicated defibrillation was delivered during these scenarios by a single subject in the control group. Twenty-eight percent and 72% of VF scenarios were managed appropriately by control and experimental groups, respectively; bradycardia scenarios were managed without severe adverse event by 64% of control group and 28% of experimental group. Conclusions: In situ simulation can provide useful information, both anticipated and unexpected, to guide decisions about proposed defibrillation technologies and SCA response models for in-hospital resuscitation system design and education before implementation.

32/


Resuscitated cardiac arrest (CA), leading to harmful cardiovascular dysfunction and multiple organ failure, includes a whole-body hypoxia - reoxygenation phenomenon. Opening of the mitochondrial permeability transition pore (mPTP) appears to be a pivotal event in ischaemia - reperfusion injury. We hypothesized that pharmacological inhibition of mPTP opening may prevent the post-CA syndrome. Anaesthetized New Zealand White rabbits underwent a 15 min primary asphyxial CA and 120 min of reperfusion following resuscitation. At reflow, animals received an intravenous bolus of either cyclosporine A (CsA, 5 mg/kg) or NIM 811 (2.5 mg/kg), two potent inhibitors of mPTP opening, or the CsA vehicle (control). Short-term survival, haemodynamics, regional (sonomicrometry), and global cardiac function (d/d and aortic flow) were assessed. We measured markers of cellular injuries and/or organ failure, including troponin Ic release, lactic-dehydrogenase, lactate, creatinine, and alanine aminotransferase. Cyclosporine A and NIM 811 significantly improved short-term survival, post-resuscitation cardiac function, as well as liver and kidney failure (< 0.05). CsA and NIM 811 both attenuated mPTP opening (calcium retention capacity by spectrofluorimetry) and restored oxidative phosphorylation when compared with controls (< 0.05). These data suggest that pharmacological inhibition of mPTP opening, added
to basic life support, attenuates the post-CA syndrome and improves short-term outcomes in the rabbit model.

33/

BACKGROUND: Anesthesiologists are responsible for the management of peri-operative cardiopulmonary arrest in children. This study used simulation to assess the pediatric resuscitation skills of experienced anesthesia residents. METHODS: Nineteen anesthesia residents were evaluated using a pediatric pulseless electrical activity scenario. The authors used a standardized checklist to evaluate the residents' diagnostic and therapeutic interventions. RESULTS: After the onset of pulseless electrical activity, 79% of residents initiated cardiopulmonary resuscitation within 1 minute. Approximately one third (31%) performed chest compressions at the recommended rate. Epinephrine was administered by 95% of residents, but only one third used the correct pediatric dose. All residents administered fluid boluses, but only 16% administered the recommended volume. Only one fourth of the residents considered hyperkalemia as a cause of pulseless electrical activity. None of the residents asked for dosing aids. CONCLUSION: During this simulated pediatric emergency, anesthesia residents demonstrated an acceptable knowledge of general resuscitation maneuvers. However, a subset of resuscitation skills was incorrectly performed, mostly related to age or weight. Importantly, many residents did not consider the full differential diagnosis of pulseless electrical activity. Anesthesia residents may benefit from additional pediatric resuscitation training and practice using cognitive aids to access dosages and complicated diagnostic algorithms.

34/
The LMA Supreme 2122 has been suggested for use in emergency situations by medical personnel with no experience in endotracheal intubation. We evaluated the LMA Supreme when inserted by non-anaesthetists, firstly in a manikin and then in patients. Fifty airway novices inserted a LMA Supreme in a manikin without any complications so we proceeded to the patient phase. Fifty airway novices inserted the LMA Supreme in anaesthetised patients undergoing elective surgery. First time insertion success rate was 86% and overall insertion success rate was 100%. Mechanical ventilation was successful in all cases. Median (IQR [range]) time to establish an airway was 34 s (26-40 [182013145] s). Median (IQR [range]) pharyngeal seal pressure was 23 cmH2O (19-28 [13201340] cmH2O). There were no important complications. Results are consistent with previous studies of use of the LMA Supreme by airway experts. We conclude that the LMA supreme is suitable for use by airway novices. Further research is needed before it may be recommended for cardiopulmonary resuscitation and emergency airway use.

PURPOSE: The 90 degrees rotation technique for inserting the ProSeal laryngeal mask airway (PLMA) in anesthetized paralyzed patients was compared with the index finger insertion technique. METHODS: One hundred twenty Asian adult patients were randomly allocated to either a standard technique group or a rotation technique group. A PLMA size 4 was used for women and size 5 was used for men. In the standard technique group (n = 60), the PLMA was inserted using the index finger. In the rotation technique group (n = 60), the entire cuff of the PLMA was placed in the patient's mouth in a midline approach without finger insertion, rotated 90 degrees counter clockwise around the patient's tongue, advanced and then rotated back until resistance was felt. The primary outcome was success at first insertion. Secondary outcome measures were insertion time and complications.

RESULTS: The success rate at first insertion was greater for the rotation technique group than for the standard technique group (100% vs 83%, respectively; P = 0.003), and less time was required (11 +/- 3 sec vs 19 +/- 16 sec, respectively; P = 0.03). The incidence of postoperative sore throat was lower for the rotation technique group than for the standard technique group (12% vs 33%, respectively; P = 0.009), and blood staining on the PLMA was less (8% vs 40%, respectively; P < 0.001). CONCLUSION: The 90 degrees rotation technique for inserting the PLMA is more successful than the standard index finger insertion technique. It is associated with fewer side effects, such as blood on the PLMA and sore throat, which suggests it causes less pharyngeal trauma.


Objectives: In accidental hypothermia, normal signs of death are unreliable. It is generally accepted that a lifeless person is beyond the limits of rescue if plasma potassium (P-potassium) is higher than 10mmol/l. However, the rate of increase in potassium or in other markers after cardiac arrest has not been carefully studied in hypothermic individuals. The aim of this animal study was to assess biochemical changes after anoxic circulatory arrest at hypothermia and at normothermia followed by external cooling.

Methods: Five pigs were treated with heparin and extracorporeal circulation and cooled to 20° C (primary hypothermia group). The animals were weaned from extracorporeal circulation, suffered cardiac arrest, and were cooled externally with ice to mimic victims found in a cold environment. With the use of intermittent external cardiac compressions mixing the blood, arterial P-potassium was followed after cardiac arrest until the level exceeded 10mmol/l. Another group of five pigs (anoxic cardiac arrest group) were treated with heparin and killed by anoxia at normothermia and were thereafter treated and followed similarly to the primary hypothermia group. Results: In primary hypothermia P-potassium exceeded 10mmol/l after median 3.5 h, whereas in anoxic cardiac
arrest P-potassium exceeded 10 mmol/l after median 1 h. Conclusion: This study shows that if cardiac arrest occurs before hypothermia is established, P-potassium increases quickly in contrast to the situation when hypothermia induces cardiac arrest. Thus, a low P-potassium in a hypothermic individual with cardiac arrest indicates that cardiac arrest occurred recently or was secondary to the hypothermic event.

CASE SERIES / CASE STUDIES/ LETTERS/EDITORIALS

37/
Heat stroke is rare and usually occurs in warm conditions. It is often fatal. This paper reports six runners from two road-running events who developed heat stroke despite cool conditions and who improved quickly with immediate treatment.

38/
OBJECTIVE: Pediatric cardiac arrest unresponsive to advanced life support and several adrenaline doses has a very poor prognosis. Alternative vasopressors could improve the results of resuscitation in such cases. We report our experience with the compassionate administration of terlipressin in children who suffered in-pediatric intensive care unit cardiac arrest and did not respond to immediate advanced life support and at least three epinephrine doses. DESIGN: Prospective multicenter registry. SETTING: Three pediatric intensive care units at university-affiliated tertiary care children’s hospitals. PATIENTS: Five pediatric patients aged 5 months to 12 yrs, with in-pediatric intensive care unit cardiac arrest unresponsive to advanced life support that included at least three epinephrine doses. INTERVENTIONS: Addition of terlipressin (10-20 μg/kg intravenous, up to two doses) to standard cardiopulmonary resuscitation. MEASUREMENTS AND MAIN RESULTS: Sustained return of spontaneous circulation was achieved in four cases, two of them were declared dead 6 and 12 hrs later, and the remaining two survived without cardiopulmonary procedures-related sequelae and with good neurologic condition. CONCLUSIONS: Terlipressin might contribute to obtain sustained return of spontaneous circulation in children with refractory in-hospital cardiac arrest. A randomized controlled clinical trial should be conducted to investigate the optimal drug treatment in pediatric cardiac arrest.

Background: The European Resuscitation Council’s 2005 guidelines for cardiopulmonary resuscitation (CPR) emphasize the delivery of uninterrupted chest compressions of adequate depth during cardiac arrest. Objectives: To describe how the circumstances of out-of-hospital cardiac arrest can impede the performance of CPR, and how this situation can be overcome.

Case Report: The presentation of two cases of prolonged CPR (48 min and 120 min, respectively) with an automated chest compression device, the AutoPulse®, under difficult circumstances. Both patients survived without neurological sequelae.

Conclusion: Prolonged chest compressions may be necessary in some cardiac arrests. These cases suggest that automated chest compression devices may increase the chance of a favorable outcome in these rare situations.


Background: Inhalation of hydrogen cyanide from smoke in structural fires is common, but cardiovascular function in these patients is poorly documented. Objective: The objective was to study the cardiac complications of cyanide poisoning in patients who received early administration of a cyanide antidote, hydroxocobalamin (Cyanokit®; Merck KGaA, Darmstadt, Germany [in the United States, marketed by Meridian Medical Technologies, Bristol, TN]).

Methods: The medical records of 161 fire survivors with suspected or confirmed cyanide poisoning were reviewed in an open, multicenter, retrospective review of cases from the Emergency Medical Assistance Unit (Service d'Aide Medical d'Urgence) in France.

Results: Cardiac arrest (61/161, 58 asystole, 3 ventricular fibrillation), cardiac rhythm disorders (57/161, 56 supraventricular tachycardia), repolarization disorders (12/161), and intra-cardiac conduction disorders (5/161) were observed. Of the total 161 patients studied, 26 displayed no cardiac disorder. All patients were given an initial dose of 5 g of hydroxocobalamin. Non-responders received a second dose of 5 g of hydroxocobalamin. Of the patients initially in cardiac arrest, 30 died at the scene, 24 died in hospital, and 5 survived without cardiovascular sequelae. Cardiac disorders improved with increasing doses of hydroxocobalamin, and higher doses of the antidote seem to be associated with a superior outcome in patients with initial cardiac arrest.

Conclusions: Cardiac complications are common in cyanide poisoning in fire survivors.
A 73-year-old diabetic, hypertensive man sustained acute infero-lateral wall myocardial infarction 2 days before a syncopal episode, and he was resuscitated on the way to the hospital and during the preoperative examination. An extensive tear of the left posterolateral pericardium with massive left haemothorax and left ventricular free wall rupture with pulsatile bleeding were found during surgery. Iatrogenic pericardial tear due to vigorous cardiac massage could temporarily relieve the pericardial tamponade due to the post infarction ventricular rupture and allowed the timely surgery to be conducted.

EDUCATION / ETHICS

The decision on whether or not to attempt resuscitation of an infant born at a very early gestational age is difficult for parents and caregivers because it is impossible to know what is in the infant’s best interest and the consequences of this decision are so profound. If resuscitation is withheld, death is almost a certainty. If resuscitation is provided, the infant faces an uncertain future with considerable medical, emotional, societal and financial risks, but with the possibility of a normal life. This dilemma has sometimes been perceived as a conflict between parental autonomy and an infant’s right to resuscitation. However, framing this complex situation in this manner is simplistic and tends to lead to endless non-productive debate. Rather, focusing on reasonable options for decision making in this situation proved to be helpful during the development of the COFN statement......

The current definition of death used for donation after cardiac death relies on a determination of the irreversible cessation of the cardiac function. Although this criterion can be compatible with transplantation of most organs, it is not compatible with heart transplantation since heart transplants by definition involve the resuscitation of the supposedly "irreversibly" stopped heart. Subsequently, the definition of "irreversible" has been altered so as to permit heart transplantation in some circumstances, but this
is unsatisfactory. There are three available strategies for solving this "irreversibility problem": altering the definition of death so as to rely on circulatory irreversibility, rather than cardiac; defining death strictly on the basis of brain death (either whole-brain or more pragmatically some higher brain criteria); or redefining death in traditional terms and simultaneously legalizing some limited instances of medical killing to procure viable hearts. The first two strategies are the most ethically justifiable and practical.

44/

Even among health care professionals, resuscitation performance has been shown to be poor. So far, it remains unclear whether cardiac arrest staff with frequent practice in resuscitation require training to adapt to the new International Liaison Committee on Resuscitation (ILCOR) guidelines of 2005. This study evaluated the need for basic life support training in nurses with emergency experience. Nurses (N = 24) recruited from an intensive care unit self-assessed their resuscitation skills and performed a cardiac arrest scenario using a manikin. After a theoretical instruction and hands-on training followed by feedback, participants once again performed a resuscitation scenario in addition to completing post-training self-assessments. Participating nurses considered resuscitation skills training - in particular in adapting to the new ILCOR guidelines of 2005 - to be important. Pre-training data revealed performance deficits even in this sample of emergency-experienced nursing staff. Training resulted in significant improvement in ventilation volume (P < .001), rate of compressions with correct depth (P < .031) and full release (P < .001), and a reduction in total hands-off time (P < .050). Objective data were mirrored in participants' self-assessed competencies. Results suggest that basic life support training based on the ILCOR guidelines of 2005 is necessary even in nurses with emergency experience. Training followed by the application of a feedback algorithm seems to improve short-term resuscitation performance and is well accepted by experienced nurses who work on an intensive care unit and who also comprise the inner-hospital cardiac arrest team.

45/

In December 2005 the new guidelines for resuscitation were released and a new curriculum for the teaching of basic life support (BLS) was adopted. The aim of the present study was to investigate the effectiveness of the new guidelines and teaching curriculum on the BLS skill retention of medical students 1 year following their initial training. The study was conducted in two consecutive academic years and compared BLS skill retention of two groups of medical students in their fourth year of medicine. The first group
(group A) was taught the old guidelines with the old curriculum in the year 2005 and was re-assessed in 2006, and the second group (group B) was taught the new guidelines with the new curriculum in the year 2006 and was re-assessed in 2007. Significantly more students in group B assessed signs of life, located the compression area correctly and performed good quality chest compressions compared with the group taught the old guidelines with the old curriculum. The most important BLS skill, good quality chest compressions, was retained by significantly more students who were taught the new resuscitation guidelines according to the new curriculum.

46/
Cardiopulmonary resuscitation (CPR) in patients with end-stage cancer is an issue of significant clinical and ethical importance. In general, the overall survival to discharge in cancer patients is referred to be 6.2% (localized - 9.5% vs. metastatic disease - 5.6%) compared to 15% of unselected in-hospital arrests. However, immediate survival, as well as survival to discharge after a successful CPR is affected by multiple factors. Type and extend of tumor, degree of clinical deterioration, functional status and many other factors do correlate with outcome in different degrees. Critical illness scoring systems are commonly used in order to assess performance status of patients and predict outcome. This article will review all the above mentioned factors, as well as patients' perception about "do-not-resuscitate" orders and palliative care.

47/
de Vries W, Bierens JJLM. Instructor retraining and poster retraining are equally effective for the retention of BLS and AED skills of lifeguards. Eur J Emerg Med 2010;(3):150-7
More than a million people in the USA and Europe suffer a sudden cardiac arrest each year. Thousands of people have to be trained in delivering help in such a situation. This cluster-randomized study compared two refresher training methods for basic life support and use of an automated external defibrillation: a traditional instructor-led course and self-instruction by poster. Methods: One hundred and thirty-nine lifeguards were assigned to one of the two groups. Group A (n=79) received a 1.5 h, instructor-led refresher training course, whereas group B (n=60) was advised to refresh their own knowledge with a poster, a manikin, and an automated external defibrillation training device. The lifeguards were assessed 3, 6, and 12 months after the initial training. Results: Seventy-five percent of the lifeguards in each group were deemed competent after 3 months. After 6 months, 78% lifeguards in group A and 75% in group B were considered competent. After 12 months, this was 71 and 76%, respectively. Young, less experienced lifeguards performed better than older, more experienced lifeguards. Conclusion: Refresher self-training by the use of a poster was as effective
as, and more flexible than, scheduled, instructor-led refresher training

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To assess whether problem-based learning (PBL) is more effective over conventional teaching methods by comparing final resuscitation exam results of nursing students who received cardiopulmonary resuscitation (CPR) training either by traditional or by a PBL approach. A retrospective and comparative research design was implemented. Data on final CPR exam grades, collected both from PBL and traditionally trained students, were obtained for a total of 1775 students between 2000 and 2007 in three major schools of health sciences in Hungary. Comparison between PBL and traditional teaching methods as well as across schools was made. T-tests on means yielded significant differences (t=3.569; p<0.001) between PBL and conventional training favoring PBL instructed students. Students who received PBL training had better final CPR exam grades than traditionally trained peers. The only significant difference among schools was found for PBL training. There was no difference across schools in final CPR grades when traditional training was concerned. PBL was a superior instruction method for CPR training. Students who attended PBL classes achieved greater theoretical knowledge and demonstrated better resuscitation skills when tested. Whether or not PBL is superior in real-life application of CPR practice is yet to be confirmed.

AND….

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The results of the now published Italian study are in sharp contrast to the German paper published in 2008 in the New England Journal of Medicine. In that study, cardiovascular events were 2.66 (95% CI 2.33–3.04) times more incident on the 7 days that the German team played during the 2006 world championship tournament. The German study raised significant public concern. The authors suggested that preventive measures be taken, especially in subjects with pre-existing coronary disease. It is debatable whether such recommendations were warranted, since at the time the results of several other studies between watching football games and cardiovascular events were inconsistent......