RCP MECÀNICA

Experience of a Maastrich type II non heart beating donor program in a small city: preliminary results.
[Article in English, Spanish]
Miñambres E1, Suberviola B2, Guerra C3, Lavid N4, Lassalle M3, González-Castro A2, Ballesteros MA5.
Abstract
OBJECTIVE: To study the results of a non-controlled cardiac death (Maastricht type II) donor program in a city of 200,000 inhabitants. The study was initially focused on lung donation and was extended to kidney donation after 9 months.
DESIGN: A prospective observational study was conducted between October 2012 and December 2013.
SETTING: The Intensive Care Unit of Marqués de Valdecilla University Hospital in Santander (Spain), and surrounding areas.
POPULATIONS: Patients (< 55 years) who died of out-of-hospital cardiac arrest.
INTERVENTIONS:
All out-of-hospital cardiac arrests were treated with mechanical cardiac compression (LUCAS II). The diagnosis of death and organ preservation were performed in the ICU.
RESULTS: A total of 14 calls were received, of which three were discarded. Of the 11 potential donors, 7 were effective donors with a median age of 39.5 years (range: 32-48). A total of 5 single lung transplants and four kidney transplants were performed. In addition, corneas and tissues were harvested. The non-valid donors were rejected mainly due to technical problems. There were no donation refusals on the part of the patient relatives. The lung transplant patient survival rate was 100% after one month and 80% after one year. One month after transplantation, the kidney recipients had a serum creatinine concentration of<2mg/dl. The interval from cardiac arrest to renal preservation was 80minutes (range: 71-89), and the interval from cardiac arrest to lung preservation was 84minutes (range: 77-94).
CONCLUSIONS: A Maastricht type II donation program in a small city is viable for both abdominal and thoracic organs. The program was initially very cautious, but its potential is easily improvable by increasing donor and by equipping mobile ICU ambulances with mechanical cardiac compression systems. Full management of the donor in the ICU, avoiding the emergency department or operating rooms, reduces the warm ischemia time, thereby improving transplant outcomes.

Chest Compression Fraction between Mechanical Compressions on a Reducible Stretcher and Manual Compressions on a Standard Stretcher during Transport in Out-of-Hospital Cardiac Arrests: The Ambulance Stretcher Innovation of Asian Cardiopulmonary Resuscitation (ASIA-CPR) Pilot Trial.
Kim TH, Shin SD, Song KJ, Hong KJ, Ro YS, Song SW, Kim CH.
Abstract
BACKGROUND: Cardiopulmonary resuscitation (CPR) with the use of mechanical devices is recommended during ambulance transport. However, the CPR quality en route and while in transfer to the emergency department (ED) for out-of-hospital cardiac arrests (OHCAs) remains uncertain. We developed a mechanical CPR device outfitted on a reducible stretcher (M-CPR) and compared with standard manual CPR on a standard stretcher (S-CPR) to evaluate CPR quality.
METHODS: Adult OHCAs transported by five ambulances in a metropolitan area with a population of 3.5 million (many of whom lived in high-rise buildings) from September to October (before-phase) and November to December (after-phase) in 2015 were collected. The reducible stretcher was developed for use in a small elevator during the transfer from scene to ambulance, and the AutoPulse® (ZOLL Medical, Chelmsford, MA, USA) was used for M-CPR. Chest compression fraction (CCF) was measured by transthoracic impedance data using an X-series® cardiac monitor (ZOLL Medical) during time from attachment to patient to arrival to the ED. A comparison of CCF using a Wilcoxon signed-rank test evaluated the difference between the before- and after-phases.
RESULTS: Of the eligible 49 OHCAs, 31 (21 in the before-phase and 10 in the after-phase) were analyzed, excluding patients for whom CCF was not measured, for whom M-CPR was not used, who had a return of spontaneous circulation in the field before transport, or who collapsed during transport. There were no differences in demographic data. Median total CCF (median, q1-q3) was significantly higher in the after-phase M-CPR group (85.2, 83.4-86.3) than in the before-phase S-CPR group (80.1, 68.0-85.2) (p = 0.03).
CONCLUSION: Mechanical CPR on the reducible stretcher during the transport of OHCAs to the ED showed a much higher chest compression fraction than standard manual CPR.

RCP

A Novel Educational Outreach Approach to Teach Hands-Only Cardiopulmonary Resuscitation to the Public.
Chang MP1, Gent LM2, Sweet M2, Potts J2, Ahtone J3, Idris AH4.
Abstract

REVIEW: The American Heart Association set goals in 2010 to train 20 million people annually in cardiopulmonary resuscitation and to double bystander response by 2020. These ambitious goals are difficult to achieve without new approaches.

METHODS: The main objective is to evaluate a new approach to cardiopulmonary resuscitation instruction using a self-instructional kiosk to teach Hands-Only CPR to people at a busy international airport. This is a prospective, observational study evaluating a new approach to teach Hands-Only CPR to the public from July 2013 to February 2016. The American Heart Association developed a Hands-Only CPR Kiosk for this project. We assessed the number of participants who viewed the instructional video and practiced chest compressions as well as the quality metrics of the chest compressions.

RESULTS: In a 32-month period, there were 23478 visits to the Hands-Only CPR Kiosk and 9006 test sessions; of those practice sessions, 26.2% achieved correct chest compression rate, 60.2% achieved correct chest compression depth, and 63.5% had the correct hand position.

CONCLUSIONS: There is noticeable public interest in learning Hands-Only CPR by using an airport kiosk and an airport is an opportune place to engage a layperson in learning Hands-Only CPR. The average quality of Hands-Only CPR by the public needs improvement and adding kiosks to other locations in the airport could reach more people and could be replicated in other major airports in the United States.

Bystander Efforts and 1-Year Outcomes in Out-of-Hospital Cardiac Arrest.
Kragholm K1, Wissenberg M1, Mortensen RN1, Hansen SM1, Malta Hansen C1, Thorsteinsson K1, Rajan S1, Lippert F1, Folke F1, Gislason G1, Køber L1, Fonager K1, Jensen SE1, Gerds TA1, Torp-Pedersen C1, Rasmussen BS1.
Abstract
BACKGROUND: The effect of bystander interventions on long-term functional outcomes among survivors of out-of-hospital cardiac arrest has not been extensively studied.

METHODS: We linked nationwide data on out-of-hospital cardiac arrests in Denmark to functional outcome data and reported the 1-year risks of anoxic brain damage or nursing home admission and of death from any cause among patients who survived to day 30 after an out-of-hospital cardiac arrest. We analyzed risks according to whether bystander cardiopulmonary resuscitation (CPR) or defibrillation was performed and evaluated temporal changes in bystander interventions and outcomes.

RESULTS: Among the 2855 patients who were 30-day survivors of an out-of-hospital cardiac arrest during the period from 2001 through 2012, a total of 10.5% had brain damage or were admitted to a nursing home and 9.7% died during the 1-year follow-up period. During the study period, among the 2084 patients who had cardiac arrests that were not witnessed by emergency medical services (EMS) personnel, the rate of bystander CPR increased from 66.7% to 80.6% (P<0.001), the rate of bystander defibrillation increased from 2.1% to 16.8% (P<0.001), the rate of brain damage or nursing home admission decreased from 10.0% to 7.6% (P<0.001), and all-cause mortality decreased from 18.0% to 7.9% (P=0.002). In adjusted analyses, bystander CPR was associated with a risk of brain damage or nursing home admission that was significantly lower than that associated with no bystander resuscitation (hazard ratio, 0.62; 95% confidence interval [CI], 0.47 to 0.82), as well as a lower risk of death from any cause (hazard ratio, 0.70; 95% CI, 0.50 to 0.99) and a lower risk of the composite end point of brain damage, nursing home admission, or death (hazard ratio, 0.67; 95% CI, 0.53 to 0.84). The risks of these outcomes were even lower among patients who received bystander defibrillation as compared with no bystander resuscitation.

CONCLUSIONS: In our study, we found that bystander CPR and defibrillation were associated with risks of brain damage or nursing home admission and of death from any cause that were significantly lower than those associated with no bystander resuscitation.

REGISTRES I REVISIONS

When is a Cardiac Arrest Non-Cardiac?
Carter RM1, Cone DC1.
Abstract
Introduction While the overall survival rate for out-of-hospital cardiac arrest (OHCA) is low, ranging from 5%-10%, several characteristics have been shown to decrease mortality, such as presence of bystander cardiopulmonary resuscitation (CPR), witnessed vs unwitnessed events, and favorable initial rhythm (VF/VT). More recently, studies have shown that modified CPR algorithms, such as chest-compression only or cardio-cerebral resuscitation, can further increase survival rates in OHCA. Most of these studies have included only OHCA patients with "presumed cardiac etiology," on the assumption that airway management is of lesser impact than chest compressions in these patients. However, prehospital personnel often lack objective and consistent criteria to assess whether an OHCA is of cardiac or non-cardiac etiology. Hypothesis/Problem The relative proportions of cardiac vs non-cardiac etiology in published data sets of OHCA in the peer-reviewed literature were examined in order to assess the variability of prehospital clinical etiology assessment.

METHODS: A Medline (US National Library of Medicine, National Institutes of Health; Bethesda, Maryland USA) search was performed using the subject headings "OHCA" and "Emergency Medical Services" (EMS). Studies were included if they reported prevalence of cardiac etiology among OHCA in the entire patient sample, or in all arms of a comparison study.

Studies that either did not report etiology of OHCA, or that excluded all cardiac or non-cardiac etiologies prior to reporting clinical data, were excluded.

RESULTS: Twenty-four studies were identified, containing 27 datasets of OHCA which reported the prevalence of presumed cardiac vs non-cardiac etiology. These 27 datasets were drawn from 15 different countries. The prevalence of cardiac etiology among OHCA ranged from 50% to 91%. No obvious patterns were found regarding database size, year of publication, or global region (continent) of origin.

CONCLUSIONS: There exists significant variation in published rates of cardiac etiology among OHCAs. While some of this variation likely reflects different actual rates of cardiac etiologies in the sampled populations, varying definitions of cardiac etiology among prehospital personnel or varying implementation of existing definitions may also play a role. Different proportions of cardiac vs non-cardiac etiology of OHCA in a sample could result in entirely different interpretations of data. A more specific consensus definition of cardiac etiology than that which currently exists in the Utstein template may provide better guidance to prehospital personnel and EMS researchers in the future.

Clinical cardiac imaging in cardiac arrest and periarrest.
Amico AF1.
Abstract
Echocardiography during preresuscitation care, cardiopulmonary resuscitation and postresuscitation is suggested to be an important tool in critical care medicine. At present a structured process integrating advanced life support and transthoracic echocardiography is not included in guidelines of cardiac resuscitation. However identification and treatment of reversible causes or complicating factors during cardiopulmonary resuscitation is rational and aimed to improve the outcomes. Furthermore, echocardiography has the potential to define the efficiency of the chest compressions and the optimal duration of the resuscitation maneuvers and/or the right time to switch to extracorporeal resuscitation

Outcomes of Cardiac Arrest in Residential Care Homes for the Elderly in Hong Kong.
Fan KL, Leung LP.
Abstract
OBJECTIVE: Studies done in the 1990's suggested nursing home residents with cardiac arrest had minimal chance of survival and resuscitation was not recommended. More recent studies showed opposing results. In Hong Kong, the proportion of elderly living in the residential care homes for the elderly is increasing. There is no study of out-of-hospital cardiac arrest outcomes in this population. This study aimed at evaluating the prognosis of out-of-hospital cardiac arrest occurring in the residential care homes for the elderly. It is hoped that the findings may inform the local emergency medical service concerning the issue of futility of resuscitating the residents with cardiac arrest in the residential care homes.
METHODS: This study was a retrospective analysis of a database of all patients aged 65 years or above with atraumatic out-of-hospital cardiac arrest and who were attended by the emergency medical service in a 12-month period. Data in the database were prospectively collected by the emergency medical service. The characteristics of patients and cardiac arrests, timeliness of the emergency medical service, and survival were analyzed. Comparison was made between elderly living in and not living in the residential care homes. Predictors of survival were evaluated with logistic regression.
RESULTS: 3919 patients aged ≥ 65 years were analyzed. There were 1506 cases of cardiac arrest occurring in the residential care homes for the elderly. Resuscitation was discontinued at the emergency department in over 70% of these cases. The survival to hospital admission rate and the 30-day survival rate were 9.6% and 0.3% respectively. Both were lower than patients not residing in the residential care homes. Younger age, witnessed arrest, bystander defibrillation, and shorter call to ED interval were associated with higher chance of surviving to hospital admission.
CONCLUSION: Elderly suffering from cardiac arrest in residential care homes had a poor chance of survival. Except age, witnessed arrest, bystander defibrillation, and call to ED interval are modifiable predictors of survival. It is inappropriate to declare that resuscitating elderly in residential care homes is futile unless those factors have been fully addressed

Characteristics and Outcomes of Out-of-Hospital Sudden Cardiac Arrest According to the Time of Occurrence.
Karam N1, Marijon E2, Dumas F3, Offredo L 4, Beganton F4, Bougouin W5, Jost D6, Lamhaut L7, Empana JP8, Cariou A9, Spaulding C2, Jouven X2; Paris Sudden Death Expertise Center.
Abstract
PURPOSE: The impact of time of occurrence has been extensively evaluated for in-hospital cardiac arrests but less for Out-of-Hospital Cardiac Arrests (OHCA). We assessed the impact of the time of occurrence on the characteristics and prognosis of OHCA.
METHODS: Using data from the Paris Sudden Cardiac Death Expertise Center prospective study that includes all OHCA in the Paris Area, we compared characteristics and outcomes of off-hours OHCA (nights and days off) to regular-hours OHCA between 2011 and 2014.
RESULTS: Among a total of 9,834 OHCA (70.0±17years old, 62.1% males), off-hours OHCA accounted for 63.4%. Although bystanders were more often present (74.4 vs. 72.1%, P=0.01), rates of bystander CPR (46.7 vs. 50.6%, P=0.001) and AED

use (1.0 vs. 1.9%, P=0.01) were lower during off-hours. While EMS arrival delays were similar, patients were less often in shockable rhythm (16.3 vs. 19.1%, P<0.0001), and return of spontaneous circulation was less frequent (27.5 vs. 31.1%, P<0.0001). There was no difference in rates of targeted temperature control (54.8 vs. 54.7%, P=0.75), coronary angiography (57.3 vs. 58.2%, P=0.68) and angioplasty use (32.2 vs. 35.6%, P=0.22). Survival at hospital discharge was lower (4.7 vs. 6.5%, P<0.0001) during off-hours. After adjusting for potential confounders, time of occurrence was not associated with worse outcome (OR 0.85, 95% CI 0.69-1.06, P=0.15), and bystander-initiated CPR, shockable initial rhythm and AED use were the main survival predictors (P<0.0001).
CONCLUSION: Off-hours OHCA have a 30% lower survival rate, mainly due to differences in initial management (bystander CPR and AED use), illustrating the need to improve bystanders' responsiveness in all circumstances.

Long-term survival of out-of-hospital cardiac arrest patients with malignancy.
Kang SB1, Kim KS2, Suh GJ1, Kwon WY1, You KM3, Park MJ1, Ko JI1, Kim T1.
Abstract
BACKGROUND: The aim of this study was to investigate whether the 1-year survival rate of out-of-hospital cardiac arrest (OHCA) patients with malignancy was different from that of those without malignancy.
METHODS: All adult OHCA patients were retrospectively analyzed in a single institution for 6years. The primary outcome was 1-year survival, and secondary outcomes were sustained return of spontaneous circulation (ROSC), survival to hospital admission, survival to discharge and discharge with a good neurological outcome (CPC 1 or 2). Kaplan-Meier survival analysis and Cox proportional hazard regression analysis were performed to test the effect of malignancy.
RESULTS: Among 341 OHCA patients, 59 patients had malignancy (17.3%). Sustained ROSC, survival to admission, survival to discharge and discharge with a good CPC were not different between the two groups. The 1-year survival rate was lower in patients with malignancy (1.7% vs 11.4%; P=0.026). Kaplan-Meier survival analysis revealed that patients with malignancy had a significantly lower 1-year survival rate when including all patients (n=341; P=0.028), patients with survival to admission (n=172, P=0.002), patients with discharge CPC 1 or 2 (n=18, P=0.010) and patients with discharge CPC 3 or 4 (n=57, P=0.008). Malignancy was an independent risk factor for 1-year mortality in the Cox proportional hazard regression analysis performed in patients with survival to admission and survival to discharge.
CONCLUSIONS: Although survival to admission, survival to discharge and discharge with a good CPC rate were not different, the 1-year survival rate was significantly lower in OHCA patients with malignancy than in those without malignancy.

CAUSES D'ACR

Prevalence of Type A Acute Aortic Dissection in Patients With Out-Of-Hospital Cardiopulmonary Arrest.
Tanaka Y1, Sakata K1, Sakurai Y2, Yoshimuta T1, Morishita Y3, Nara S3, Takahashi I3, Hirokami M4, Yamagishi M5.
Abstract
Postmortem computed tomography (PMCT) has been recently reported to be useful for detecting causes of death in the emergency department. In this study, the incidence and causes of death of type A acute aortic dissection (AAD) were investigated in patients who experienced out-of-hospital cardiopulmonary arrest (OHCPA) using PMCT. PMCT or enhanced computed tomography was performed in 311 of 528 consecutive patients experiencing OHCPA. A total of 23 (7%) of 311 patients were diagnosed with type A AAD based on clinical courses and CT findings. Eighteen consecutive patients who did not experience OHCPA were diagnosed with type A AAD during the same period. Pre-hospital death was observed in 21 (51%) of 41 patients with type A AAD. Bloody pericardial effusion was observed more frequently in patients who experienced OHCPA with type A AAD than in those who did not experience OHCPA with type A AAD (91% vs 28%, respectively; p <0.05). In conclusion, the incidence of type A AAD was common (7%) in patients who experienced OHCPA, with a high rate of pre-hospital death. Aortic rupture to the intrapericardial space was considered the major cause of death in patients who experienced OHCPA with type A AAD.

FV I DESFIBRIL·LACIÓ

The impact of body mass index on the wearable cardioverter defibrillator shock efficacy and patient wear time.
Wan C1, Szymkiewicz SJ2, Klein HU3.
Abstract
BACKGROUND: The impact of body mass index (BMI) on the shock efficacy and patient adherence among patients using a wearable cardioverter defibrillator (WCD) is unknown.
METHODS: Patients prescribed the WCD between January 1, 2008 and June 1, 2013, who experienced at least one episode of sustained ventricular tachycardia (VT) or ventricular fibrillation (VF) and who received appropriate WCD therapy, were identified within a registry maintained by the manufacturer for regulatory, reimbursement, and administrative purposes.

The registry contained patients' Body Mass Index (BMI) which was categorized as normal (18.0<BMI<25.0), overweight (25.0≤BMI<30.0) or obese (30.0≥BMI). Demographics, indication for WCD prescription and other clinical information were reviewed. Device-stored ECG, transthoracic impedance (TTI) and time worn were downloaded for analyses. A post-shock rhythm which was no longer VT or VF was considered a successful tachyarrhythmia conversion. Only the first-shock arrhythmia conversion and TTI were included in the analyses.

RESULTS: A total of 574 patients were included in the final analyses. Patient characteristics were similar across all groups except the obese group (60±11 years) was younger than the normal (63±16 years) and overweight (64±12 years, P=.001) groups. Mean length of use for normal, overweight and obese groups was 79±131, 82±202 and 55±97 days (P=.12), respectively; the median daily wear time was 21 hours among all groups. In a total of 623 VT/VF events, the median TTI was 44 ohms, 51 ohms and 65 ohms for normal, overweight and obese groups, respectively; TTI was positively correlated to BMI (r=0.33, P<.01). First-shock conversion rate was 92.9% in the normal group, 93.6% and 93.9% in the overweight and obese groups, respectively (P=.93). There was no difference in 24-hour survival among the three groups (91.9%, 94.1% and 92.3%, P=.66).

CONCLUSION: The WCD first-shock success rate and post-event 24-hour survival were high and independent from BMI. TTI was positively correlated with BMI but did not impact early clinical outcome. WCD was safe to all BMI groups and the patient wear time was excellent across all groups.

TARGET TEMEPERATURE MANAGEMENT

Mild induced hypothermia and survival after out-of-hospital cardiac arrest in a Swedish urban area.
Martinell L1, Herlitz J2, Karlsson T3, Nielsen N 4, Rylander C5.
Abstract
BACKGROUND: Mild induced hypothermia (MIH) was introduced for post cardiac arrest care in Sweden in 2003, based on two clinical trials. This retrospective study evaluated its association with 30-day survival after out-of-hospital cardiac arrest (OHCA) in a Swedish community from 2003 to 2015.

METHODS: Out of 3680 patients with OHCA, 1100 were hospitalized after return of spontaneous circulation and 871 patients who remained unconscious were included in the analysis. Prehospital data were extracted from the Swedish Registry of Cardiopulmonary Resuscitation and in-hospital data were extracted from clinical records. Propensity score analysis on complete data sets and multivariable logistic regression with multiple imputations to compensate for missing data were performed.

RESULTS: Unadjusted 30-day survival was 23.5%; 37% in 386/871 (44%) MIH treated and 13% in 485/871 (56%) non-MIH treated patients. Unadjusted odds ratio (OR) for 30-day survival in patients treated with MIH compared to non-MIH treated patients was 3.79 (95% CI 2.71-5.29; p<0.0001). Using stratified propensity score analysis and in addition adjusting for in-hospital factors, 30-day survival was not significantly different in patients treated with MIH compared to non-MIH treated patients; OR 1.33 (95% CI 0.83-2.15; p=0.24). Using multiple imputations to handle missing data yielded a similar adjusted OR of 1.40 (95% CI 0.88-2.22; p=0.15). Good neurologic outcome at hospital discharge was seen in 82% of patients discharged alive.

CONCLUSION: Treatment with MIH was not significantly associated with increased 30-day survival in patients remaining unconscious after OHCA when adjusting for potential confounders.

POST ACR

Early prediction of coma recovery after cardiac arrest with blinded pupillometry.
Solari D1,2, Rossetti AO3, Carteron L1,2,4, Miroz JP1,2, Novy J3, Eckert P1, Oddo M1,2.
Abstract
Objectives Prognostication studies on comatose cardiac arrest (CA) patients are limited by lack of blinding, potentially causing overestimation of outcome predictors and self-fulfilling prophecy. Using a blinded approach, we analysed the value of quantitative automated pupillometry to predict neurological recovery after CA. Methods We examined a prospective cohort of 103 comatose adult patients who were unconscious 48 hours after CA and underwent repeated measurements of quantitative pupillary light reflex (PLR) using the Neurolight-Algiscan® device. Clinical examination, electroencephalography (EEG), somatosensory evoked potentials (SSEP) and serum neuron specific enolase (NSE) were performed in parallel, as part of standard multimodal assessment. Automated pupillometry results were blinded to clinicians involved in patient care. Cerebral Performance Categories (CPC) at 1 year was the outcome endpoint. Results Survivors (n=50 patients; 32 CPC 1, 16 CPC 2, 2 CPC 3) had higher quantitative PLR (median 20 [range 13-41] %, p<0.0001) and constriction velocity (1.46 [0.85-4.63] vs. 0.94 [0.16-4.97] mm/sec, p<0.0001) than non-survivors. At 48 hours, a quantitative PLR <13% had 100% specificity and positive predictive value to predict poor recovery (0% false-positive rate), and provided equal performance than that of EEG and SSEP. Reduced quantitative PLR correlated with higher serum neuron specific enolase (Spearman's r -0.52, p<0.0001). Interpretation Reduced quantitative PLR correlates with post-anoxic brain injury and, when compared to standard multimodal assessment, is highly accurate in predicting long-term

prognosis after CA. This is the first prognostication study to show the value of automated pupillometry using a blinded approach to minimize self-fulfilling prophecy

PEDIATRIA

1. **Pediatr Int.** 2017 Apr 28. doi: 10.1111/ped.13310. [Epub ahead of print]
Impact of Bradycardia or Asystole on Neonatal Cardiopulmonary Resuscitation at Birth.
Kumar VHS1,2, Skrobacz A1, Ma C2.

Abstract
BACKGROUND: Fetal hypoxia from intrapartum events can lead to absent heart rate (HR) or bradycardia (BC) at birth requiring aggressive neonatal resuscitation. Neonatal resuscitation guidelines do not differentiate infants with bradycardia (HR<100/min) from absent HR at birth. As HR is the primary determinant of resuscitation, we hypothesize that infants with no HR at 1 minute would require more extensive resuscitation with worse clinical outcomes compared to infants with bradycardia at 1minute.
METHODS: A retrospective analysis was performed in infants born from 1/1/00 - 12/31/15 with no HR at 1minute [determined by Apgar score (AS) of zero at 1min - AHR group] or bradycardia at 1 minute (AS=1 at 1min; BC group). Patient demographics, resuscitation characteristics and clinical outcomes analyzed in both the groups.
RESULTS: Apgar scores were significantly lower in the AHR group over time. AHR group had significantly higher rates of intubation, chest compressions (CC) and administration of intravenous epinephrine (IV-epi); resulting in longer duration of CC, time to HR>100/minute & duration of resuscitation. Systemic hypotension and death were higher in the AHR group. By logistic regression, chest compressions and cord pH were significantly correlated with AS of zero at 1min. Gestational age, birth weight, AS at 5min, cord pH and first blood gas pH after resuscitation were related to overall mortality.
CONCLUSIONS: Infants with no HR at 1 minute did worse than infants with bradycardia. Education focused on effective positive pressure ventilation and early administration of intravenous epinephrine are essential for successful resuscitation of the depressed newborn. This article is protected by copyright.

ECMO

1. **Eur Heart J Acute Cardiovasc Care**. 2016 Dec;5(8):512-521. Epub 2015 May 12.
Editor's Choice-Extracorporeal life support for out-of-hospital cardiac arrest: Part of a treatment bundle.
Lazzeri C1, Valente S2, Peris A3, Gensini GF2,4.

Abstract
In recent years, an increasing number of papers have been published on the use of extracorporeal cardiopulmonary resuscitation (ECPR) in adult patients, but, although promising results have been reported in patients with in-hospital refractory cardiac arrest supported by extracorporeal life support (ECLS), data on patients with out-of-hospital (OHCA) cardiac arrest are scarce and conflicting. The present study aims at summarizing the available evidence on the use of ECPR in adult patients with OHCA, clinically focusing on the factors most often associated with outcome in these patients. Even in the absence of randomized trials, there is growing evidence from ECLS centers documenting sound clinical benefits of ECPR in selected OHCA. According to the available evidence, three factors seem to contribute strongly to the favorable outcome of ECLS supported OHCA patients: (a) selection of patients (mainly definition of age range and a witnessed cardiac arrest); (b) the availability of an ECLS team, well skilled and experienced (to reduce time of implantation and incidence of complications); (c) a multifaceted approach to the OHCA patient (the so-called ECLS-bundle) to treat the reversible cause of CA (i.e. percutaneous coronary intervention), ensure neuroprotection (hypothermia), and maintain organ perfusion (till recovery). Taking into account the promising results of ECPR in selected OHCA patients, there is a clinical need for shared protocols to reduce differences related to the center experience and mostly to increase availability of ECLS as part of a multifaceted approach for these patients.

2. **Scand J Trauma Resusc Emerg Med**. 2017 May 2;25(1):46. doi: 10.1186/s13049-017-0388-7.
Clinical course and prognostic factors of patients in severe accidental hypothermia with circulatory instability rewarmed with veno-arterial ECMO - an observational case series study.
Kosiński S1,2, Darocha T3,4, Jarosz A5, Zeliaś A6,7, Ziętkiewicz M5, Podsiadło P6,8, Sanak T9,10, Sałapa K11, Piątek J12, Konstany-Kalandyk J12, Gałązkowski R6,13, Krawczyk P5, Krzych Ł14, Drwiła R5.

Abstract
BACKGROUND: Recently, veno-arterial extracorporeal membrane oxygenation (VA-ECMO) has become the rewarming treatment of choice in hypothermic cardiac arrest. The detailed indications for extracorporeal rewarming in non-arrested, severely hypothermic patients with circulatory instability have not been established yet. The primary purpose of the study was a preliminary analysis of all aspects of the treatment process, as well as initial identification of mortality risk factors within the group of severely hypothermic patients, treated with arteriovenous extracorporeal membrane oxygenation (VA-ECMO). The secondary aim of the study was to evaluate efficacy of VA-ECMO in initial 6-h period of treatment METHODS: From July 2013 to June 2016, thirty one hypothermic patients were accepted for extracorporeal rewarming at Severe Accidental Hypothermia Center, Cracow. Thirteen patients were identified with circulatory instability and were enrolled in

the study. The evaluation took into account patients' condition on admission, the course of therapy, and changes in laboratory and hemodynamic parameters.

RESULTS: Nine out of 13 analyzed patients survived (69%). Patients who died were older, had lower both systolic and diastolic pressure, and had increased creatinine an potassium levels on admission. In surviving patients, arterial blood gases parameters (pH, BE, HCO3) and lactates would normalize more quickly. Their potassium level was lower on admission as well. The values of the core temperature on admission were comparable. Although normothermia was achieved in 92% of patients, none of them had been weaned-off VA-ECMO in the first 6 h of treatment.

DISCUSSION AND CONCLUSIONS: In our preliminary study more pronounced markers of cardiocirculatory instability and organ hypoperfusion were observed in non-survivors. Future studies on indications to extracorporeal rewarming in severely hypothermic, non-arrested patients should focus on the extent of hemodynamic disturbances. Short term (<6 h) treatment in severe hypothermic, non-arrested patients seems to be not clinically appropriate.

VENTILACIÓ

Advanced Airway Type and Its Association with Chest Compression Interruptions During Out-of-Hospital Cardiac Arrest Resuscitation Attempts.
Jarman AF, Hopkins CL, Hansen JN, Brown JR, Burk C, Youngquist ST.

Abstract
OBJECTIVE: To assess interruptions in chest compressions associated with advanced airway placement during cardiopulmonary resuscitation (CPR) of out-of-hospital cardiac arrest (OHCA) victims.
METHODS: The method used was observational analysis of prospectively collected clinical and defibrillator data from 339 adult OHCA victims, excluding victims with <5 minutes of CPR. Interruptions in CPR, summarized by chest compression fraction (CCF), longest pause, and the number of pauses greater than 10 seconds, were compared between patients receiving bag valve mask (BVM), supraglottic airway (SGA), endotracheal intubation (ETI) via direct laryngoscopy (DL), and ETI via video laryngoscopy (VL). Secondary outcomes included first pass success and the effect of multiple airway attempts on CPR interruptions.
RESULTS: During the study period, paramedics managed 23 cases with BVM, 43 cases with SGA, 148 with DL, and 125 with VL. There were no statistically significant differences between the airway groups with regard to longest compression pause (BVM 18 sec [IQR 11-33], SGA 29 sec [IQR 15-65], DL 26 sec [IQR 12-59], VL 22 sec [IQR 14-41]), median number of pauses greater than 10 seconds (BVM 2 [IQR 1-3], SGA 2 [IQR 1-3], DL 2 [IQR 1-4], VL 2 [IQR 1-3]), or CCF (0.92 for all groups). However, each additional attempt following failed initial DL was associated with an increase in the risk of additional chest compression pauses (relative risk 1.29, 95% confidence interval 1.02-1.64). Such an association was not observed with additional attempts using VL or SGA. First pass success was highest with SGA (77%), followed by between DL (68%) and VL (67%); these differences were not statistically significant.
CONCLUSIONS: While summary measures of chest compression delivery did not differ significantly between airway classes in this observational study, repeated attempts following failed initial DL during cardiopulmonary resuscitation were associated with an increase in the number of pauses in chest compression delivery observed.

Effect of metronome rates on the quality of bag-mask ventilation during metronome-guided 30:2 cardiopulmonary resuscitation: A randomized simulation study.
Na JU1, Han SK1, Choi PC1, Shin DH1 .

Abstract
BACKGROUND: Metronome guidance is a feasible and effective feedback technique to improve the quality of cardiopulmonary resuscitation (CPR). The rate of the metronome should be set between 100 to 120 ticks/minute and the speed of ventilation may have crucial effect on the quality of ventilation. We compared three different metronome rates (100, 110, 120 ticks/minute) to investigate its effect on the quality of ventilation during metronome-guided 30:2 CPR.
METHODS: This is a prospective, randomized, crossover observational study using a RespiTrainerℴr. To simulate 30 chest compressions, one investigator counted from 1 to 30 in cadence with the metronome rate (1 count for every 1 tick), and the participant performed 2 consecutive ventilations immediately following the counting of 30. Thirty physicians performed 5 sets of 2 consecutive (total 10) bag-mask ventilations for each metronome rate. Participants were instructed to squeeze the bag over 2 ticks (1.0 to 1.2 seconds depending on the rate of metronome) and deflate the bag over 2 ticks. The sequence of three different metronome rates was randomized.
RESULTS: Mean tidal volume significantly decreased as the metronome rate was increased from 110 ticks/minute to 120 ticks/minute (343±84 mL vs. 294±90 mL, P=0.004). Peak airway pressure significantly increased as metronome rate increased from 100 ticks/minute to 110 ticks/minute (18.7 vs. 21.6 mmHg, P=0.006).
CONCLUSION: In metronome-guided 30:2 CPR, a higher metronome rate may adversely affect the quality of bag-mask ventilations. In cases of cardiac arrest where adequate ventilation support is necessary, 100 ticks/minute may be better than 110 or 120 ticks/minute to deliver adequate tidal volume during audio tone guided 30:2 CPR.

RECERCA EXPERIMENTAL

RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA (REBOA) FOR MAJOR ABDOMINAL VENOUS INJURY IN A PORCINE HEMORRHAGIC SHOCK MODEL.
Lallemand MS1, Moe DM, McClellan JM, Smith JP, Daab L, Marko S, Tran N, Starnes B, Martin MJ.
Abstract
BACKGROUND: Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) is a rescue maneuver for unstable patients with non-compressible hemorrhage below the diaphragm. The efficacy of REBOA in the setting a major abdominal venous injury is unknown. Our objective was to examine the use of REBOA in a large animal model of major abdominal venous injury, and characterize any impact on the hemodynamics, rate and volume of hemorrhage, and survival.
METHODS: Ten swine (35-55kg) underwent a controlled and validated hemorrhage and ischemia/reperfusion injury protocol to produce shock physiology. Animals were randomly assigned to a control arm (N=5) or a treatment (REBOA) arm (N=5). An injury was then created in the common iliac vein. Bleeding was allowed for 60 seconds and the balloon was then inflated in the REBOA arm. Hemodynamics were recorded for 45 minutes or until death. Blood loss was verified post-mortem and bleeding rate calculated.
RESULTS: All animals demonstrated shock physiology at the time of randomization. There were no differences between control versus REBOA animals in baseline MAP (42 vs 50), pH (7.29 vs 7.26), lactate (6.19 vs 6.26), or INR (1.2 vs 1.3, all p=NS). REBOA animals demonstrated immediate improvements in MAP (50.6 vs 97.2, p=0.04). The mean survival time was 4.1 minutes for controls (100% died) versus 40.1 minutes for REBOA (p<0.01). There was no difference in total blood loss (mean 630 cc for both). The rate of bleeding was significantly lower in the REBOA animals (control 197 cc/min vs REBOA 14 cc/min, p=0.02).
CONCLUSION: In the setting of an abdominal venous injury, REBOA improved hemodynamics and lengthened survival time. Blood loss was similar between groups but the rate of bleeding was markedly decreased with REBOA. REBOA appears effective for central venous injuries and provides a sustained period of stabilization and window for surgical intervention.

The Effect of REBOA, Partial Aortic Occlusion and Aggressive Blood Transfusion on Traumatic Brain Injury in a Swine Polytrauma Model.
Johnson MA1, Williams TK, Ferencz SE, Davidson AJ, Russo RM, O'Brien WT Sr, Galante JM, Grayson JK, Neff LP.
Abstract
OBJECTIVES: Despite clinical reports of poor outcomes, the degree to which REBOA exacerbates traumatic brain injury (TBI) is not known. We hypothesized that combined effects of increased proximal mean arterial pressure (pMAP), carotid blood flow (Qcarotid), and intracranial pressure (ICP) from REBOA would lead to TBI progression compared to partial aortic occlusion (PAO) or no intervention.
METHODS: 21 swine underwent a standardized TBI via computer Controlled cortical impact followed by 25% total blood volume rapid hemorrhage. After 30 minutes of hypotension, animals were randomized to 60 minutes of continued hypotension (Control), REBOA, or PAO. REBOA and PAO animals were then weaned from occlusion. All animals were resuscitated with shed blood via a rapid blood infuser. Physiologic parameters were recorded continuously and brain computed tomography obtained at specified intervals.
RESULTS: There were no differences in baseline physiology or during the initial 30 minutes of hypotension. During the 60-minute intervention period, REBOA resulted in higher maximal pMAP (REBOA 105.3±8.8; PAO 92.7±9.2; Control 48.9±7.7, p=0.02) and higher Qcarotid (REBOA 673.1±57.9; PAO 464.2±53.0; Control 170.3±29.4, p<0.01). Increases in ICP were greatest during blood resuscitation, with Control animals demonstrating the largest peak ICP (Control 12.8±1.2; REBOA 5.1±0.6; PAO 9.4±1.1, p<0.01). There were no differences in the percentage of animals with hemorrhage progression on CT (Control 14.3%, 95%CI 3.6-57.9; REBOA 28.6%, 95%CI 3.7-71.0; and PAO 28.6%, 95%CI 3.7-71.0).
CONCLUSIONS: In an animal model of TBI and shock, REBOA increased carotid flow and pMAP, but did not exacerbate TBI progression. PAO resulted in physiology closer to baseline with smaller increases in ICP and pMAP. Rapid blood resuscitation, not REBOA, resulted in the largest increase in ICP after intervention, which occurred in Control animals. Continued studies of the cerebral hemodynamics of aortic occlusion and blood transfusion are required to determine optimal resuscitation strategies for multi-injured patients.

Changes in anteroposterior chest height measured during static chest compression and decompression with a ResQPUMP reveal chest compliance alteration in human cadavers.
Segal N1, Robinson AE2, Berger PS3, Lick MC 4, Moore JC2, Salverda BJ2, Hinke MB2, Ashton AA5, McArthur AM5, Lurie KG6, Metzger AK7.
Abstract
INTRODUCTION: Chest compliance plays a fundamental role in the generation of circulation during cardiopulmonary resuscitation (CPR). To study potential changes in chest compliance over time, anterior posterior (AP) chest height

measurements were performed on newly deceased (never frozen) human cadavers during CPR before and after 5minutes of automated CPR. We tested the hypothesis that after 5 minutes of CPR chest compliance would be significantly increased.

METHODS: Static compression (30, 40, and 50kg) and decompression forces (-10, -15kg) were applied with a manual ACD-CPR device (ResQPUMP, ZOLL) before and after 5minutes of automated CPR. Lateral chest x-rays were obtained with multiple reference markers to assess changes in AP distance.

RESULTS: In 9 cadavers, changes (mean±SD) in the AP distance (cm) during the applied forces were 2.1±1.2 for a compression force of 30kg, 2.9±1.3 for 40kg, 4.3±1.0 for 50kg, 1.0±0.8 for a decompression force of -10kg and 1.8±0.6 for -15kg. After 5minutes of automated CPR, AP excursion distances were significantly greater ($p < 0.05$). AP distance increased to 3.7±1.4 for a compression force of 30kg, 4.9±1.6 for 40kg, 6.3±1.9 for 50kg, 2.3±0.9 for a -10kg of lift and 2.7±1.1 for -15kg of lift.

CONCLUSIONS: These data demonstrate chest compliance increases significantly over time as demonstrated by the significant increase in the measured AP distance after 5minutes of CPR. These findings suggest that adjustments in compression and decompression forces may be needed to optimize CPR over time.

Field and en route REBOA: A feasible military reality?
Reva VA1, Hörer T, Makhnovskiy AI, Sokhranov MV, Samokhvalov IM, DuBose JJ.
Abstract

BACKGROUND: Severe non-compressible torso hemorrhage (NCTH) remains a leading cause of potentially preventable death in modern military conflicts. Resuscitative endovascular occlusion of the aorta (REBOA) has demonstrated potential as an effective adjunct to the treatment of NCTH in the civilian early hospital and even pre-hospital settings - but the application of this technology for military pre-hospital use has not been well described. We aimed to assess the feasibility of both field and en route pre-hospital REBOA in the military exercise setting simulating a modern armed conflict.

METHODS: Two adult male Sus Scrofa underwent simulated junctional combat injury in the context of a planned military training exercise. Both underwent zone I REBOA in conjunction with standard tactical combat casualty care (TCCC) interventions - one during point of injury care and the other during en route flight care. Animals were sequentially evacuated to two separate Forward Surgical Teams (FSTs) by rotary wing platform where the balloon position was confirmed by chest X-Ray. Animals then underwent different damage control thoracic and abdominal procedures before euthanasia.

RESULTS: The first swine underwent immediate successful REBOA at the point of injury 7:30 minutes after the injury. It required 6 minutes total from initiation of procedure to effective aortic occlusion. Total occlusion time was 60 minutes. In the second animal, the REBOA placement procedure was initiated immediately after take-off (17:40 minutes after the injury). Although the movements and vibration of flight were not significant impediments, we only succeeded to put a 6-Fr sheath into a femoral artery during the 14 minutes flight due to lighting and visualization challenges. After the sheath had been upsized in the FST, the REBOA catheter was primarily placed in zone I followed by its replacement to zone III. Both animals survived to study completion and the termination of training. No complications were observed in either animal.

CONCLUSION: Our study demonstrates the potential feasibility of REBOA for use during tactical field and en route (flight) care of combat casualties. Further study is needed to determine the optimal training and utilization protocols required to facilitate the effective incorporation of REBOA into military pre-hospital care capabilities.

REGISTRES I
REVISIONS

Improving CPR performance.
Nassar BS1, Kerber R2.
Abstract

Cardiac arrest continues to
represent a public health burden with most patients having dismal outcomes.
Cardiopulmonary resuscitation (CPR) is a complex set of interventions requiring
leadership, coordination, and best practices. Despite the widespread adoption
of new evidence in various guidelines, the provision of CPR remains variable
with poor adherence to published recommendations. Key steps health care systems
can take to enhance the quality of CPR and, potentially, to improve outcomes,
include optimizing chest compressions; avoiding hyperventilation; encouraging
intraosseus access, and monitoring capnography. Feedback devices provide
instantaneous guidance to the rescuer, improve rescuer technique and could
impact patient outcomes. New technologies promise to improve the resuscitation
process: mechanical devices standardize chest compressions; capnography guides

resuscitation efforts and signals the return of spontaneous circulation (ROSC); intraosseous devices minimize interruptions to gain vascular access. This review aims at identifying a discreet group of interventions that healthcare systems can employ to raise their standard of cardiac resuscitation.

2. First Aid Training May Improve First Aid Skills.

Editors
Strømme H, Jeppesen E, Reinar LM.

Excerpt
Each year approximately half a million people in Norway suffer injury caused by accidents, violence or self inflicted injury and about 3,000 experience out of hospital cardiac arrest. Surveys have indicated that many Norwegians have limited first aid skills. The Norwegian Ministry of Health and Care Services have commissioned an overview of the effect of first aid training. Evidence from five systematic reviews about first aid training for lay people shows that first aid training may have a positive effect on first aid skills. Several of the systematic reviews found that the effect declines over time. One of the systematic reviews referenced three studies showing that the majority of the people who had provided first aid described it as a positive experience. None of the systematic reviews included studies about survival and functional ability in persons who had received first aid. The quality of the documentation is low or very low, which means that the results must be interpreted with caution. This does not mean that there is no effect; it means that it we are unsure about whether or not there is an effect.

Doctors' attitudes towards the introduction and clinical operation of do not resuscitate orders (DNRs) in Ireland.

O'Reilly M1, O'Tuathaigh CMP2, Doran K1.

Abstract
BACKGROUND: Do not resuscitate orders (DNRs) are documents which state that should a patient suffer from cardiopulmonary failure, resuscitation should not be attempted. Internationally, DNRs are often misunderstood and used inappropriately in a clinical setting.

AIMS:
The aim of this paper was to determine the current understanding of DNRs and their clinical operation among hospital doctors in Ireland.

METHODS: A cross-sectional, questionnaire-based study was conducted involving doctors from the Cork teaching hospitals. The questionnaire sought information regarding understanding of DNRs and their clinical operation, as well as attitudes regarding the current absence of relevant Irish guidelines. The questionnaire also collected information regarding demographics, clinical specialty, and level of experience.

RESULTS: 45.9% (47/103) of all doctors stated that their clinical knowledge was sufficient to draft a DNR, but 48.7% of this group (n = 23) chose the incorrect definition for a DNR when provided with three separate options. Thirty-five percent (n = 36) of all

doctors surveyed demonstrated an incorrect understanding of a DNR. Neither specialty nor experience level had any effect on level of understanding of DNRs (p > 0.05). 93.2% (n = 96) agreed that there is a need for introduction of domestic guidelines regarding DNRs. 57.6% (n = 59) would draft more DNRs in the event that such domestic guidelines were in place.
CONCLUSIONS: A substantial
proportion of hospital doctors surveyed demonstrated an incomplete understanding of DNRs and their clinical operation. However, the overwhelming majority of the present sample believe that domestic guidelines are needed on the matter.

Cardiopulmonary Resuscitation
Training Disparities in the United States.
Blewer AL1,2, Ibrahim SA3,
Leary M1,4, Dutwin D5, McNally B6, Anderson ML7, Morrison LJ8, Aufderheide TP9, Daya M10, Idris AH11, Callaway CW12, Kudenchuk PJ13, Vilke GM14, Abella BS15.
Abstract
BACKGROUND: Bystander
cardiopulmonary resuscitation (CPR) is associated with increased survival from cardiac arrest, yet bystander CPR rates are low in many communities. The overall prevalence of CPR training in the United States and associated individual-level disparities are unknown. We sought to measure the national prevalence of CPR training and hypothesized that older age and lower socioeconomic status would be independently associated with a lower likelihood of CPR training.

METHODS AND RESULTS: We
administered a cross-sectional telephone survey to a nationally representative adult sample. We assessed the demographics of individuals trained in CPR within 2 years (currently trained) and those who had been trained in CPR at some point in time (ever trained). The association of CPR training and demographic variables were tested using survey weighted logistic regression. Between September 2015 and November 2015, 9022 individuals completed the survey; 18% reported being currently trained in CPR, and 65% reported training at some point previously. For each year of increased age, the likelihood of being currently CPR trained or ever trained decreased (currently trained: odds ratio, 0.98; 95% CI, 0.97-0.99; P <0.01; ever trained: OR, 0.99; 95% CI, 0.98-0.99; P=0.04). Furthermore, there was a greater then 4-fold difference in odds of being currently CPR trained from the 30-39 to 70-79 year old age groups (95% CI, 0.10-0.23). Factors associated with a lower likelihood of CPR training were lesser educational attainment and lower household income (P<0.01 for each of these variables).
CONCLUSIONS: A minority of
respondents reported current training in CPR. Older age, lesser education, and lower income were associated with reduced likelihood of CPR training. These findings illustrate important gaps in US CPR education and suggest the need to develop tailored CPR training efforts to address this variability.

FÀRMACS

Management of untreatable
ventricular arrhythmias during pharmacologic challenges with sodium channel blockers for suspected Brugada syndrome.
Poli S1,2, Toniolo M1, Maiani
M1, Zanuttini D 1, Rebellato L1, Vendramin I1, Dametto E3, Bernardi G3, Bassi F4, Napolitano C5, Livi U1, Proclemer A1.

Abstract
Pharmacologic challenge with

sodium channel blockers is part of the diagnostic workout in patients with suspected Brugada syndrome. The test is overall considered safe but both ajmaline and flecainide detain well known pro-arrhythmic properties. Moreover, the treatment of patients with life-threatening arrhythmias during these diagnostic procedures is not well defined. Current consensus guidelines suggest to adopt cautious protocols interrupting the sodium channel blockers as soon as any ECG alteration appears. Nevertheless, the risk of life-threatening arrhythmias persists, even adopting a safe and cautious protocol and in absence of major arrhythmic risk factors. The authors revise the main published case studies of sodium channel blockers challenge in adults and in children, and summarize three cases of untreatable ventricular arrhythmias discussing their management. In particular, the role of advanced cardiopulmonary resuscitation with extra-corporeal membrane oxygenation is stressed as it can reveal to be the only reliable lifesaving facility in prolonged cardiac arrest.

CURES POST RCE

Epileptiform discharge
detection with the 4-channel frontal electroencephalography during post-resuscitation care.

You KM1, Suh GJ2, Kwon WY3,
Kim KS4, Ko SB5, Park MJ4, Kim T4, Ko JI4.

Abstract
INTRODUCTION: We performed
this study to investigate whether the SEDline system, a 4-channel-processed electroencephalography (EEG) monitoring device in the frontal area, can detect epileptiform discharges accurately during post-resuscitation care in comatose cardiac arrest survivors.
METHODS: Adult comatose
cardiac arrest survivors, who were admitted to the intensive care unit (ICU) for post-resuscitation care including TTM, were enrolled. Within 72h post-return of spontaneous circulation (ROSC), conventional EEG was conducted for 30minutes. The SEDline system data were recorded with a video camera simultaneously with conventional EEG. Data retrieved from conventional EEG were interpreted by a neurologist and data from the SEDline system were interpreted by three emergency physicians blinded to the conventional EEG data. Then, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of the SEDline system to detect epileptiform discharges were calculated.
RESULTS: Thirty-nine patients
were enrolled in this study. Epileptiform discharges were confirmed in 6 patients (15.4%) who had the same patterns of generalized periodic epileptiform discharges in both conventional EEG and the concurrent SEDline system. The SEDline system showed 100.0% (95% confidence interval (CI), 54.1%-100.0%) of sensitivity, 100.0% (95% CI, 89.4%-100.0%) of specificity, 100.0% (95% CI, 54.1%-100.0%) of PPV, and 100.0% (95% CI, 89.4%-100.0%) of NPV. The overall classification accuracy of the SEDline system to detect epileptiform discharges was 100.0%.
CONCLUSION: The SEDline system
detected epileptiform discharges accurately in comatose cardiac arrest survivors during post-resuscitation care.

FV I DESFIBRIL·LACIÓ

The Girona Territori
Cardioprotegit Project: Performance Evaluation of Public Defibrillators.
[Article in English, Spanish]

Loma-Osorio P1, Nuñez M2,
Aboal J2, Bosch D2, Batlle P3, Ruiz de Morales E3, Ramos R4, Brugada J5, Onaga

H6, Morales A3, Olivet J7, Brugada R8.
Abstract
INTRODUCTION AND OBJECTIVES:
In recent years, public access defibrillation programs have exponentially
increased the availability of automatic external defibrillators (AED) in public
spaces but there are no data on their performance in our setting. We conducted
a descriptive analysis of the performance of AED since the launch of a public
defibrillation program in our region.
METHODS: A retrospective
analysis was conducted of electrocardiographic tracings and the performance of
AED in a public defibrillation program from June 2011 to June 2015 in the
province of Girona, Spain.
RESULTS: There were 231 AED
activations. Full information was available on 188 activations, of which 82%
corresponded to mobile devices and 18% to permanent devices. Asystole was the
most prevalent rhythm (42%), while ventricular fibrillation accounted for 23%.
The specificity of the device in identifying a shockable rhythm was 100%, but
there were 8 false negatives (sensitivity 83%). There were 47 shockable
rhythms, with a spontaneous circulation recovery rate of 49% (23 cases). There
were no accidents related to the use of the device.
CONCLUSIONS: Nearly half of
the recorded rhythms were asystole. The AED analyzed showed excellent safety
and specificity, with moderate sensitivity. Half the patients with a shockable
rhythm were successfully treated by the AED.

TARGET TEMPERATURE MANAGEMENT

Routine Laboratory Indices as
Predictor of Neurological Recovery in Post-Resuscitation Syndrome Patients
Treated with Therapeutic Hypothermia.
Minha S1, Taraboulos T1,
Elbaz-Greener G1, Kalmanovich E1, Vered Z1, Blatt A1.

Abstract
BACKGROUND: Hypothermia is
associated with improved outcome in selected survivors of cardiac arrest but no
single metric enables proper prediction of neurological outcome.
OBJECTIVES: To explored the
association between routine laboratory indices of patients treated by
hypothermia for cardiac arrest and their neurological outcome.

METHODS: We retrospectively
collected data from survivors of cardiac arrest treated with hypothermia for 24
hours and grouped them according to their neurological outcome to either
"poor" or "favorable". Routine laboratory indices were
collected at constant time intervals up to one week of admission. A comparison
between the laboratory values in both groups was performed.
RESULTS: Between May 2008 to
November 2011, 41 consecutive patients with a mean age of 54.3 ± 16.7 years
were included in this study. No significant correlation was found between
routine laboratory indices and the neurological outcome. The temporal trend of
decay in the serum glucose values and the ratio of polymorphonuclears to white
blood cells during the first 72 hours after admission was steeper in the
favorable outcome group (P for trend < 0.05).
CONCLUSIONS: No single routine
laboratory index was associated with neurological outcome of survivors of
cardiac arrest treated with hypothermia. The temporal trends in both serum
glucose and polymorphonuclear ratio signal a more intense inflammatory response
associated with poor outcome.

COOL AMI EU pilot trial: a
multicentre, prospective, randomised controlled trial to assess cooling as an
adjunctive therapy to percutaneous intervention in patients with acute
myocardial infarction.

Noc M1, Erlinge D, Neskovic
AN, Kafedzic S, Merkely B, Zima E, Fister M, Petrović M, Čanković M, Veress G,
Laanmets P, Pern T, Vukcevic V, Dedovic V, Średniawa B, Świątkowski A, Keeble
TR, Davies JR, Warenits AM, Olivecrona G, Peruga JZ, Ciszewski M, Horvath I,
Edes I, Nagy GG, Aradi D, Holzer M.

Abstract
AIMS: We aimed to investigate
the rapid induction of therapeutic hypothermia using the ZOLL Proteus
Intravascular Temperature Management System in patients with anterior
ST-elevation myocardial infarction (STEMI) without cardiac arrest.
METHODS AND RESULTS: A total
of 50 patients were randomised; 22 patients (88%; 95% confidence interval [CI]:
69-97%) in the hypothermia group and 23 patients (92%; 95% CI: 74-99) in the
control group completed cardiac magnetic resonance imaging at four to six days
and 30-day follow-up. Intravascular temperature at coronary guidewire crossing
after 20.5 minutes of endovascular cooling decreased to 33.6°C (range
31.9-35.5°C). There was a 17-minute (95% CI: 4.6-29.8 min) cooling-related
delay to reperfusion. In "per protocol" analysis, median infarct
size/left ventricular mass was 16.7% in the hypothermia group versus 23.8% in
the control group (absolute reduction 7.1%, relative reduction 30%; p=0.31) and
median left ventricular ejection fraction (LVEF) was 42% in the hypothermia
group and 40% in the control group (absolute reduction 2.4%, relative reduction
6%; p=0.36). Except for self-terminating paroxysmal atrial fibrillation (32%
versus 8%; p=0.074), there was no excess of adverse events in the hypothermia
group.
CONCLUSIONS: We rapidly and
safely cooled patients with anterior STEMI to 33.6°C at the time of coronary
guidewire crossing. This is ≥1.1°C lower than in previous cooling studies.
Except for self-terminating atrial fibrillation, there was no excess of adverse
events and no clinically important cooling-related delay to reperfusion. A
statistically non-significant numerical 7.1% absolute and 30% relative
reduction in infarct size warrants a pivotal trial powered for efficacy.

Protocol-driven neurological
prognostication and withdrawal of life-sustaining therapy after cardiac arrest
and targeted temperature management.

Dragancea I1, Wise MP2,
Al-Subaie N3, Cranshaw J4, Friberg H5, Glover G6, Pellis T7, Rylance R8, Walden
A9, Nielsen N10, Cronberg T11; TTM trial investigators.

Abstract
BACKGROUND: Brain injury is
reportedly the main cause of death for patients resuscitated after
out-of-hospital cardiac arrest (OHCA). However, the majority may actually die
following withdrawal of life-sustaining therapy (WLST) with a presumption of
poor neurological recovery. We investigated how the protocol for neurological
prognostication was used and how related treatment recommendations might have
affected WLST decision-making and outcome after OHCA in the Targeted
Temperature Management (TTM) trial.
METHODS: Analyses of
prospectively recorded data: details of neurological prognostication;
recommended level-of-care; WLST decisions; presumed cause of death; and
Cerebral Performance Category (CPC) 6 months following randomisation.

RESULTS: Of 939 patients, 452 (48%) woke and 139 (15%) died, mostly for non-neurological reasons, before a scheduled time point for neurological prognostication (72hours after the end of TTM). Three hundred and thirteen (33%) unconscious patients underwent prognostication at a median 117(IQR 93-137) hours after arrest. Thirty-three (3%) unconscious patients were not neurologically prognosticated and for 2 patients (1%) data were missing. Related care recommendations were: continue in 117 (37%); not escalate in 55 (18%); and withdraw in 141 (45%). WLST eventually occurred in 196 (63%) at median day 6 (IQR 5-8). At 6 months, only 2 patients with WLST were alive and 248 (79%) of prognosticated patients had died. There were significant differences in time to WLST and death after the different recommendations (log rank <0.001).
CONCLUSION: Delayed prognostication was relevant for a minority of patients and related to subsequent decisions on level-of-care with effects on ICU length-of-stay, survival time and outcome.

A Novel Cooling Method and Comparison of Active Rewarming of Mildly Hypothermic Subjects.
Christensen ML1, Lipman GS2, Grahn DA3, Shea KM2, Einhorn J4, Heller HC3.

Abstract
OBJECTIVE: To compare the effectiveness of arteriovenous anastomosis (AVA) vs heated intravenous fluid (IVF) rewarming in hypothermic subjects. Additionally, we sought to develop a novel method of hypothermia induction.
METHODS: Eight subjects underwent 3 cooling trials each to a mean core temperature of 34.8±0.6 (32.7 to 36.3°C) by 14°C water immersion for 30 minutes, followed by walking on a treadmill for 5 minutes. Core temperatures (Δtes) and rates of cooling (°C/h) were measured. Participants were then rewarmed by 1) control: shivering only in a sleeping bag; 2) IVF: shivering in sleeping bag and infusion of 2 L normal saline warmed to 42°C at 77 mL/min; and 3) AVA: shivering in sleeping bag and circulation of 45°C warmed fluid through neoprene pads affixed to the palms and soles of the feet.
RESULTS: Cold water immersion resulted in a decrease of 0.5±0.5°C Δtes and 1±0.3°C with exercise (P < .01); with an immersion cooling rate of 0.9±0.8°C/h vs 12.6±3.2°C/h with exercise (P < .001). Temperature nadir reached 35.0±0.5°C. There were no significant differences in rewarming rates between the 3 conditions (shivering: 1.3±0.7°C/h, R^2 = 0.683; IVF 1.3±0.7°C/h, R^2 = 0.863; and AVA 1.4±0.6°C/h, R^2 = 0.853; P = .58). Shivering inhibition was greater with AVA but was not significantly different (P = .07).
CONCLUSIONS: This study developed a novel and efficient model of hypothermia induction through exercise-induced convective afterdrop. Although there was not a clear benefit in either of the 2 active rewarming methods, AVA rewarming showed a nonsignificant trend toward greater shivering inhibition, which may be optimized by an improved interface.

Endovascular rewarming in the emergency department for moderate to severe accidental hypothermia.
Klein LR1, Huelster J2, Adil U2, Rischall M3, Brunette DD3, Kempainen RR2, Prekker ME4.

Abstract
BACKGROUND: Endovascular
temperature control catheters can be utilized for emergent rewarming in
accidental hypothermia. The purpose of this study was to compare patients with
moderate to severe hypothermia rewarmed with an endovascular temperature
control catheter versus usual care at our institution.
METHODS: We conducted a
retrospective, observational cohort study of patients with moderate to severe
accidental hypothermia (core body temperature less than 32°C) in the Emergency
Department of an urban, tertiary care medical center. We identified the
rewarming techniques utilized for each patient, including those who had an
endovascular temperature control catheter placed (Quattro© or Icy© catheter,
CoolGuard© 3000 regulation system, Zoll Medical). Rewarming rates and outcomes
were compared for patients with and without the endovascular temperature
control catheter. We systematically screened for procedural complications.
RESULTS: There were 106
patients identified with an initial core temperature less than or equal to
32°C; 52 (49%) patients rewarmed with an endovascular temperature control
catheter. Other methods of rewarming included external forced-air rewarming
(85, 80%), bladder lavage (17, 16%), gastric lavage (10, 9%), closed pleural
lavage (6, 6%), and peritoneal lavage (3, 3%). Rate of rewarming did not differ
between the groups with and without catheter-based rewarming (1.3°C/h versus
1.0°C/h, difference 0.3°C, 95% confidence interval [CI] of the difference 0-0.6°C)
and neither did survival (70% versus 71%, difference 1%, 95% CI -17 to 20%). We
did not identify any significant vascular injuries resulting from endovascular
catheter use.
CONCLUSION: The endovascular
temperature control system was not associated with an increased rate of
rewarming in this cohort with moderate to severe hypothermia; however, this
technique appears to be safe and feasible.

TRAUMA

Pelvic fracture pattern
predicts the need for hemorrhage control intervention-Results of an AAST
multi-institutional study.

Costantini TW1, Coimbra R,
Holcomb JB, Podbielski JM, Catalano RD, Blackburn A, Scalea TM, Stein DM,
Williams L, Conflitti J, Keeney S, Hoey C, Zhou T, Sperry J, Skiada D, Inaba K,
Williams BH, Minei JP, Privette A, Mackersie RC, Robinson BR, Moore FO; AAST
Pelvic Fracture Study Group.

Abstract

BACKGROUND: Early
identification of patients with pelvic fractures at risk of severe bleeding
requiring intervention is critical. We performed a multi-institutional study to
test our hypothesis that pelvic fracture patterns predict the need for a pelvic
hemorrhage control intervention.
METHODS: This prospective,
observational, multicenter study enrolled patients with pelvic fracture due to
blunt trauma. Inclusion criteria included shock on admission (systolic blood
pressure <90 mm Hg or heart rate >120 beats/min and base deficit >5,
and the ability to review pelvic imaging). Demographic data, open pelvic
fracture, blood transfusion, pelvic hemorrhage control intervention
(angioembolization, external fixator, pelvic packing, and/or REBOA

[resuscitative balloon occlusion of the aorta]), and mortality were recorded. Pelvic fracture pattern was classified according to Young-Burgess in a blinded fashion. Predictors of pelvic hemorrhage control intervention and mortality were analyzed by univariate and multivariate regression analyses.

RESULTS: A total of 163 patients presenting in shock were enrolled from 11 Level I trauma centers. The most common pelvic fracture pattern was lateral compression I, followed by lateral compression I, and vertical shear. Of the 12 patients with an anterior-posterior compression III fracture, 10 (83%) required a pelvic hemorrhage control intervention. Factors associated with the need for pelvic fracture hemorrhage control intervention on univariate analysis included vertical shear pelvic fracture pattern, increasing age, and transfusion of blood products. Anterior-posterior compression III fracture patterns and open pelvic fracture predicted the need for pelvic hemorrhage control intervention on multivariate analysis. Overall in-hospital mortality for patients admitted in shock with pelvic fracture was 30% and did not differ based on pelvic fracture pattern on multivariate analysis.

CONCLUSION: Blunt trauma patients admitted in shock with anterior-posterior compression III fracture patterns or patients with open pelvic fracture are at greatest risk of bleeding requiring pelvic hemorrhage control intervention.

LEVEL OF EVIDENCE:Prognostic/epidemiologic study, level III.

PEDIATRIA

Use of EEG in critically ill children and neonates in the United States of America.
Gaínza-Lein M1,2, Sánchez Fernández I1,3, Loddenkemper T4.

Abstract

The objective of the study was to estimate the proportion of patients who receive an electroencephalogram (EEG) among five common indications for EEG monitoring in the intensive care unit: traumatic brain injury (TBI), extracorporeal membrane oxygenation (ECMO), cardiac arrest, cardiac surgery and hypoxic-ischemic encephalopathy (HIE). We performed a retrospective cross-sectional descriptive study utilizing the Kids' Inpatient Database (KID) for the years 2010-2012. The KID is the largest pediatric inpatient database in the USA and it is based on discharge reports created by hospitals for billing purposes. We evaluated the use of electroencephalogram (EEG) or video-electroencephalogram in critically ill children who were mechanically ventilated. The KID database had a population of approximately 6,000,000 pediatric admissions. Among 22,127 admissions of critically ill children who had mechanical ventilation, 1504 (6.8%) admissions had ECMO, 9201 (41.6%) TBI, 4068 (18.4%) HIE, 2774 (12.5%) cardiac arrest, and 4580 (20.7%) cardiac surgery. All five conditions had a higher proportion of males, with the highest (69.8%) in the TBI group. The mortality rates ranged from 7.02 to 39.9% (lowest in cardiac surgery and highest in ECMO). The estimated use of EEG was 1.6% in cardiac surgery, 4.1% in TBI, 7.2% in ECMO, 8.2% in cardiac arrest, and 12.1% in HIE, with an overall use of 5.8%. Among common indications for EEG monitoring in critically ill children and neonates, the estimated proportion of patients actually having an EEG is low.

[Mistakes in drug prescription during simulated pediatric resuscitations and other urgency procedures].
[Article in Spanish; Abstract

Enriquez D1, Gómez Traverso
R2, Brizuela S2, Szyld E3.

Abstract
INTRODUCTION: The probability
of making mistakes in the prescription of medicines is high in pediatrics, and
substantially increases in emergency situations.
MATERIAL AND METHODS: This
prospective observational study analyzed the prescriptions issued by physicians
during 23 cardiopulmonary resuscitation pediatric emergency training sessions.
RESULTS: During 94 simulated
cases, 96 physicians participated. Forty-four prescriptions on paper were
analyzed (48%) including 120 doses. Twelve medication errors were found (10%,
CI 95%: 5.517.2). Stress was identified as the primary cause of prescription
mistakes.
CONCLUSIONS: Drug prescription
mistakes frequently occurred during pediatric emergency simulations.

ECMO

Aeromedical Evacuation Using
Extra Corporeal Life Support After Resuscitated Cardiac Arrest.
Gerard D1, Raffin H, Lebreton
G.

Abstract
BACKGROUND: Extra corporeal
life support (ECLS) is presently first line therapy for refractory cardiogenic
shock. Mobile circulatory support teams implant ECLS or extra corporeal
membrane oxygenation (ECMO) in patients in the hospital without circulatory
support. These patients are then transported to specialized centers. Here we
report a case of sending a mobile circulatory support team abroad, followed by
air ambulance evacuation, which, to our knowledge, has never been used as part
of medical assistance abroad.
CASE REPORT: In June, during a
holiday in Turkey, a 56-yr-old woman complained about chest pain. She had a
cardiac arrest and was resuscitated with no no-flow time in the local hospital.
ECG showed ST segment elevation. Medic'Air International medical assistance
(Paris, France) contacted the hospital, which was not equipped with
coronarography or cardiac ultrasound and the local treating doctor refused
transfer of the patient to another facility. A medical team completed by a
cardiothoracic surgeon and a perfusionist went from Paris to the patient's
bedside by air ambulance. They implemented the ECLS and successfully
repatriated the patient to her home country (Belgium). The patient's condition
improved, she neurologically improved, and returned home on the 14th day.
DISCUSSION: Possible
indications for ECLS repatriations firstly take into account recognized ECLS
indications and case-by-case discussions on the evaluation of inadequacy of the
health facilities and risk-benefit balance. In international medical
assistance, this case's description is an example of repatriation for patients
who previously could not be transferred due to high risk of such
intervention.Gerard D, Raffin H, Lebreton G. Aeromedical evacuation using extra
corporeal life support after resuscitated cardiac arrest. Aerosp Med Hum
Perform. 2017; 88(4):431-433.

RECERCA EXPERIMENTAL

Induction of hibernation-like

hypothermia by central activation of the A1 adenosine receptor in a non-hibernator, the rat.

Shimaoka H1, Kawaguchi T2, Morikawa K2, Sano Y1, Naitou K1, Nakamori H1, Shiina T1,2, Shimizu Y3,4,5.

Abstract
Central adenosine A1-receptor (A1AR)-mediated signals play a role in the induction of hibernation. We determined whether activation of the central A1AR enables rats to maintain normal sinus rhythm even after their body temperature has decreased to less than 20 °C. Intracerebroventricular injection of an adenosine A1 agonist, N6-cyclohexyladenosine (CHA), followed by cooling decreased the body temperature of rats to less than 20 °C. Normal sinus rhythm was fundamentally maintained during the extreme hypothermia. In contrast, forced induction of hypothermia by cooling anesthetized rats caused cardiac arrest. Additional administration of pentobarbital to rats in which hypothermia was induced by CHA also caused cardiac arrest, suggesting that the operation of some beneficial mechanisms that are not activated under anesthesia may be essential to keep heart beat under the hypothermia. These results suggest that central A1AR-mediated signals in the absence of anesthetics would provide an appropriate condition for maintaining normal sinus rhythm during extreme hypothermia.

Microcirculatory alterations during haemorrhagic shock and after resuscitation in a paediatric animal model.

González R1, Urbano J1, López J1, Solana MJ1, Botrán M2, García A2, Fernández SN1, López-Herce J3.

Abstract
BACKGROUND: Haemorrhagic shock is frequent in paediatric trauma patients and after cardiac surgery, especially after cardiopulmonary bypass. It has demonstrated to be related to bad outcome.
OBJECTIVES: To evaluate changes on microcirculatory parameters during haemorrhagic shock and resuscitation in a paediatric animal model. To determine correlation between microcirculatory parameters and other variables routinely used in the monitoring of haemorrhagic shock.
METHODS: Experimental study on 17 Maryland pigs. Thirty minutes after haemorrhagic shock induction by controlled bleed animals were randomly assigned to three treatment groups receiving 0.9% normal saline, 5% albumin with 3% hypertonic saline, or 5% albumin with 3% hypertonic saline plus a bolus of terlipressin. Changes on microcirculation (perfused vessel density (PVD), microvascular blood flow (MFI) and heterogeneity index (HI)) were evaluated and compared with changes on macrocirculation and tisular perfusion parameters.
RESULTS: Shock altered microcirculation: PVD decreased from 13.5 to 12.3 mm mm(-2) (p=0.05), MFI decreased from 2.7 to 1.9 (p<0.001) and HI increased from 0.2 to 0.5 (p<0.001). After treatment, microcirculatory parameters returned to baseline (PVD 13.6 mm mm(-2) (p<0.05), MFI 2.6 (p<0.001) and HI 0.3 (p<0.05)). Microcirculatory parameters showed moderate correlation with other parameters of tissue perfusion. There were no differences between treatments.
CONCLUSIONS: Haemorrhagic shock causes important microcirculatory alterations, which are reversed after treatment. Microcirculation should be assessed during haemorrhagic shock providing additional information to guide resuscitation.

Comparison of early sequential
hypothermia and delayed hypothermia on neurological function after
resuscitation in a swine model.
Yuan W1, Wu JY1, Zhao YZ1, Li
J2 , Li JB3, Li ZH4, Li CS5.

Abstract
BACKGROUND: We utilized a
porcine cardiac arrest model to compare early sequential hypothermia (ESH) with
delayed hypothermia (DH) and no hypothermia (NH) to investigate the different
effects on cerebral function after resuscitation.
METHODS: After return of
spontaneous circulation (ROSC), resuscitated 24 pigs divided into three groups.
The ESH group implemented early sequential hypothermia immediately, and the DH
group implemented delayed hypothermia at 1 h after ROSC. The core temperature,
hemodynamic parameters and oxygen metabolism were recorded. Cerebral metabolism
variables and neurotransmitter in the extracellular fluid were collected
through the microdialysis tubes. The bloods were analyzed for venous jugular
bulb oxygen saturation, lactate and neuron specific nolase. The cerebral
function was evaluated using the cerebral performance category and neurologic
deficit score at 72h after ROSC and cerebral histology in the right posterior
frontal lobe were collected.
RESULTS: ESH reached the
target temperature earlier and showed more favorable outcomes of neurological
function than DH. Specifically, early sequential hypothermia reduced cerebral
oxygen and energy consumption and decreased extracellular accumulation of
neurotransmitters after resuscitation and protected the integrity of the BBB
during reperfusion.
CONCLUSIONS: Early sequential
hypothermia could increase the protection of neurological function after
resuscitation and produce better neurological outcomes.

CASE REPORT

Repetitive postoperative
extubation failure and cardiac arrest due to laryngomalacia after general
anesthesia in an elderly patient: a case report.
Takeshita J1, Nishiyama K2,
Fujii M3, Tanaka H 2, Beppu S2, Sasahashi N2, Shime N4.

Abstract
The authors report a case
involving an elderly patient who experienced repetitive perioperative cardiac
arrest caused by laryngomalacia. The patient underwent surgery under general
anesthesia; however, 2 h after initial extubation, he experienced
cardiopulmonary arrest. Return of spontaneous circulation was achieved by
immediate resuscitation. Four hours later, a second extubation was performed
without any neurological complications. However, 2 h later, he experienced
cardiopulmonary arrest again. Immediately after the third extubation, 12 h
after the second cardiopulmonary arrest, fiberoptic laryngoscopy revealed
laryngomalacia. His respiratory condition stabilized after emergent
tracheostomy. Laryngomalacia should be considered even in adult cases when
signs of upper airway obstruction manifest after extubation.