RCP MECÀNICA

LUCAS(™)2 in Danish Search and Rescue Helicopters.
Winther K1, Bleeg RC2.
Abstract
OBJECTIVE:
Prehospital resuscitation is often challenging. Giving uninterrupted and effective compressions is relatively impossible during transportation. In 2012, The Royal Danish Air Force received a donation of 8 mechanical chest compression devices (LUCAS(™)2; Physio-Control/Jolife AB, Lund, Sweden) to be used onboard the Danish search and rescue (SAR) helicopters. The scope of this investigation was to establish whether or not mechanical chest compression devices should be considered a necessity onboard the Danish SAR helicopters.
METHODS:
Data were compiled from SAR medical journals. From the data collected, observations were made as to when LUCAS(™)2 was used and what diagnosis the SAR physician made.
RESULTS:
One thousand ninety missions were registered in the 24-month research period, and LUCAS(™)2 was used in 25 missions. Cardiac emergencies amounted for 25% of the missions.
CONCLUSION:
The Danish SAR helicopters retrieved 33 drowned/hypothermic patients during the research period, and the LUCAS(™)2 was used in 11 of the patients requiring resuscitation. The LUCAS(™)2 was frequently used during other emergencies like sudden cardiac arrest. Cardiac emergencies were the predominant type of mission. LUCAS(™)2 is now considered mandatory on Danish SAR helicopters.

Hands-off Time during Automated Chest Compression Device Application in Out-of-Hospital Cardiac Arrest: A Case Series Report.
Maurin O, Frattini B, Jost D, Galinou N, Allanati L, Dang Minh P, Genotelle N, Burlaton G, de Regloix S, Bignand M, Tourtier JP.
Abstract
INTRODUCTION:
During out-of-hospital cardiac arrest (OHCA), chest compression interruptions or hands-off time (HOT) affect the prognosis. Our aim was to measure HOT due to the application of an automated chest compression device (ACD) by an advanced life support team.
MATERIALS AND METHODS:
This was a prospective observational case series report since the introduction of a new method of installing the ACD. Inclusion criteria were patients over 18 years old with OHCA who were treated with an ACD (Lucas 2TM, Physio-Control). The ACD application was indicated only for OHCA patients transported to a hospital for Extra Corporeal Life Support (ECLS). We recorded the HOT related to switching from manual to mechanical chest compressions. An ACD consists of dorsal and ventral components, which can be installed either in one or in two steps, separated from a chest compression sequence. HOT was expressed as a median number of seconds [interquartile range].
RESULTS:
From January 1, 2012 to January 15, 2013, 30 patients were included. In the case of ACD application in one phase (n = 16), the median HOT was 25.3 s [19.8-30.5]. With regard to patients with an ACD application in two phases (n = 14), the median HOT was, respectively, 9.8 s [7.8-17] and 12.4 s [9.5-16.2], that is, a median global HOT of 23.6 s [19-27.6]. HOT was not different between ACD applications in one or two phases (p = 0.52). For a two phase application, the median chest compression time between the two manipulations was 14.2 s [6.4-18].
CONCLUSION:
There was no significant difference between techniques in the application of the Lucas 2TM device in terms of HOT. The short time needed to apply the device lends itself well to use as a

primary chest compression modality during cardiac arrest as well as a bridge to novel resuscitation strategies (ECLS). A further study is currently underway with a larger number of ECLS patients.

REGISTRES I REVISIONS

Meta-analysis of outcomes of the 2005 and 2010 cardiopulmonary resuscitation guidelines for adults with in-hospital cardiac arrest.
Zhu A1, Zhang J2.
Abstract
OBJECTIVES:
The post-cardiac arrest survival rate has remained low since the 2010 cardiopulmonary resuscitation (CPR) guidelines were published. The present study aimed to review the 2010 vs 2005 CPR guideline outcomes in adults with in-hospital cardiac arrest.
METHODS:
The Pub Med, EMBASE, and Cochrane Library databases were searched for articles published between January 2006 and July 2015. We extracted the following from observational studies and intervention studies: first author's name, publication year, study duration, age of study population, and sample size. The primary outcome variables were return of spontaneous circulation (ROSC) and survival to discharge. The data were divided into 2005 (data collected before December 2010) and 2010 (data collected in December 2010 or later) CPR guidelines groups.
RESULTS:
Twenty-four original articles (77,605 patients) were included. Statistically significant heterogeneity (ROSC: $P<.01$, $I2=97.9\%$; survival to discharge: $P<.01$, $I2=98.3\%$) was seen, and a random-effects model was used to pool the outcomes. The pooled ROSC rate for the 2010 group (n=5; mean, 48%; 95% confidence interval [CI], 0.38-0.58) was only slightly higher than that of the 2005 group (n=19; mean, 47%; 95% CI, 0.38-0.57). The opposite result was noted in the pooled survival to discharge rates (2010: n=5, mean, 14%; 95% CI, 0.08-0.20 vs 2005: n=19; mean, 15%; 95% CI, 0.10-0.20). There was actually no significant difference in ROSC or survival to discharge outcomes between the 2 groups.
CONCLUSIONS:
The 2010 CPR guidelines emphasized that high-quality chest compressions can increase the ROSC rate but did not show to improve long-term results.

Near-infrared spectroscopy monitoring during cardiac arrest: a systematic review and meta-analysis.
Cournoyer A1, Iseppon M1, Chauny JM1,2, Denault A1,3, 4, Cossette S1,3, Notebaert É1,2,5.
Abstract
BACKGROUND:
Tissue oximetry using near-infrared spectroscopy (NIRS) is a non-invasive monitor of cerebral oxygenation. This new technology has been used during cardiac arrest (CA) because of its ability to give measures in low blood flow situations. The aim of this study was to assess the evidence regarding the association between the types of NIRS measurements (mean, initial and highest values) and resuscitation outcomes (return of spontaneous circulation (ROSC), survival to discharge and good neurologic outcome) in patients undergoing cardiopulmonary resuscitation.
METHODS AND RESULTS:
This review was registered (Prospero CRD42015017380) and is reported as per the PRISMA guidelines. Medline, Embase and CENTRAL were searched. All studies, except case reports and case series of fewer than five patients, reporting on adults that had NIRS monitoring during CA were eligible for inclusion. Two reviewers assessed the quality of the included articles and extracted the data. The outcome effect was standardized using standardized mean difference (SMD). Twenty non-randomized observational studies (15 articles and five conference

abstracts) were included in this review, for a total of 2436 patients. We found a stronger association between ROSC and mean NIRS values (SMD 1.33 [95% confidence interval (CI) 0.92-1.74]) than between ROSC and initial NIRS measurements (SMD 0.51 [95% CI 0.23-0.78]). There was too much heterogeneity amongst the highest NIRS measurements group to perform meta-analysis. Only two of the 75 patients who experienced ROSC had a mean NIRS saturation under 30%. Patients who survived to discharge and who had good neurologic outcome displayed superior combined initial and mean NIRS values than their counterparts (SMD 1.63 [95% CI 1.34-1.92]; SMD 2.12 [95% CI 1.14-3.10]).

CONCLUSIONS:

Patients with good resuscitation outcomes have significantly higher NIRS saturations during resuscitation than their counterparts. The types of NIRS measurements during resuscitation influenced the association between ROSC and NIRS saturation. Prolonged failure to obtain a NIRS saturation higher than 30% may be included in a multi-modal approach to the decision of terminating resuscitation efforts (Class IIb, Level of Evidence C-Limited Data).

Relationship between Time-to-ROSC and Survival in Out-of-hospital Cardiac Arrest ECPR Candidates: When is the Best Time to Consider Transport to Hospital?

Grunau B, Reynolds J, Scheuermeyer F, Stenstom R, Stub D, Pennington S, Cheskes S, Ramanathan K, Christenson J.

Abstract

OBJECTIVE:

Extracorporeal cardiopulmonary resuscitation (ECPR) may improve outcomes for refractory out-of-hospital cardiac arrest (OHCA). Transport of intra-arrest patients to hospital however, may decrease CPR quality, potentially reducing survival for those who would have achieved return-of-spontaneous-circulation (ROSC) with further on-scene resuscitation. We examined time-to-ROSC and patient outcomes for the optimal time to consider transport.

METHODS:

From a prospective registry of consecutive adult non-traumatic OHCA's, we identified a hypothetical ECPR-eligible cohort of EMS-treated patients with age ≤ 65, witnessed arrest, and bystander CPR or EMS arrival < 10 minutes. We assessed the relationship between time-to-ROSC and survival, and constructed a ROC curve to illustrate the ability of a pulseless state to predict non-survival with conventional resuscitation.

RESULTS:

Of 6,571 EMS-treated cases, 1,206 were included with 27% surviving. Increasing time-to-ROSC (per minute) was negatively associated with survival (adjusted OR 0.91; 95%CI 0.89-0.93%). The yield of survivors per minute of resuscitation increased from commencement and started to decline in the 8th minute. Fifty percent and 90% of survivors had achieved ROSC by 8.0 and 24 min, respectively, at which times the probability of survival for those with initial shockable rhythms was 31% and 10%, and for non-shockable rhythms was 5.2% and 1.6%. The ROC curve illustrated that the 16th minute of resuscitation maximized sensitivity and specificity (AUC = 0.87, 95% CI 0.85-0.89).

CONCLUSION:

Transport for ECPR should be considered between 8 to 24 minutes of professional on-scene resuscitation, with 16 minutes balancing the risks and benefits of early and later transport. Earlier transport within this window may be preferred if high quality CPR can be maintained during transport and for those with initial non-shockable rhythms.

Treatment of cardiac arrest in the hyperbaric environment: key steps on the sequence of care--case reports.

Wright KT, Praske SP, Bhatt NA, Magalhaes RM, Quast TM.

Abstract

The U.S. territory of Guam attracts thousands of military and civilian divers annually and is home to the only recompression facility within a 5,000-km radius that accepts critically injured

dive casualties. As recompression chambers are confined spaces and standard use of electrical cardioversion cannot be used, cardiac resuscitation at depth must deviate from advanced cardiovascular life support (ACLS) algorithms. Furthermore, many hyperbaric chambers that accept dive casualties are in remote locations, a situation that requires providers to approach cardiac resuscitation in a different way when compared to an in-hospital or ICU setting. This presents a challenge to trained medical and diving professionals. We present two contrasting vignettes of diving injuries initially responsive to appropriate treatment but then deteriorating during recompression therapy and ultimately requiring resuscitation at depth. Additionally, we explore the physiologic basis of resuscitation in a hyperbaric environment as it relates to the treatment of cardiac arrest at depth. This review critically examines the current guidelines in place for emergency cardiac resuscitation in a hyperbaric chamber followed by recommendations for the key steps in the sequence of care.

The Reliability of Turkish "Basic Life Support" and "Cardiac Massage" Videos Uploaded to Websites.
Elicabuk H1, Yaylacı S2, Yilmaz A1, Hatipoglu C3, Kaya FG4, Serinken M1.
Abstract
OBJECTIVE:
In this study, the reliability of Turkish cardiac massage and Basic Life Support (BLS) videos, which have already been downloaded from three website such as YouTube, Google, Yahoo following the publication of 2010 cardiopulmonary resuscitation (CPR) guideline and their suitability to the same guideline were researched.
MATERIALS AND METHODS:
The videos uploaded to the three web-site to search videos on internet were queried by using the keywords "cardiac massage" and "basic life support". Videos that had been uploaded between January 2011 and July 2014 were analyzed and scored by two experienced emergency specialists.
RESULTS:
A total of 1126 videos were obtained. 1029 of the videos (91.4%) were excluded by researchers. 97 videos were detected to accord with study criteria. Despite most of the videos were found on Google website by keywords, the enormous part of videos proper to criteria were sourced from YouTube website (n=65, 67.0%). One fourth of the videos (24.7%) were observed to not be suitable for 2010 CPR guideline. AED usage was mentioned slightly in the videos (14.4%). Median score of the videos is 5 (IQR: 4-6). The rate and scores of the videos uploaded by official institution or association were significantly higher than others (p=0.007 and 0.006, respectively). Moreover, scores of the videos compatible with guidelines uploaded by official institution or association and medical personal were also found higher (p=0.001).
CONCLUSION:
Eventually, all the data obtained in this study support that Turkish videos were not reliable on the subject of BLS and cardiac massage. It is promising that videos with high follow-up rates also have been scored higher.

Aminophylline for bradyasystolic cardiac arrest in adults.
Hurley KF1, Magee K, Green R.
Aminophylline for bradyasystolic cardiac arrest in adults. [Cochrane Database Syst Rev. 2013]
Abstract
BACKGROUND:
In cardiac ischaemia, the accumulation of adenosine may lead to or exacerbate bradyasystole and diminish the effectiveness of catecholamines administered during resuscitation. Aminophylline is a competitive adenosine antagonist. Case studies suggest that aminophylline may be effective for atropine-resistant bradyasystolic arrest.
OBJECTIVES:

To determine the effects of aminophylline in the treatment of patients in bradyasystolic cardiac arrest, primarily survival to hospital discharge. We also considered survival to admission, return of spontaneous circulation, neurological outcomes and adverse events.
SEARCH METHODS:
For this updated review, we searched the Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAHL, LILACS, ClinicalTrials.gov and WHO International Clinical Trials Registry Platform in November 2014. We checked the reference lists of retrieved articles, reviewed conference proceedings, contacted experts and searched further using Google.
SELECTION CRITERIA:
All randomised controlled trials comparing intravenous aminophylline with administered placebo in adults with non-traumatic, normothermic bradyasystolic cardiac arrest who were treated with standard advanced cardiac life support (ACLS).
DATA COLLECTION AND ANALYSIS:
Two review authors independently reviewed the studies and extracted the included data. We contacted study authors when needed. Pooled risk ratio (RR) was estimated for each study outcome. Subgroup analysis was predefined according to the timing of aminophylline administration.
MAIN RESULTS:
We included five trials in this analysis, all of which were performed in the prehospital setting. The risk of bias was low in four of these studies (n = 1186). The trials accumulated 1254 participants. Aminophylline was found to have no effect on survival to hospital discharge (risk ratio (RR) 0.58, 95% confidence interval (CI) 0.12 to 2.74) or on secondary survival outcome (survival to hospital admission: RR 0.92, 95% CI 0.61 to 1.39; return of spontaneous circulation: RR 1.15, 95% CI 0.89 to 1.49). Survival was rare (6/1254), making data about neurological outcomes and adverse events quite limited. The planned subgroup analysis for early administration of aminophylline included 37 participants. No one in the subgroup survived to hospital discharge.
AUTHORS' CONCLUSIONS:
The prehospital administration of aminophylline in bradyasystolic arrest is not associated with improved return of circulation, survival to admission or survival to hospital discharge. The benefits of aminophylline administered early in resuscitative efforts are not known.

POST RCE

1. Resuscitation. 2016 Mar 29. pii: S0300-9572(16)00144-1. doi: 10.1016/j.resuscitation.2016.03.018. [Epub ahead of print]
Automated assessment of early hypoxic brain edema in non-enhanced CT predicts outcome in patients after cardiac arrest.
Hanning U1, Sporns P2, Lebiedz P3, Niederstadt T2, Zoubi T2, Schmidt R4, Knecht S5, Heindel W2, Kemmling A6.
Abstract
INTRODUCTION:
Early prediction of potential neurological recovery in patients after cardiac arrest is challenging. Recent studies suggest that the densitrometic gray-white matter ratio (GWR) determined from cranial computed tomography (CT) scans may be a reliable predictor of poor outcome. We evaluated an automated, rater independent method to determine GWR in CT as an early objective imaging predictor of clinical outcome.
METHODS:
We analyzed imaging data of 84 patients after cardiac arrest that underwent noncontrast CT within 24hours after arrest. To determine GWR in CT we applied two methods using a recently published automated probabilistic gray-white matter segmentation algorithm (GWR_aut) and conventional manual measurements within gray-white regions of interest (GWR_man). Neurological outcome was graded by the cerebral performance category (CPC). As part of standard routine CPC was assessed by the treating physician in the intensive care unit at admission and at discharge to normal ward. The performance of GWR measures (automated and manual) to predict the binary clinical endpoints of poor (CPC3-5) and good outcome

(CPC1-2) was assessed by ROC analysis with increasing discrimination thresholds. Results of GWR_aut were compared to GWR_man of two raters.
RESULTS:
Of 84 patients, 55 (65%) showed a poor outcome. ROC curve analysis revealed reliable outcome prediction of GWR_aut (AUC 0.860) and GWR_man (AUC 0.707 and 0.699, respectively). Predictive power of GWR_aut was higher than GWR_man by each rater (p=0.019 and p=0.021, respectively) at an optimal cut-off of 1.084 to predict poor outcome (optimal criterion with 92.7% sensitivity, 72.4% specificity). Interrater reliability of GWR_man by intra-class correlation coefficent (ICC) was moderate (0.551).

2. Neurocrit Care. 2016 Mar 31. [Epub ahead of print]
Group-Based Trajectory Modeling of Suppression Ratio After Cardiac Arrest.
Elmer J1,2, Gianakas JJ3, Rittenberger JC4, Baldwin ME5, Faro J4, Plummer C6, Shutter LA7,8,9, Wassel CL10, Callaway CW4, Fabio A3; Pittsburgh Post-Cardiac Arrest Service.
Author information:
Abstract
BACKGROUND:
Existing studies of quantitative electroencephalography (qEEG) as a prognostic tool after cardiac arrest (CA) use methods that ignore the longitudinal pattern of qEEG data, resulting in significant information loss and precluding analysis of clinically important temporal trends. We tested the utility of group-based trajectory modeling (GBTM) for qEEG classification, focusing on the specific example of suppression ratio (SR).
METHODS:
We included comatose CA patients hospitalized from April 2010 to October 2014, excluding CA from trauma or neurological catastrophe. We used Persyst®v12 to generate SR trends and used semi-quantitative methods to choose appropriate sampling and averaging strategies. We used GBTM to partition SR data into different trajectories and regression associate trajectories with outcome. We derived a multivariate logistic model using clinical variables without qEEG to predict survival, then added trajectories and/or non-longitudinal SR estimates, and assessed changes in model performance.
RESULTS:
Overall, 289 CA patients had ≥36 h of EEG yielding 10,404 h of data (mean age 57 years, 81 % arrested out-of-hospital, 33 % shockable rhythms, 31 % overall survival, 17 % discharged to home or acute rehabilitation). We identified 4 distinct SR trajectories associated with survival (62, 26, 12, and 0 %, P < 0.0001 across groups) and CPC (35, 10, 4, and 0 %, P < 0.0001 across groups). Adding trajectories significantly improved model performance compared to adding non-longitudinal data.
CONCLUSIONS:
Longitudinal analysis of continuous qEEG data using GBTM provides more predictive information than analysis of qEEG at single time-points after CA.

3. Acad Emerg Med. 2016 Mar 29. doi: 10.1111/acem.12978. [Epub ahead of print]
Receiving Hospital Characteristics Associated with Survival in Patients Transported by Emergency Medical Services After Out-of-Hospital Cardiac Arrest.
Hunter BR1, O'Donnell DP1, Kline JA1.
Abstract
OBJECTIVE:
To test whether primary Emergency Medical Services (EMS) transport to hospitals with certain characteristics [24/7 percutaneous coronary intervention (PCI) availability, trauma center status, large (>24 bed) ICU] vs. hospitals without those characteristics is associated with improved hospital survival after Out-of-Hospital Cardiac Arrest (OHCA).
METHODS:
This is an analysis of a prospectively collected EMS database, which archives patients with OHCA treated by a single large metropolitan EMS system. The database contains Utstein data, EMS transport data, and survival to hospital discharge. EMS providers uniformly apply advanced cardiac life support protocols to OHCA patients in the field. Patients with ROSC are transported to one of 10 hospitals in the area. If ROSC is not achieved within 30 minutes,

efforts are terminated and the patient is not transported. We used multivariate logistic regression to test if receiving hospital characteristics were independently associated with survival among those transported after ROSC. We excluded patients not transported to a hospital and patients with incomplete outcome data.

RESULTS:

Between January 2011 and December 2014, 1,188 OHCA patients were resuscitated in the field and transported to an area hospital. After excluding patients with missing data, 1,024 patients were included in the analysis. The average age was 61.1 years, and 57.7% were male. Of transported patients, 76% were taken to 24/7 PCI centers, 46% were taken to trauma centers, and 37% were taken to hospitals with large ICUs. There was considerable overlap in these hospital characteristics. A multivariate logistic regression model including age, gender, shockable rhythm, EMS time to scene, and dispatch complaint of cardiac arrest found that none of the hospital characteristics were independently associated with increased survival to discharge. The Odds Ratios (ORs) for survival were: PCI center: 1.28 (0.80 to 2.04); Trauma Center: 1.44 (0.73 to 2.85); and Large ICU: 1.39 (0.69 to 2.80).

CONCLUSIONS:

After adjusting for patient demographic data, we found no significant independent association between receiving hospital characteristics and survival to discharge among OHCA patients transported after ROSC by a single EMS agency.

FV I ELECTROFISIOLOGIA

Public access defibrillation: improving accessibility and outcomes.
Mao RD1, Ong ME2.
Abstract
BACKGROUND:

Worldwide, out-of-hospital cardiac arrest (OHCA) remains a serious problem. Public access defibrillation (PAD) has been shown to be effective in improving survival in OHCA with good neurological outcome.

SOURCES OF DATA:

Original articles, reviews and national/international guidelines.

AREAS OF AGREEMENT:

Limitations to how much we can improve ambulance response times mean that the public have an essential role to play in OHCA survival. Training of laypersons in the use of automated external defibrillators (AEDs) has been shown to improve outcomes. Placement of AEDs should be related to underlying population demographics.

AREAS OF CONTROVERSY:

Placements of AEDs face cost constraints. PAD programs also face challenges in the upkeep of AEDs. Concerns about legal liability for lay rescuers to act remain.

GROWING POINTS:

Systematic programs should be in place to train the public in PAD. All AEDs should be listed in national registries and available for usage in an emergency.

AREAS TIMELY FOR DEVELOPING RESEARCH:

Smart technology is being developed to improve accessibility of AEDs.

A randomized control hands-on defibrillation study - barrier use evaluation.
Wampler D1, Kharod C2, Bolleter S3, Burkett A3, Gabehart C4, Manifold C4.
Abstract
INTRODUCTION:

Chest compressions and defibrillation are the only therapies proven to increase survival in cardiac arrest. Historically, rescuers must remove hands to shock, thereby interrupting chest

compressions. This hands-off time results in a zero blood flow state. Pauses have been associated with poorer neurological recovery.

METHODS:
This was a blinded randomized control cadaver study evaluating the detection of defibrillation during manual chest compressions. An active defibrillator was connected to the cadaver in the sternum-apex configuration. The sham defibrillator was not connected to the cadaver. Subjects performed chest compressions using 6 barrier types: barehand, single and double layer nitrile gloves, firefighter gloves, neoprene pad, and a manual chest compression/decompression device. Randomized defibrillations (10 per barrier type) were delivered at 30 joules (J) for bare hand and 360J for all other barriers. After each shock, the subject indicated degree of sensation on a VAS scale.

RESULTS:
Ten subjects participated. All subjects detected 30j shocks during barehand compressions, with only 1 undetected real shock. All barriers combined totaled 500 shocks delivered. Five (1%) active shocks were detected, 1(0.2%) single layer of Nitrile, 3(0.6%) with double layer nitrile, and 1(0.2%) with the neoprene barrier. One sham shock was reported with the single layer nitrile glove. No shocks were detected with fire gloves or compression decompression device. All shocks detected barely perceptible (0.25(±.05) cm on 10cm VAS scale).

CONCLUSIONS:
Nitrile gloves and neoprene pad prevent (99%) responder's detection of defibrillation of a cadaver. Fire gloves and compression decompression device prevented detection.

3. Curr Opin Crit Care. 2016 Mar 30. [Epub ahead of print]
See through ECG technology during cardiopulmonary resuscitation to analyze rhythm and predict defibrillation outcome.
Affatato R1, Li Y, Ristagno G.
Abstract
PURPOSE OF REVIEW:
Automated external defibrillators require preshock interruptions in cardiopulmonary resuscitation (CPR) to perform rhythm analysis. Artifact filtering technology may provide the opportunity to visualize the underlying ECG trace during CPR. Moreover, a continuous ventricular fibrillation analysis may be performed such to prioritize CPR interventions, that is, chest compression or defibrillation.
RECENT FINDINGS:
Different ECG filtering techniques and ventricular fibrillation analysis algorithms to predict defibrillation outcome have been developed. Techniques to analyze ECG rhythm during CPR encompass two major solutions: adaptive filters for the suppression of chest compression artifacts and algorithms for a direct analysis of the artifact-contaminated ECG. The above methods achieve overall a high sensitivity of more than 99%, but an unacceptable specificity of less than 93%. Among the different ventricular fibrillation analysis approaches and defibrillation predictors, amplitude spectrum area has appeared as an independent predictor of defibrillation success, with an area under the receiver operating curve of 0.86.
SUMMARY:
The feasibility of ventricular fibrillation detection during CPR is a challenging issue that, if solved, would enable CPR to continue during the automated external defibrillator rhythm analysis. Furthermore, it would allow a continuous ventricular fibrillation analysis to optimize the timing of defibrillation and maximize the shock success.

4. Circulation. 2016 Mar 28. pii: CIR.0000000000000394. [Epub ahead of print]
Wearable Cardioverter-Defibrillator Therapy for the Prevention of Sudden Cardiac Death: A Science Advisory From the American Heart Association.
Piccini JP Sr, Allen LA, Kudenchuk PJ, Page RL, Patel MR, Turakhia MP

TTM

1. Curr Opin Crit Care. 2016 Mar 28. [Epub ahead of print]

Is hypothermia indicated during cardiopulmonary resuscitation and after restoration of spontaneous circulation?

Stratil P1, Holzer M.

Abstract

PURPOSE OF REVIEW:

Targeted temperature management (TTM) after cardiac arrest has become a standard therapy in postresuscitation care. However, many questions addressing the optimum treatment protocol remain unanswered.

RECENT FINDINGS:

The positive influence of intra-arrest cooling on survival and neurologic outcome, seen in animal studies, was not revealed in clinical trials so far. By contrast, the evidence of TTM after restoration of circulation is based on both experimental and clinical data. The mechanisms of cerebral injury unfold different time windows for cooling initiation. Immediate cooling and early achievement of a target temperature less than 34°C seems to be beneficial, although clinical data on preclinical cooling failed to detect a positive correlation. Despite previous beneficial experimental and clinical data, the benefit of a lower body temperature was recently called into question by a recent study. Regardless of the preferred temperature range, the main focus must lie in active cooling and prevention of hyperthermic conditions. There are many factors that influence the effect of TTM, which should therefore be tailored to the specific patient's needs.

SUMMARY:

To maximize its beneficial potential, TTM should be customized to resuscitation covariates. Despite open questions on the optimum treatment protocol, active cooling should be started as soon as possible and hyperthermic conditions should be prevented in any case. To answer the question if intra-arrest cooling or prehospital cooling induction is indicated, additional studies are needed.

Influence of the temperature on the moment of awakening in patients treated with therapeutic hypothermia after cardiac arrest.

Ponz I1, Lopez-de-Sa E2, Armada E2, Caro J2, Blazquez Z2, Rosillo S2, Gonzalez O2, Rey JR2, Monedero MD2, Lopez-Sendon JL2.

Abstract

INTRODUCTION:

Target temperature management (TTM) has shown to reduce brain damage after an out-of-hospital cardiac arrest (CA), but the time to neurological recovery is not defined yet. We sought to determine the time these patients need to regain consciousness, as well as factors associated with a late post-arrest awakening.

METHODS:

We performed a retrospective analysis of patients cooled to 32-34°C during 24h after CA, who regained neurological responsiveness after rewarming. We measured the time until awakening, defined as obedience to verbal commands.

RESULTS:

We included 163 CA survivors (84.7% male, 60.2 years) who regained consciousness after TTM: target temperature was either 32°C (36.2%), 33°C (56.4%) or 34°C (6.7%). Mean time of awakening was 3.8 days. Thirty-four patients (20.9%) regained neurological responsiveness after 5 days after CA. All of them had been cooled to either 32°C (18 patients) or 33°C (16), and no patient cooled to 34°C awakened after day 5. A lower target temperature was associated with a later awakening (p<0.001). The time to advanced cardiopulmonary resuscitation (CPR) was shorter among the early awakers (p=0.04), but we found no other predictors of an earlier awakening.

CONCLUSIONS:

A high proportion of CA survivors induced to TTM regained consciousness after 5 days, and cooling to a lower target temperature may influence on a late neurological recovery. Therefore, withdrawal of life supporting treatment should be delayed to more than 5 days in

patients cooled to 33°C or less. Time to advanced CPR was found to be a predictor of early awakening.

3. BMJ Open. 2016 Mar 30;6(3):e009913. doi: 10.1136/bmjopen-2015-009913.

Effects of prehospital hypothermia on transfusion requirements and outcomes: a retrospective observatory trial.

Klauke N1, Gräff I1, Fleischer A1, Boehm O1, Guttenthaler V1, Baumgarten G1, Meybohm P2, Wittmann M1.

Abstract

OBJECTIVES:

Prehospital hypothermia is defined as a core temperature <36.0°C and has been shown to be an independent risk factor for early death in patients with trauma. In a retrospective study, a possible correlation between the body temperature at the time of admission to the emergency room and subsequent in-hospital transfusion requirements and the in-hospital mortality rate was explored.

SETTING:

This is a retrospective single-centre study at a primary care hospital in Germany.

PARTICIPANTS:

15 895 patients were included in this study. Patients were classified by admission temperature and transfusion rate. Excluded were ambulant patients and patients with missing data.

PRIMARY AND SECONDARY OUTCOME MEASURES:

The primary outcome values were length of stay (LOS) in days, in-hospital mortality, the transferred amount of packed red blood cells (PRBCs), and admission to an intensive care unit. Secondary influencing variables were the patient's age and the Glasgow Coma Scale.

RESULTS:

In 22.85% of the patients, hypothermia was documented. Hypothermic patients died earlier in the course of their hospital stay than non-hypothermic patients ($p<0.001$). The administration of 1-3 PRBC increased the LOS significantly ($p<0.001$) and transfused patients had an increased risk of death ($p<0.001$). Prehospital hypothermia could be an independent risk factor for mortality (adjusted OR 8.521; $p=0.001$) and increases the relative risk for transfusion by factor 2.0 (OR 2.007; $p=0.002$).

CONCLUSIONS:

Low body temperature at hospital admission is associated with a higher risk of transfusion and death. Hence, a greater awareness of prehospital temperature management should be established

RECERCA EXPERIMENTAL

1. J Bioenerg Biomembr. 2016 Mar 28. [Epub ahead of print]

Increased platelet mitochondrial respiration after cardiac arrest and resuscitation as a potential peripheral biosignature of cerebral bioenergetic dysfunction.

Ferguson MA1, Sutton RM1, Karlsson M2, Sjövall F2, Becker LB3, Berg RA1, Margulies SS4, Kilbaugh TJ5.

Abstract

Cardiac arrest (CA) results in a sepsis-like syndrome with activation of the innate immune system and increased mitochondrial bioenergetics.

OBJECTIVE:

To determine if platelet mitochondrial respiration increases following CA in a porcine pediatric model of asphyxia-associated ventricular fibrillation (VF) CA, and if this readily obtained biomarker is associated with decreased brain mitochondrial respiration. CA protocol: 7 min of asphyxia, followed by VF, protocolized titration of compression depth to systolic blood pressure of 90 mmHg and vasopressor administration to a coronary perfusion pressure greater than 20 mmHg.

PRIMARY OUTCOME:

platelet integrated mitochondrial electron transport system (ETS) function evaluated pre- and post-CA/ROSC four hours after return of spontaneous circulation (ROSC). Secondary outcome: correlation of platelet mitochondrial bioenergetics to cerebral bioenergetic function. Platelet

maximal oxidative phosphorylation (OXPHOSCI+CII), P < 0.02, and maximal respiratory capacity (ETSCI+CII), P < 0.04, were both significantly increased compared to pre-arrest values. This was primarily due to a significant increase in succinate-supported respiration through Complex II (OXPHOSCII, P < 0.02 and ETSCII, P < 0.03). Higher respiration was not due to uncoupling, as the LEAKCI + CII respiration (mitochondrial respiration independent of ATP-production) was unchanged after CA/ROSC. Larger increases in platelet mitochondrial respiratory control ratio (RCR) compared to pre-CA RCR were significantly correlated with lower RCRs in the cortex (P < 0.03) and hippocampus (P < 0.04) compared to sham respiration. Platelet mitochondrial respiration is significantly increased four hours after ROSC. Future studies will identify mechanistic relationships between this serum biomarker and altered cerebral bioenergetics function following cardiac arrest.

Effects of intraosseous epinephrine in a cardiac arrest swine model.
Wong MR1, Reggio MJ1, Morocho FR1, Holloway MM1, Garcia-Blanco JC2, Jenkins C1, Johnson AD3.
Electronic address: arthurjohnso@gmail.com.
Abstract
BACKGROUND:
Interruptions in cardiopulmonary resuscitation (CPR) to obtain vascular access reduces blood flow to vital organs. Tibial intraosseous (TIO) access may be a faster alternative to intravenous (IV) access for delivery of vasoactive medications. The purpose of this study was to examine the differences in pharmacokinetics and pharmacodynamics of TIO- and IV-delivered epinephrine.
MATERIALS AND METHODS:
A prospective, between subjects, experimental design comparing Cmax, Tmax, return of spontaneous circulation (ROSC), and time to ROSC. Adult male swine were divided into three equal groups (n = 7) all received CPR and defibrillation: the second group received IV epinephrine and the third group received tibial intraosseous epinephrine. Swine were placed in cardiac arrest for 2 min before CPR was initiated. After 2 min of CPR, epinephrine was delivered by IV or TIO, and serial blood samples were collected over 4 min.
RESULTS:
There were no significant differences between IV versus TIO epinephrine in achieving ROSC, time to ROSC, and Cmax. A one-way analysis of variance demonstrated a significant difference between the IV and TIO groups in Tmax (P = 0.025). A Fisher exact test demonstrated a significant difference between IV epinephrine versus CPR/Defib only (P = 0.035) and TIO epinephrine versus CPR/Defib only (P = 0.010) in achieving ROSC. A multivariate analysis of variance showed significant differences in IV versus intraosseous epinephrine concentration at specific time intervals: 60 (P = 0.023), 90 (P = 0.001), and 120 (P < 0.000) sec.
CONCLUSIONS:
In the context of ROSC, epinephrine delivered via TIO route is a clinically relevant alternative to IV administration. When IV access cannot be immediately obtained in cardiac arrest patients, TIO access should be considered.

RCP

Are two or four hands needed for elderly female bystanders to achieve the required chest compression depth during dispatcher-assisted CPR: a randomized controlled trial.
Krikscionaitiene A1, Dambrauskas Z2, Barron T3, Vaitkaitiene E4, Vaitkaitis D4.
Abstract
BACKGROUND:
Rescuers are often unable to achieve the recommended 5-6 cm CC depth. The physical limitations of elderly bystanders may affect the quality of CC; thus, we investigated new strategies to improve CC performance.
METHODS:

We performed a randomized controlled trial in December 2013. Sixty-eight lay rescuers aged 50-75 were randomized to intervention or control pairs (males and females separately). Each pair performed 8 min of DA-CPR on a manikin connected to a PC. Each participant in every pair took turns performing CCs in cycles of 2 min and switched as advised by the dispatcher. In the middle of every 2-min cycle, the dispatcher asked the participants of the intervention group to perform the Andrew's manoeuvre (to push on the shoulders of the person while he/she performed CCs to achieve deeper CC). Data on the quality of the CCs were analysed for each participant and pair.

RESULTS:

The CC depth in the intervention group increased by 6.4 mm (p = 0.002) compared to the control group (54.2 vs. 47.8 mm) due to a significant difference in the female group. The CC depth in the female intervention and control groups was 51.5 and 44.9 mm.

DISCUSSION:

The largest group of out-of-hospital cardiac arrest occurred in males over the age of 60 at home, and accordingly, the most likely witness, if any, is the spouse or family member, most frequently an older woman. There is a growing body of evidence that female rescuers are frequently unable to achieve sufficient CC depth compared to male rescuers. In some instances, the adequate depth of the CCs could only be reached using four hands, with the second pair of hands placed on the shoulders of the rescuer performing CPR.

CONCLUSION:

Andrew's manoeuvre (four-hands CC) during the simulated DA-CPR significantly improved the performance of elderly female rescuers and helped them to achieve the recommended CC depth.

REGISTRES I REVISIONS

Chest compression pauses during defibrillation attempts.
Deakin CD1, Koster RW.
Abstract

PURPOSE OF REVIEW:

This article summarizes current knowledge of the causes and consequences of interruption of chest compressions during cardiopulmonary resuscitation.

RECENT FINDINGS:

Pauses in chest compressions occur during analysis of the heart rhythm, delivery of ventilation, interventions such as intubation, and gaining intravenous access, but pauses may also be unprompted. Pauses related to defibrillation are because of preshock pauses for rhythm analysis and charging, and postshock pauses to evaluate the outcome of the shock. Prolonged pauses, mainly preshock pauses (>10 s) are associated with decreased survival to discharge in retrospective analyses. Measures to reduce preshock and postshock pauses include resuming chest compressions during defibrillator charging, continued chest compression during defibrillation by mechanical chest compression devices or during manual chest compression with sufficiently insulating gloves for the rescuer, and eliminating postshock rhythm and pulse checks. New filtering techniques may allow rhythm analysis during chest compressions.

SUMMARY:

It is important to avoid any unnecessary pause in chest compressions before and after a defibrillation shock. Pauses should be kept to an absolute minimum, preferably to less than 10 s.

Regional Variation in Out-of-Hospital Cardiac Arrest Survival in the United States.
Girotra S1, van Diepen S2, Nallamothu BK3, Carrel M4, Vellano K5, Anderson ML6, McNally B7, Abella B8, Sasson C9, Chan PS10; in collaboration with CARES Surveillance Group and the HeartRescue Project.
Abstract

BACKGROUND:

-Although previous studies have shown marked variation in out-of-hospital cardiac arrest survival across U.S. regions, factors underlying this survival variation remain incompletely explained.

METHODS AND RESULTS:
-Using data from the Cardiac Arrest Registry to Enhance Survival, we identified 96,662 adult patients with out-of-hospital cardiac in 132 U.S. counties. We used hierarchical regression models to examine county-level variation in rates of survival and survival with functional recovery (defined as Cerebral Performance Category score of 1 or 2) and examined the contribution of demographics, cardiac arrest characteristics, bystander cardiopulmonary resuscitation (CPR), automated external defibrillator (AED) use, and county-level socio-demographic factors in survival variation across counties. A total of 9317 (9.6%) patients survived to discharge, and 7176 (7.4%) achieved functional recovery. At a county-level, there was marked variation in rates of survival to discharge (range: 3.4%-22.0%, median odds ratio [MOR] 1.40, 95% CI 1.32-1.46) and survival with functional recovery (range: 0.8%-21.0%, MOR 1.53, 95% CI 1.43-1.62). County-level rates of bystander CPR and AED use were positively correlated with both outcomes (P<0.0001 for all). Patient demographic and cardiac arrest characteristics explained 4.8% and 27.7% of the county-level variation in survival, respectively. Additional adjustment of bystander CPR and AED explained 41% of the survival variation, and this increased to 50.4% after adjustment of county-level socio-demographic factors. Similar findings were noted in analyses of survival with functional recovery.

CONCLUSIONS:
-Although out-of-hospital cardiac arrest survival varies significantly across U.S. counties, a substantial proportion of the variation is due to differences in bystander response across communities.

3. Prehosp Emerg Care. 2016 Apr 13:1-7. [Epub ahead of print]

Termination of Resuscitation Rules to Predict Neurological Outcomes in Out-of-Hospital Cardiac Arrest for an Intermediate Life Support Prehospital System.

Cheong RW, Li H, Doctor NE, Ng YY, Goh ES, Leong BS, Gan HN, Foo D, Tham LP, Charles R, Ong ME.

Abstract
AIM:
Futile resuscitation can lead to unnecessary transports for out-of-hospital cardiac arrest (OHCA). The Basic Life Support (BLS) and Advanced Life Support (ALS) termination of resuscitation (TOR) guidelines have been validated with good results in North America. This study aims to evaluate the performance of these two rules in predicting neurological outcomes of OHCA patients in Singapore, which has an intermediate life support Emergency Medical Services (EMS) system.

METHODS:
A retrospective cohort study was carried out on Singapore OHCA data collected from April 2010 to May 2012 for the Pan-Asian Resuscitation Outcomes Study (PAROS). The outcomes of each rule were compared to the actual neurological outcomes of the patients. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and predicted transport rates of each test were evaluated.

RESULTS:
A total of 2,193 patients had cardiac arrest of presumed cardiac etiology. TOR was recommended for 1,411 patients with the BLS-TOR rule, with a specificity of 100% (91.9, 100.0) for predicting poor neurological outcomes, PPV 100% (99.7, 100.0), sensitivity 65.7% (63.6, 67.7), NPV 5.6% (4.1, 7.5), and transportation rate 35.6%. Using the ALS-TOR rule, TOR was recommended for 587 patients, specificity 100% (91.9, 100.0) for predicting poor neurological outcomes, PPV 100% (99.4, 100.0), sensitivity 27.3% (25.4, 29.3), NPV 2.7% (2.0, 3.7), and transportation rate 73.2%. BLS-TOR predicted survival (any neurological outcome) with specificity 93.4% (95% CI 85.3, 97.8) versus ALS-TOR 98.7% (95% CI 92.9, 99.8).

CONCLUSION:
Both the BLS and ALS-TOR rules had high specificities and PPV values in predicting neurological outcomes, the BLS-TOR rule had a lower predicted transport rate while the ALS-TOR rule was

more accurate in predicting futility of resuscitation. Further research into unique local cultural issues would be useful to evaluate the feasibility of any system-wide implementation of TOR.

Understanding Early Decisions to Withdraw Life-sustaining Therapy in Cardiac Arrest Survivors: A Qualitative Investigation.

Dale CM1,2, Sinuff T3,4, Morrison LJ5,6, Golan E7, 8,9, Scales DC3,8,10,11.

Abstract

RATIONALE:

Early withdrawal of life-sustaining therapy contributes to the majority of deaths following out-of-hospital cardiac arrest (OHCA) despite current recommendations for delayed neurological prognostication (≥72 hours) after treatment with targeted temperature management. Little is known about clinicians' experiences of early withdrawal of life support decisions in OHCA patients.

OBJECTIVES:

To explore clinicians' experiences and perceptions of early withdrawal of life support decisions and barriers to guideline-concordant neurological prognostication in comatose survivors of OHCA treated with targeted temperature management.

METHODS:

We conducted qualitative interviews with intensive care unit (ICU) physicians and nurses following withdrawal of life support in comatose OHCA patients treated with targeted temperature management across 18 academic and community hospitals participating in a multi-centre stepped-wedge cluster randomized controlled trial designed to improve quality of care processes for patients after OHCA in Ontario, Canada. We used a focused thematic analysis to capture barriers to guideline-concordant neurological prognostication and used these barriers to identify potentially modifiable issues.

MEASUREMENTS AND MAIN RESULTS:

The core thematic finding was a high emotional burden of ICU family-team communication in which strong feelings inhibited information transfer and delayed decision-making following OHCA. Four sub-themes describing sources of communication strain were identified: (1) requests from family members to provide early outcome predictions; (2) incomplete family comprehension of critical care; (3) family requests for early withdrawal of life support based on their understanding of patients' preferences and values; and (4) family-team communication gaps related to prognostic uncertainty. Participants worried that gaps in timely and clear prognostic information contributed to surrogates' perceptions of a poor outcome and inappropriately early decisions to withdraw life support.

CONCLUSIONS:

Family-team communication difficulties may be an underestimated factor leading to early withdrawal of life support in intensive care units for individuals who initially survive an out-of-hospital cardiac arrest.

The impact of downtime on neurologic intact survival in patients with targeted temperature management after out-of-hospital cardiac arrest: National multicenter cohort study.

Kim WY1, Ahn S2, Hong JS3, Cho GC4, Seo DW2, Jeung KW5, Kim YM6, Park KN6, Berg K7, Donnino MW7.

Abstract

AIM OF STUDY:

The association between long duration of resuscitation efforts in out-of-hospital cardiac arrest (OHCA) and neurologic outcome is unclear and understudied with advancements in post-cardiac arrest care and high-quality cardiopulmonary resuscitation. We investigated how downtime, defined as the interval from collapse-to-return of spontaneous circulation (ROSC), impacts on neurologic outcome in OHCA patients treated with targeted temperature management (TTM).

METHODS:

A multicenter, registry-based, retrospective cohort study was conducted using cases from 24 hospitals across South Korea. Of the 930 adults (≥18 years) non-traumatic OHCA patients treated with TTM between January 2007 and December 2012 at these hospitals, we included 858 patients who had sufficient data for calculating downtime. Good neurologic outcome was defined as a cerebral performance category score of 1 or 2.

RESULTS:

Median downtime was 30.0 (22.0-41.0min) and 242 patients (28.2%) had good neurologic outcome. When downtime was divided by 10-min intervals (≤10min, 11-20min, 21-30min, 31-40min, 41-50min, 51-60min, and >60min), their neurologically intact survival rate were 48.2%, 51.6%, 29.2%, 22.1%, 16.1%, 14.8%, and 7.1%, respectively (p=0.01). Although downtime was associated with poor neurologic outcome [odds ratio 1.06 (1.05-1.08), p<0.01], the area under the receiver operating characteristic curve of downtime for outcome was only 0.67, 95% CI (0.63-0.71). Furthermore, even with downtime >20min, 22.2% (150/526) patients still had a good neurologic outcome, and this percentage increased to 50.3% (93/185) in patients with an initial shockable rhythm, and 31.1% (134/431) with age <65 years.

CONCLUSIONS:

We found that neurologically intact survival can occur at prolonged downtimes and were unable to identify a downtime for which survivability was clearly futile. These data suggest that downtime should not be considered as a factor in determining whether to provide aggressive post-arrest care, especially in patients with young patients or those with an initially shockable rhythm.

Long-Term Outcomes Among Elderly Survivors of Out-of-Hospital Cardiac Arrest.
Chan PS1, McNally B2, Nallamothu BK3, Tang F4, Hammill BG5, Spertus JA6, Curtis LH7.

Abstract

BACKGROUND:

Most studies on out-of-hospital cardiac arrest have focused on immediate survival. However, little is known about long-term outcomes and resource use among survivors.

METHODS AND RESULTS:

Within the national CARES registry, we identified 16 206 adults 65 years or older with an out-of-hospital cardiac arrest between 2005 and 2010. Among 1127 patients who were discharged alive, we evaluated whether 1-year mortality, cumulative readmission incidence, and follow-up inpatient costs differed according to patients' race, sex, initial cardiac arrest rhythm, bystander delivery of cardiopulmonary resuscitation, discharge neurological status, and functional status (hospital discharge disposition). Overall 1-year mortality after hospital discharge was 31.8%. Among survivors, there were no long-term mortality differences by sex, race, or initial cardiac arrest rhythm, but worse functional status and severe neurological disability at discharge were associated with higher mortality. Moreover, compared with first responders, cardiopulmonary resuscitation delivered by bystanders was associated with 23% lower mortality (hazard ratio 0.77 [confidence interval 0.58-1.02]). Besides mortality, 638 (56.6%) patients were readmitted within the first year, and the cumulative readmission incidence was 197 per 100 patient-years. Mean 1-year inpatient costs were $23 765±41 002. Younger age, black race, severe neurological disability at discharge, and hospital disposition to a skilled nursing or rehabilitation facility were each associated with higher 1-year inpatient costs (P for all <0.05).

CONCLUSION:

Among elderly survivors of out-of-hospital cardiac arrest, nearly 1 in 3 patients die within the first year. Long-term mortality and inpatient costs differed substantially by certain demographic factors, whether cardiopulmonary resuscitation was initiated by a bystander, discharge neurological status, and hospital disposition.

Withholding and withdrawal of life-sustaining treatments in low-middle-income versus high-income Asian countries and regions.
Phua J1, Joynt GM2, Nishimura M3, Deng Y4, Myatra SN5, Chan YH6, Binh NG7, Tan CC8, Faruq MO9, Arabi YM10, Wahjuprajitno B11, Liu SF12,13, Hashemian SM14, Kashif W15, Staworn D16, Palo JE17, Koh Y18.

Abstract

PURPOSE:

To compare the attitudes of physicians towards withholding and withdrawing life-sustaining treatments in intensive care units (ICUs) in low-middle-income Asian countries and regions with those in high-income ones, and to explore differences in the role of families and surrogates, legal risks, and financial considerations between these countries and regions.

METHODS:

Questionnaire study conducted in May-December 2012 on 847 physicians from 255 ICUs in 10 low-middle-income countries and regions according to the World Bank's classification, and 618 physicians from 211 ICUs in six high-income countries and regions.

RESULTS:

After we accounted for personal, ICU, and hospital characteristics on multivariable analyses using generalised linear mixed models, physicians from low-middle-income countries and regions were less likely to limit cardiopulmonary resuscitation, mechanical ventilation, vasopressors and inotropes, tracheostomy and haemodialysis than those from high-income countries and regions. They were more likely to involve families in end-of-life care discussions and to perceive legal risks with limitation of life-sustaining treatments and do-not-resuscitate orders. Nonetheless, they were also more likely to accede to families' requests to withdraw life-sustaining treatments in a patient with an otherwise reasonable chance of survival on financial grounds in a case scenario (adjusted odds ratio 5.05, 95 % confidence interval 2.69-9.51, P < 0.001).

CONCLUSIONS:

Significant differences in ICU physicians' self-reported practice of limiting life-sustaining treatments, the role of families and surrogates, perception of legal risks and financial considerations exist between low-middle-income and high-income Asian countries and regions.

NOVES TECNOLOGIES

1. Scand J Trauma Resusc Emerg Med. 2016 Apr 16;24(1):51.

Real-time tablet-based resuscitation documentation by the team leader: evaluating documentation quality and clinical performance.

Grundgeiger T1, Albert M1, Reinhardt D1, Happel O2, Steinisch A2, Wurmb T3.

Abstract

BACKGROUND:

Precise and complete documentation of in-hospital cardiopulmonary resuscitations is important but data quality can be poor. In the present study, we investigated the effect of a tablet-based application for real-time resuscitation documentation used by the emergency team leader on documentation quality and clinical performance of the emergency team.

METHODS:

Senior anaesthesiologists either used the tablet-based application during the simulated resuscitation for documentation and also used the application for the final documentation or conducted the full documentation at the end of the scenario using the local hospital information system. The latter procedure represents the current local documentation method. All scenarios were video recorded. To assess the documentation, we compared the precision of intervention delivery times, documentation completeness, and final documentation time. To assess clinical performance, we compared adherence to guidelines for defibrillation and adrenaline administration, the no-flow fraction, and the time to first defibrillation.

RESULTS:

The results showed significant benefits for the tablet-based application compared to the hospital information system for precision of the intervention delivery times, the final documentation time, and the no-flow fraction. We observed no differences between the groups for documentation completeness, adherence to guidelines for defibrillation and adrenaline administration, and the time to first defibrillation.

DISCUSSION:

In the presented study, we observed that a tablet-based application can improve documentation data quality. Furthermore, we demonstrated that a well-designed application

can be used in real-time by a member of the emergency team with possible beneficial effects on clinical performance.

CONCLUSION:

The present evaluation confirms the advantage of tablet-based documentation tools and also shows that the application can be used by an active member of an emergency team without compromising clinical performance.

VENTILACIÓ

Airway management in out-of-hospital cardiac arrest in Finland: current practices and outcomes.

Hiltunen P1, Jäntti H2, Silfvast T3, Kuisma M3, Kurola J2; FINNRESUSCI Prehospital study group.

Abstract

BACKGROUND:

Though airway management methods during out-of-hospital cardiac arrest (OHCA) remain controversial, no studies on the topic from Finland have examined adherence to OHCA recommendations in real life. In response, the aim of this study was to document the interventions, success rates, and adverse events in airway management processes in OHCA, as well as to analyse survival at hospital discharge and at follow-up a year later.

METHODS:

During a 6-month study period in 2010, data regarding all patients with OHCA and attempted resuscitation in southern and eastern Finland were prospectively collected. Emergency medical services (EMS) documented the airway techniques used and all adverse events related to the process. Study endpoints included the frequency of different techniques used, their success rates, methods used to verify the correct placement of the endotracheal tube, overall adverse events, and survival at hospital discharge and at follow-up a year later.

RESULTS:

A total of 614 patients were included in the study. The incidence of EMS-attempted resuscitation was determined to be 51/100,000 inhabitants per year. The final airway technique was endotracheal intubation (ETI) in 413 patients (67.3 %) and endotracheal intubation (SAD) in 188 patients (30.2 %). The overall success rate of ETI was 92.5 %, whereas that of SAD was 85.0 %. Adverse events were reported in 167 of the patients (27.2 %). Having a prehospital EMS physician on the scene (p < .001, OR 5.05, 95 % CI 2.94-8.68), having a primary shockable rhythm (p < .001, OR 5.23, 95 % CI 3.05-8.98), and being male (p = .049, OR 1.80, 95 % CI 1.00-3.22) were predictors for survival at hospital discharge.

CONCLUSIONS:

This study showed acceptable ETI and SAD success rates among Finnish patients with OHCA. Adverse events related to airway management were observed in more than 25 % of patients, and overall survival was 17.8 % at hospital discharge and 14.0 % after 1 year.

Cardiac Arrests Associated With Tracheal Intubations in PICUs: A Multicenter Cohort Study.

Shiima Y1, Berg RA, Bogner HR, Morales KH, Nadkarni VM, Nishisaki A; National Emergency Airway Registry for Children and the Pediatric Acute Lung Injury and Sepsis Investigators.

Abstract

OBJECTIVES:

To determine the incidence and epidemiologic characteristics of cardiac arrests among tracheal intubations in PICUs.

DESIGN:

Retrospective cohort study of prospectively collected data.

SETTING:

Twenty-five diverse PICUs.

PATIENTS:

Critically ill children requiring tracheal intubation in PICUs.

INTERVENTIONS:

Tracheal intubation quality improvement data were prospectively collected for all initial tracheal intubations in 25 PICUs from July 2010 to March 2014 using National Emergency Airway Registry for Children registry.

MEASUREMENTS AND MAIN RESULTS:

Tracheal intubation-associated cardiac arrest was defined as chest compressions more than 1 minute occurring during tracheal intubation or within 20 minutes after tracheal intubation. A total of 5,232 pediatric tracheal intubations were evaluated. Tracheal intubation-associated cardiac arrest was reported in 87 (1.7%). Patient factors (demographics and indications for tracheal intubation), provider factors (discipline and training level), and practice factors (tracheal intubation method and use of neuromuscular blockade) were recorded. Hemodynamic instability and oxygenation failure as tracheal intubation indications were associated with cardiac arrests (adjusted odds ratio, 6.3; 95% CI, 3.9-10.3; and adjusted odds ratio, 4.3; 95% CI, 2.6-6.9, respectively). History of difficult airway and cardiac disease were also associated with cardiac arrests (adjusted odds ratio, 2.1; 95% CI, 1.2-3.5; and adjusted odds ratio, 2.1; 95% CI, 1.2-3.9, respectively). Provider and practice factors were not associated with cardiac arrests, and provider factors did not modify the effect of patient factors on cardiac arrests.

CONCLUSIONS:

Tracheal intubation-associated cardiac arrests occurred during 1.7% of PICU tracheal intubations. Tracheal intubation-associated cardiac arrests were much more common with tracheal intubations when the child had acute hemodynamic instability or oxygen failure and when the child had a history of difficult airway or cardiac disease.

TRAUMA

Trauma team utilization of universal precautions: if you see something, say something.
Peponis T1, Cropano MC1, Larentzakis A1, van der Wilden MG1, Mejaddam YA1, Sideris CA1, Michailidou M1, Fikry K1, Bramos A1, Janjua S1, Chang Y1, King DR2.

Abstract

PURPOSE:

The risks deriving from the lack of compliance with universal safety precautions (USPs) are unequivocal. However, the adoption of these prophylactic precautions by healthcare providers remains unacceptably low. We hypothesized that trauma teams are not routinely adhering to USPs and that a brief educational intervention, followed by real-time peer feedback, would substantially improve compliance rates.

METHODS:

This before-and-after interventional study took place in the resuscitation bay of a Level I Trauma Center during trauma team activations. Six USPs were examined: hand washing (before and after patient contact), use of gloves, gowns, eye protection, and masks. Surgery and Emergency Medicine attending physicians, residents, and nurses, who had direct patient contact, were included. Following 162 baseline observations, an educational intervention in the form of brief lectures was conducted, emphasizing the danger to self from dereliction of USPs. Subsequently, 167 post-intervention observations were made after a one-month period of knowledge decay. Finally, real-time feedback was provided by trauma team leaders and study staff. Adherence to prophylactic measures was recorded again.

RESULTS:

Baseline compliance rates were dismal. Only hand washing prior to patient interaction, the use of eye protection, and the use of masks improved significantly (p < 0.05) after the educational initiative. However, compliance rates remained suboptimal. No difference was noted regarding the three other USPs. Impressively, following real-time behavioral corrections, compliance improved to nearly 90 % for all USPs (p < 0.05).

CONCLUSIONS:

Compliance with OSHA-required USPs during trauma team activations is unacceptably low, but can be dramatically improved through simple educational interventions, combined with real-time peer feedback.

2. J Trauma Acute Care Surg. 2016 Apr 8. [Epub ahead of print]

Prehospital traumatic cardiac arrest: management and outcomes from the Resuscitation Outcomes Consortium Epistry-Trauma and PROPHET registries.

Evans CC1, Petersen A, Meier EN, Buick JE, Schreiber M, Kannas D, Austin MA; Resuscitation Outcomes Consortium Investigators..

Abstract

BACKGROUND:

Traumatic arrests have historically had poor survival rates. Identifying salvageable patients and ideal management is challenging. We aimed to: 1) Describe the management and outcomes of prehospital traumatic arrests; 2) Determine regional variation in survival; and 3) Identify Advanced Life Support (ALS) procedures associated with survival.

METHODS:

This was a secondary analysis of cases from the Resuscitation Outcomes Consortium Epistry-Trauma and Prospective Observational Prehospital and Hospital Registry for Trauma registries. Patients were included if they suffered a blunt or penetrating injury and received CPR. Logistic regression analyses were used to determine the association between ALS procedures and survival.

RESULTS:

We included 2300 patients who were predominately young (Epistry mean: 39 years, SD: 20 years; PROPHET mean: 40 years, SD: 19 years), males (79%), injured by blunt trauma (Epistry: 68%, PROPHET: 67%), and treated by ALS paramedics (Epistry: 93%, PROPHET: 98%). A total of 145 patients (6.3%) survived to hospital discharge. More patients with blunt (Epistry 8.3%, PROPHET: 6.5%) vs. penetrating injuries (Epistry 4.6%, PROPHET: 2.7%) survived. Most survivors (81%) had vitals on EMS arrival. Rates of survival varied significantly between the 12 study sites (p=0.048) in the Epistry but not PROPHET (p=0.14) registries.PROPHET patients who received a supraglottic airway insertion or intubation experienced decreased odds of survival (Adjusted ORs: 0.27, 95% CI: 0.08-0.93, and 0.37, 95% CI: 0.17-0.78, respectively) compared to those receiving bag-mask ventilation. No other procedures were associated with survival.

CONCLUSIONS:

Survival from traumatic arrest may be higher than expected, particularly in blunt trauma and patients with vitals on EMS arrival. Although limited by confounding and statistical power, no ALS procedures were associated with an increased odds of survival.

ACR I ICTUS

1. . J Stroke Cerebrovasc Dis. 2016 Apr 7. pii: S1052-3057(16)00152-X. doi: 10.1016/j.jstrokecerebrovasdis.2016.03.010. [Epub ahead of print]

Cardiac Arrest in Acute Ischemic Stroke: Incidence, Predisposing Factors, and Clinical Outcomes.

Joundi RA1, Rabinstein AA2, Nikneshan D3, Tu JV4, Fang J5, Holloway R6, Saposnik G7; Stroke Outcomes Research Working Group (SORCan-www.sorcan.ca).

Abstract

BACKGROUND:

Cardiac arrest is a devastating complication of acute ischemic stroke, but little is known about its incidence and characteristics. We studied a large ischemic stroke inpatient population and compared patients with and without cardiac arrest.

METHODS:

We studied consecutive patients from the Ontario Stroke Registry who had an ischemic stroke between July 2003 and June 2008 at 11 tertiary care stroke centers in Ontario. Multivariable analyses were used to determine independent predictors of cardiac arrest and associated outcomes. Adjusted survival curves were computed, and hazard ratios for mortality at 30 days and 1 year were determined for cardiac arrest and other major outcomes.

RESULTS:

Among the 9019 patients with acute ischemic stroke, 352 had cardiac arrest, for an overall incidence of 3.9%. In a sensitivity analysis with palliative patients removed, the incidence of cardiac arrest was 2.5%. Independent predictors of cardiac arrest were as follows: older age,

greater stroke severity, preadmission dependence, and a history of diabetes, myocardial infarction, congestive heart failure, and atrial fibrillation. Systemic complications associated with cardiac arrest were as follows: myocardial infarction, pulmonary embolism, sepsis, gastrointestinal hemorrhage, and pneumonia. Patients with cardiac arrest had higher disability at discharge, and a markedly increased 30-day mortality of 82.1% compared with 9.3% without cardiac arrest.

CONCLUSIONS:

Cardiac arrest had a high incidence and was associated with poor outcomes after ischemic stroke, including multiple medical complications and very high mortality. Predictors of cardiac arrest identified in this study could help risk stratify ischemic stroke patients for cardiac investigations and prolonged cardiac monitoring

OXIMETRIA CEREBRAL

Cerebral Oximetry During Cardiac Arrest: A Multicenter Study of Neurologic Outcomes and Survival.
Parnia S1, Yang J, Nguyen R, Ahn A, Zhu J, Inigo-Santiago L, Nasir A, Golder K, Ravishankar S, Bartlett P, Xu J, Pogson D, Cooke S, Walker C, Spearpoint K, Kitson D, Melody T, Chilwan M, Schoenfeld E, Richman P, Mills B, Wichtendahl N, Nolan J, Singer A, Brett S, Perkins GD, Deakin CD.

Abstract

OBJECTIVES:

Cardiac arrest is associated with morbidity and mortality because of cerebral ischemia. Therefore, we tested the hypothesis that higher regional cerebral oxygenation during resuscitation is associated with improved return of spontaneous circulation, survival, and neurologic outcomes at hospital discharge. We further examined the validity of regional cerebral oxygenation as a test to predict these outcomes.

DESIGN:

Multicenter prospective study of in-hospital cardiac arrest.

SETTING:

Five medical centers in the United States and the United Kingdom.

PATIENTS:

Inclusion criteria are as follows: in-hospital cardiac arrest, age 18 years old or older, and prolonged cardiopulmonary resuscitation greater than or equal to 5 minutes. Patients were recruited consecutively during working hours between August 2011 and September 2014. Survival with a favorable neurologic outcome was defined as a cerebral performance category 1-2.

INTERVENTIONS:

Cerebral oximetry monitoring.

MEASUREMENTS AND MAIN RESULTS:

Among 504 in-hospital cardiac arrest events, 183 (36%) met inclusion criteria. Overall, 62 of 183 (33.9%) achieved return of spontaneous circulation, whereas 13 of 183 (7.1%) achieved cerebral performance category 1-2 at discharge. Higher mean ± SD regional cerebral oxygenation was associated with return of spontaneous circulation versus no return of spontaneous circulation (51.8% ± 11.2% vs 40.9% ± 12.3%) and cerebral performance category 1-2 versus cerebral performance category 3-5 (56.1% ± 10.0% vs 43.8% ± 12.8%) (both $p <$ 0.001). Mean regional cerebral oxygenation during the last 5 minutes of cardiopulmonary resuscitation best predicted the return of spontaneous circulation (area under the curve, 0.76; 95% CI, 0.69-0.83); regional cerebral oxygenation greater than or equal to 25% provided 100% sensitivity (95% CI, 94-100) and 100% negative predictive value (95% CI, 79-100); regional cerebral oxygenation greater than or equal to 65% provided 99% specificity (95% CI, 95-100) and 93% positive predictive value (95% CI, 66-100) for return of spontaneous circulation. Time with regional cerebral oxygenation greater than 50% during cardiopulmonary resuscitation best predicted cerebral performance category 1-2 (area under the curve, 0.79; 95% CI, 0.70-0.88). Specifically, greater than or equal to 60% cardiopulmonary resuscitation time with regional cerebral oxygenation greater than 50% provided 77% sensitivity (95% CI,:46-95), 72%

specificity (95% CI, 65-79), and 98% negative predictive value (95% CI, 93-100) for cerebral performance category 1-2.
CONCLUSIONS:
Cerebral oximetry allows real-time, noninvasive cerebral oxygenation monitoring during cardiopulmonary resuscitation. Higher cerebral oxygenation during cardiopulmonary resuscitation is associated with return of spontaneous circulation and neurologically favorable survival to hospital discharge. Achieving higher regional cerebral oxygenation during resuscitation may optimize the chances of cardiac arrest favorable outcomes.

RECERCA EXPERIMENTAL

Effect of vasopressin on hippocampal injury in a rodent model of asphyxial cardiopulmonary arrest.
Zhang N1, Zang XX1, Dong N1, Liu F1, Wang SK1, Yan HE1, Xu DH1, Liu XL1, Pang LI1.
Abstract
The effect of vasopressin on the neuronal injury following the restoration of spontaneous circulation (ROSC) in cardiac arrest (CA) is not yet fully understood. The present study was conducted in order to investigate the effect of vasopressin alone, or in combination with epinephrine, on the ROSC and hippocampal injury in a rat model of asphyxial CA. Asphyxial CA was induced in 144 rats by clamping the tracheal tube, and animals were allocated equally into the following three groups: Treatment with vasopressin (0.8 U/kg); epinephrine (0.2 mg/kg); or vasopressin (0.8 U/kg) plus epinephrine (0.2 mg/kg). An additional 48 rats underwent a sham surgical procedure without asphyxial CA and cardiopulmonary resuscitation. Hippocampal tissue was harvested at 1, 3, 6 and 12 h post-ROSC, and the levels of p38 mitogen-activated protein kinase (MAPK) and nuclear factor-κB (NF-κB) p65 were determined using immunohistochemistry. In comparison with rats treated with epinephrine alone, higher ROSC success rates were observed in rats treated with vasopressin, or vasopressin plus epinephrine. In addition, treatment with vasopressin attenuated hippocampal injury and reduced hippocampal p38 MAPK and NF-κB expression more efficiently compared with epinephrine alone. In conclusion, treatment with vasopressin exhibits a protective effect in patients experiencing CA, and this may be attributed to the inhibition of p38 MAPK and NF-κB expression.

Arterial pressure, end-tidal carbon dioxide, and central venous oxygen saturation in reflecting compression depth.
Ryu SJ1, Lee SJ2, Park CH2, Lee SM1, Lee DH1, Cho YS1, Jung YH1, Lee BK1, Jeung KW1.
Abstract
BACKGROUND:
We sought to investigate the utility of arterial pressure, end-tidal carbon dioxide (ETCO2), and central venous oxygen saturation (SCVO2) to guide compression depth adjustment. Thus, in a pig model of cardiac arrest, we observed these parameters during cardiopulmonary resuscitation (CPR) with optimal and suboptimal compression depths.
METHODS:
Sixteen pigs underwent three experimental sessions after induction of ventricular fibrillation. First, the animals received two 4-min CPR trials with either optimal (20% of the anteroposterior diameter) or suboptimal (70% of the optimal depth) compression depth. Second, the animals received two 5-min CPR trials with optimal compression depth, in which adrenaline (0.02 mg/kg) or saline placebo was administered. Third, the animals randomly received compression with either optimal or suboptimal depth during advanced cardiovascular life support.
RESULTS:
The systolic arterial pressure reflected compression depth most accurately and immediately (area under the curve [AUC], 0.895-0.939 without adrenaline and 0.928-1.000 with adrenaline). Although the response of ETCO2 to the change in compression depth was 0.5 min slower than that of the systolic arterial pressure, the performance of ETCO2 was comparable

with that of systolic arterial pressure. SCVO2 did not reflect compression depth. Adrenaline administration remarkably increased systolic arterial pressure, diastolic arterial pressure, and coronary perfusion pressure but did not affect the ETCO2 readings.

CONCLUSION:

In a pig model of cardiac arrest, systolic arterial pressure reflected compression depth immediately and accurately. The performance of ETCO2 was comparable with that of systolic arterial pressure. SCVO2 did not reflect compression depth

CASE REPORTS

(NO traten de hacerlo en casa…)

Double Sequential External Defibrillation and Survival from Out-of-Hospital Cardiac Arrest: A Case Report.

Johnston M, Cheskes S, Ross G, Verbeek PR.

Abstract

BACKGROUND:

Patients who present in ventricular fibrillation are typically treated with cardiopulmonary resuscitation (CPR), epinephrine, antiarrhythmic medications, and defibrillation. Although these therapies have shown to be effective, some patients remain in a shockable rhythm. Double sequential external defibrillation has been described as a viable option for patients in refractory ventricular fibrillation.

OBJECTIVE:

To describe the innovative use of two defibrillators used to deliver double sequential external defibrillation by paramedics in a case of refractory ventricular fibrillation resulting in prehospital return of spontaneous circulation and survival to hospital discharge with good neurologic function.

CASE:

A 28-year-old female sustained a witnessed out-of-hospital cardiac arrest (OHCA). Bystander CPR was performed by her husband followed by paramedics providing high-quality CPR, antiarrhythmic medication, and 6 biphasic defibrillations using standard energy levels. Double sequential external defibrillation was applied and a return of spontaneous circulation was attained on scene and maintained through to arrival to the emergency department. Following admission to hospital the patient was diagnosed with long QT syndrome. An implantable cardioverter defibrillator was placed and the patient was discharged with a Cerebral Performance Category of 2 as well as a modified Rankin Scale of 2 after an 18-day hospital stay. The patient's functional status continued to improve post discharge.

CONCLUSION:

The addition of double sequential external defibrillation as part of a well-organized resuscitation effort may be a valid treatment option for OHCA patients who present in refractory ventricular fibrillation.

RCP

Radiological assessment of chest compression point and achievable compression depth in cardiac patients.

Nestaas S1, Stensæth KH2, Rosseland V3, Kramer-Johansen J 4,5.

Abstract

BACKGROUND:

Using magnetic resonance imaging (MRI) to relate cardiovascular structures to surface anatomy in a population relevant to cardiac arrest victims, relate the external thoracic anterior-posterior (AP) diameter (APEXTERNAL) and blood-filled structures to recommended chest compression depths, and define an optimal compression point (OCP).

METHODS:

MRI axial scans of referred patients were analysed. We defined origo as the skin surface of the centre of sternum in the internipple line. The blood-filled structures beneath origo were identified and the sum of their inner diameters (APBLOOD) and APEXTERNAL were measured. We defined OCP based on the image with maximum compressible left and right ventricle and where LVOT was not present. We measured the distance from origo to OCP.

RESULTS:

Consecutive patients, mean (SD), age 52 (17) years, 110 (76 %) males, were categorized: cardiac disease (n = 74), aortic disease (n = 13), no findings/study patient (included in another study) (n = 57). The structure LVOT/aortic valve (AV)/aortic root was present in 46 % of patients with cardiac disease vs. 19 % of patients with no findings. APEXTERNAL for males and females was 25 (2) cm and 22 (2) cm, and APBLOOD 6.5 cm (2) and 4.7 cm (2), respectively. Distance from origo to OCP was 32 (11) mm to the left and 16 (21) mm caudally.

DISCUSSION:

LVOT/AV/aortic root was present beneath the origo in almost half the patients with cardiac disease. Recommended chest compression depths exceeded the anterior-posterior diameter of blood-filled structures in more than half of the females. OCP was found 3 cm left of the origo.

CONCLUSIONS:

Based on our study, individualized compression point and depth could be further studied in a prospective, clinical study.

Intra-thoracic injuries associated with cardiopulmonary resuscitation - Frequent and serious.

Ihnát Rudinská L1, Hejna P2, Ihnát P3, Tomášková H4, Smatanová M5, Dvořáček I5.

Abstract

AIM OF THE STUDY:

The aim of the study was to evaluate prevalence, seriousness and risk factors of intra-thoracic injuries (ITI) injuries associated with CPR in non-survivors after out-of-hospital cardiac arrest.

METHODS:

This was a prospective forensic autopsy cohort study conducted in a single institution. Pathologists recorded autopsy data using standardized protocol which contained data from external and internal examination of the body focused on ITI.

RESULTS:

In total, 80 persons were included in this study. CPR-associated injuries were found in 93.7% of cases; majority of injuries were skeletal chest fractures (rib fractures in 73.7%, sternal fractures in 66.3%). ITI were identified in 41.2% of cases. Contusion of at least one lung lobe was found in 31.2%, lung laceration in 2.5%, and hemothorax in 5.0% of cases. Transmural heart contusion was identified in 17.5% of cases; hemopericard on the grounds of right atrium rupture of aortic rupture was revealed in 8.7% of cases. Risk factor analysis did not show any statistically significant correlation between ITI and any of general data (age, gender, BMI, cause of death, season of the year or location where the body was found) or CPR specifications (type and duration of CPR, manner of chest compressions). A strong correlation between ITI and skeletal chest fractures was proven.

CONCLUSION:

ITI present frequent and serious complications of unsuccessful CPR. ITI could contribute to the death only provided the fact that ROSC had been achieved. Correct performance of chest compressions according to guidelines is the best way to avoid ITI.

REGISTRES I REVISIONS

Impact of an emergency medical dispatch system on survival from out-of-hospital cardiac arrest: a population-based study.

Ageron FX1,2, Debaty G3, Gayet-Ageron A4, Belle L 5,6, Gaillard A7, Monnet MF8, Bare S9, Richard JC10, Danel V3, Perfus JP10, Savary D10.

Abstract

BACKGROUND:

In countries where a single public emergency telephone number is not in operation, different emergency telephone numbers corresponding to multiple dispatch centres (police, fire, emergency medical service) may create confusion for the population about the most appropriate service to call. In particular, out-of-hospital cardiac arrest (OHCA) requires a prompt and effective response. We compare two different dispatch systems on OHCA patient survival at 30 days in a national system with multiple emergency telephone numbers.

METHODS:

We conducted an observational retrospective study of 6871 patients aged 18 years or older with presumed OHCA of cardiac origin between 2005 and 2013 in three counties of the Northern French Alps region. One county had a single dispatch centre combining medical and fire emergencies, and two had multiple dispatch centres. Propensity score matching analyses were performed to compare patient survival at 30 days.

RESULTS:

A total of 2257 emergency calls for OHCA were managed by a single dispatch centre and 4614 by a multiple dispatch centre. A single dispatch centre was associated with an increase in survival (adjusted odds ratio [OR] for all patients: 1.7; 95 % confidence interval [CI] = 1.3-2.2; p <0.001; adjusted OR for propensity-matched patients: 2.0; 95 % CI = 1.2-3.4; p = 0.012).

CONCLUSIONS:

A single dispatch centre was associated with a markedly improved increase of survival among OHCA patients at 30 days in a system with several emergency telephone numbers.

Risk of Diabetes Mellitus on Incidence of Out-of-Hospital Cardiac Arrests: A Case-Control Study.

Ro YS1, Shin SD1,2, Song KJ1,2, Kim JY1,3, Lee EJ1,2, Lee YJ1,2, Ahn KO1, Hong KJ1,4; Cardiac Arrest Pursuit Trial with Unique Registry and Epidemiologic Surveillance (CAPTURES) investigators.

Abstract

BACKGROUND:

This study aimed to determine the risk of diabetes mellitus (DM) on incidence of out-of-hospital cardiac arrest (OHCA) and to investigate whether difference in effects of DM between therapeutic methods was observed.

METHODS:

This study was a case-control study using the Cardiac Arrest Pursuit Trial with Unique Registration and Epidemiologic Surveillance (CAPTURES) project database and 2013 Korean Community Health Survey (CHS). Cases were defined as EMS-treated adult (18 year old and older) OHCA patients with presumed cardiac etiology collected at 27 emergency departments from January to December 2014. OHCA patients whose arrest occurred at nursing homes or clinics and cases with unknown information on DM were excluded. Four controls were matched to one case with strata including age, gender, and county from the Korean CHS database. Multivariable conditional logistic regression analysis was conducted to estimate the risk of DM and treatment modality on incidence of OHCA.

RESULTS:

Total 1,386 OHCA patients and 5,544 community-based controls were analyzed. A total of 370 (26.7%) among cases and 860 (15.5%) among controls were diagnosed with DM. DM was associated with increasing risk of OHCA (AOR: 1.92 (1.65-2.24)). By DM treatment modality comparing with non-DM group, AOR (95% CI) was the highest in non-pharmacotherapy only group (4.65 (2.00-10.84)), followed by no treatment group (4.17 (2.91-5.96)), insulin group (2.69 (1.82-3.96)), and oral hypoglycemic agent group (1.55 (1.31-1.85)).

CONCLUSION:

DM increased the risk of OHCA, which was the highest in the non-pharmacotherapy group and decreased in magnitude with pharmacotherapy.

BET 1: Effectiveness of the precordial thump in restoring heart rhythm following out-of-hospital cardiac arrest.

Smith J1, Judge B1.

Abstract

A short-cut review was carried out to establish whether a precordial thump might be effective in restoring a perfusing heart rhythm in patients with pulseless VT or VF. Forty-seven papers were found in using the reported searches. Of these, three presented the best evidence to answer the clinical question. The author, date and country of publication, patient group studied, study type, relevant outcomes, results and study weaknesses of these best papers are tabulated. It is concluded that using the precordial thump in out-of-hospital cardiac arrest rarely results in immediate return of spontaneous circulation and is more commonly associated with rhythm deterioration.

BET 2: Usefulness of epinephrine in out-of-hospital cardiac arrest.

Evans ME1, Chassee T1.

Abstract

A short-cut review was carried out to establish whether prehospital adrenaline affects long-term morbidity or mortality after out-of-hospital cardiac arrest. Fifty-five papers were found using the reported search. Of these, three presented the best evidence to answer the clinical question. The author, date and country of publication, patient group studied, study type, relevant outcomes, results and study weaknesses of these best papers are tabulated. It is concluded that while epinephrine used as an adjunctive treatment during out-of-hospital cardiac arrest (OHCA) may improve return of spontaneous circulation (ROSC) and survival to hospital, it does not improve survival to discharge or neurological outcome.

ECMO

Survival After Extracorporeal Cardiopulmonary Resuscitation on Weekends in Comparison With Weekdays.

Lee DS1, Chung CR2, Jeon K3, Park CM1, Suh GY3, Song YB4, Hahn JY4, Choi SH4, Choi JH4, Gwon HC4, Yang JH5.

Abstract

BACKGROUND:

Extracorporeal cardiopulmonary resuscitation (ECPR) requires urgent decision-making and high-quality skills, which may not be uniformly available throughout the week. Few data exist on the outcomes of patients with cardiac arrest who receive in-hospital ECPR on the weekday versus weekend. Therefore, we investigated whether the outcome differed when patients with in-hospital cardiac arrest received ECPR during the weekend compared with a weekday.

METHODS:

Two hundred patients underwent extracorporeal membrane oxygenation after in-hospital cardiac arrest between January 2004 and December 2013. Patients treated between 0800 on Monday to 1759 on Friday were considered to receive weekday care and patients treated between 1800 on Friday through 0759 on Monday were considered to receive weekend care.

RESULTS:

A total of 135 cases of ECPR for in-hospital cardiac arrest occurred during the weekday (64 during daytime hours and 71 during nighttime hours), and 65 cases occurred during the weekend (39 during daytime/evening hours and 26 during nighttime hours). Rates of survival to discharge were higher with weekday care than with weekend care (35.8% versus 21.5%, p = 0.041). Cannulation failure was more frequent in the weekend group (1.5% versus 7.7%, p = 0.038). Complication rates were higher on the weekend than on the weekday, including cannulation site bleeding (3.0% versus 10.8%, p = 0.041), limb ischemia (5.9% versus 15.6%, p = 0.026), and procedure-related infections (0.7% versus 9.2%, p = 0.005).

CONCLUSIONS:

ECPR on the weekend was associated with a lower survival rate and lower resuscitation quality, including higher cannulation failure and higher complication rate.

Improvement in Trainees' Attitude and Resuscitation Quality With Repeated Cardiopulmonary Resuscitation Training: Cross-Sectional Simulation Study.

Kim JW1, Lee JH, Lee KR, Hong DY, Baek KJ, Park SO.

Abstract

INTRODUCTION:

This study investigated the effect of increasing numbers of training sessions in cardiopulmonary resuscitation (CPR) on trainees' attitude and CPR quality.

METHODS:

Cardiopulmonary resuscitation training for hospital employees was held every year from 2006 to 2010. Participants were recruited among the trainees in 2010. The trainees' attitudes toward CPR were surveyed by questionnaire, and the quality of their CPR was measured using 5-cycle 30:2 CPR on a manikin. Participants were categorized according to the number of consecutive CPR training sessions as T1 (only 2010), T2 (2009 and 2010), T3 (from 2008 to 2010) and T4-5 (from 2006 or 2007 to 2010). The trainee attitude and CPR quality were compared among the 4 groups.

RESULTS:

Of 923 CPR trainees, 267 were enrolled in the study. There was significant increase in willingness to start CPR and confidence in chest compression and mouth-to-mouth ventilation (MTMV) with increasing number of CPR training sessions attended (especially for ≥ 3 sessions). There was a significant increase in mean compression depth and decrease in percentage of chest compressions with depth of less than 38 mm in the T3 and T4-5 compared with the T1 and T2. No-flow time decreased significantly, and the percentage of MTMV with visible chest rise increased, as the number of training sessions increased.

CONCLUSIONS:

Repeated CPR training improved trainees' attitude and CPR quality. Because the number of training sessions increased (≥3), the willingness to start CPR and the confidence in skills increased significantly, and chest compression depth, no-flow time, and MTMV improved.

Utility of gum-elastic bougie for tracheal intubation during chest compressions in a manikin: a randomized crossover trial. (LA GUM ELASTIC BOUGIE ÉS LA GUIA FROVA)

Komasawa N1, Cho T2, Mihara R2, Minami T2.

Abstract

PURPOSE:

The utility of the gum-elastic bougie (GEB) as an assistive device for tracheal intubation during chest compressions has not been sufficiently validated. This study aimed to compare the utility of the GEB during chest compressions on an adult manikin.

METHODS:

Seventeen novice physicians performed tracheal intubation on an adult manikin using the GEB with or without chest compressions. Intubation success rate, intubation time, subjective difficulty of laryngoscopy, and tube passage through the glottis were measured. P < .05 was considered as significantly different.

RESULTS:

All novice physicians successfully secured the airway without chest compression with and without the GEB. In contrast, during chest compressions, 7 failed without the GEB, whereas only 1 failed with the GEB (P = .007). Intubation time was significantly longer with chest compressions regardless of GEB use (P < .001). Both laryngoscopy and tube passage through the glottis were perceived as significantly more difficult with chest compressions, regardless of GEB use (P < .001). Subjective difficulty of tube passage through the glottis during chest compression was perceived as significantly more easy by GEB application (P < .001).

CONCLUSIONS:

These findings suggest that the GEB facilitates tracheal intubation during chest compressions performed by novice physicians in adult simulations.

TRAUMA

Resuscitative Thoracotomy.
Pust GD1, Namias N2.
Abstract
Resuscitative thoracotomy is often performed on trauma patients with thoracoabdominal penetrating or blunt injuries arriving in cardiac arrest. The goal of this procedure is to immediately restore cardiac output and to control major hemorrhage within the thorax and abdominal cavity. Only surgeons with experience in the management of cardiac and thoracic injuries should perform this procedure.

A recommended early goal-directed management guideline for the prevention of hypothermia-related transfusion, morbidity, and mortality in severely injured trauma patients.
Perlman R1,2, Callum J3,4, Laflamme C1, Tien H2,5,6, Nascimento B2,5, Beckett A7, Alam A8,9,10.
Abstract
Hypothermia is present in up to two-thirds of patients with severe injury, although it is often disregarded during the initial resuscitation. Studies have revealed that hypothermia is associated with mortality in a large percentage of trauma cases when the patient's temperature is below 32 °C. Risk factors include the severity of injury, wet clothing, low transport unit temperature, use of anesthesia, and prolonged surgery. Fortunately, associated coagulation disorders have been shown to completely resolve with aggressive warming. Selected passive and active warming techniques can be applied in damage control resuscitation. While treatment guidelines exist for acidosis and bleeding, there is no evidence-based approach to managing hypothermia in trauma patients. We synthesized a goal-directed algorithm for warming the severely injured patient that can be directly incorporated into current Advanced Trauma Life Support guidelines. This involves the early use of warming blankets and removal of wet clothing in the prehospital phase followed by aggressive rewarming on arrival at the hospital if the patient's injuries require damage control therapy. Future research in hypothermia management should concentrate on applying this treatment algorithm and should evaluate its influence on patient outcomes. This treatment strategy may help to reduce blood loss and improve morbidity and mortality in this population of patients.

PEDIATRIA

Calmodulin 2 Mutation N98S Is Associated with Unexplained Cardiac Arrest in Infants Due to Low Clinical Penetrance Electrical Disorders.
Jiménez-Jáimez J1,2, Palomino Doza J3, Ortega Á4, Macías-Ruiz R1,2, Perin F5, Rodríguez-Vázquez Del Rey MM5, Ortiz-Genga M3, Monserrat L3, Barriales-Villa R3, Blanca E5, Álvarez M1,2, Tercedor L1,2.
Abstract
BACKGROUND:
Calmodulin 1, 2 and 3 (CALM) mutations have been found to cause cardiac arrest in children at a very early age. The underlying aetiology described is long QT syndrome (LQTS), catecholaminergic polymorphic ventricular tachycardia (CPVT) and idiopathic ventricular fibrillation (IVF). Little phenotypical data about CALM2 mutations is available.
OBJECTIVES:

The aim of this paper is to describe the clinical manifestations of the Asn98Ser mutation in CALM2 in two unrelated children in southern Spain with apparently unexplained cardiac arrest/death.

METHODS:

Two unrelated children aged 4 and 7, who were born to healthy parents, were studied. Both presented with sudden cardiac arrest. The first was resuscitated after a VF episode, and the second died suddenly. In both cases the baseline QTc interval was within normal limits. Peripheral blood DNA was available to perform targeted gene sequencing.

RESULTS:

The surviving 4-year-old girl had a positive epinephrine test for LQTS, and polymorphic ventricular ectopic beats were seen on a previous 24-hour Holter recording from the deceased 7-year-old boy, suggestive of a possible underlying CPVT phenotype. A p.Asn98Ser mutation in CALM2 was detected in both cases. This affected a highly conserved across species residue, and the location in the protein was adjacent to critical calcium binding loops in the calmodulin carboxyl-terminal domain, predicting a high pathogenic effect.

CONCLUSIONS:

Human calmodulin 2 mutation p.Asn98Ser is associated with sudden cardiac death in childhood with a variable clinical penetrance. Our results provide new phenotypical information about clinical behaviour of this mutation.

Early Electroencephalographic Background Features Predict Outcomes in Children Resuscitated From Cardiac Arrest.

Topjian AA1, Sánchez SM, Shults J, Berg RA, Dlugos DJ, Abend NS.

Abstract

OBJECTIVES:

To determine 1) whether early electroencephalographic background features were associated with survival and neurologic outcomes among children resuscitated from cardiac arrest and not treated with therapeutic hypothermia and 2) if addition of electroencephalographic background to commonly used clinical criteria is more predictive of outcome than clinical criteria alone.

DESIGN:

Retrospective study.

SETTING:

PICU and Cardiac ICUs of a tertiary children's hospital.

PATIENTS:

Patients resuscitated from in-hospital or out-of-hospital cardiac arrest who underwent clinically indicated electroencephalographic monitoring and were not treated with therapeutic hypothermia.

INTERVENTIONS:

None.

MEASUREMENTS AND MAIN RESULTS:

One-hundred twenty-eight patients underwent electroencephalographic monitoring within 1 day of return of spontaneous circulation. Background category was normal in four subjects (3%), slow-disorganized in 58 subjects (45%), discontinuous-burst suppression in 24 subjects (19%) and attenuated-flat in 42 subjects (33%). Forty-six subjects (36%) had a reactive electroencephalography. Twenty subjects (15%) had a seizure during electroencephalographic monitoring. Absence of reactivity ($p < 0.001$) and seizures ($p = 0.04$) were associated with worse electroencephalographic background category. After controlling for covariates, for each incrementally worse background score, the odds of death was 3.63 (95% CI, 2.18-6.0; $p < 0.001$) and the odds of unfavorable neurologic outcome was 4.38 (95% CI, 2.51-7.17; $p = 0.001$).

CONCLUSIONS:

Worse electroencephalographic background early after resuscitation from both in-hospital and out-of-hospital cardiac arrest is associated with increased odds of death and unfavorable neurologic outcomes at hospital discharge. These electroencephalographic background patterns may be used in addition to clinical criteria to support prognostic decision making.

Receipt of Life-Sustaining Treatments for Taiwanese Pediatric Patients Who Died of Cancer in 2001 to 2010: A Retrospective Cohort Study.
Hung YN1, Liu TW, Lin DT, Chen YC, Chen JS, Tang ST.
Abstract
Aggressive life-sustaining treatments have the potential to be continued beyond benefit, but have seldom been systematically/nationally explored in pediatric cancer patients. Furthermore, factors predisposing children dying of cancer to receive life-sustaining treatments at end of life (EOL) have never been investigated in a population-based study. This population-based study explored determinants of receiving life-sustaining treatments in pediatric cancer patients' last month of life.For this retrospective cohort study, we used administrative data on 1603 Taiwanese pediatric cancer patients who died in 2001 to 2010. Individual patient-level data were linked with encrypted identification numbers from the National Register of Deaths Database, Cancer Registration System database, National Health Insurance claims datasets, and Database of Medical Care Institutions Status. Life-sustaining treatments included intensive care unit (ICU) care, cardiopulmonary resuscitation (CPR), and mechanical ventilation. Associations of patient, physician, hospital, and regional factors with receiving ICU care, CPR, and mechanical ventilation in the last month of life were evaluated by multilevel generalized linear mixed models.In their last month of life, 22.89%, 46.48%, and 61.45% of pediatric cancer patients received CPR, mechanical ventilation, and ICU care, respectively, with no significant decreasing trends from 2001 to 2010. Patients were more likely to receive all three identified life-sustaining treatments at EOL if they were diagnosed with a hematologic malignancy or a localized disease, died within 1 year of diagnosis, and received care from a pediatrician. Receipt of ICU care or mechanical ventilation increased with increasing EOL-care intensity of patients' primary hospital, whereas use of mechanical ventilation decreased with increasing quartile of hospice beds in the patients' primary hospital region.Taiwanese pediatric cancer patients received aggressive life-sustaining treatments in the month before death. Healthcare policies and interventions should aim to help pediatricians treating at-risk pediatric cancer patients and hospitals with a tendency to provide aggressive EOL treatments to avoid the expense of life-sustaining treatments when chance of recovery is remote and to devote resources to care that produces the greatest benefits for children, parents, and society.

TARGETED TEMPERATURE MANAGEMENT

Early Prognosticators for Induction of Therapeutic Hypothermia Following Cardiac Arrest.
Tasan E1, Jesinger ME1, Charnigo RJ2, Kramer SP3, Kim S3, Clements L4, Bailey AL5, Campbell CL5.
Abstract
The American Heart Association recommends therapeutic hypothermia for comatose patients with return of spontaneous circulation after out-of-hospital ventricular fibrillation cardiac arrest. While there is a growing body of evidence for the general efficacy of therapeutic hypothermia, the individualized benefit of therapy is not currently predictable. Ninety-one consecutive patients, from April 2011 to July 2014, were treated at the University of Kentucky Medical Center with the therapeutic hypothermia protocol. Medical records were reviewed retrospectively. Data, such as preexisting comorbidities, cardiac arrest characteristics, and hospital course, were used to compose a multivariate logistic regression with mortality serving as the primary endpoint. The overall in-hospital mortality was 64% (n = 58) in this group. The arrest was considered cardiac etiology in 84% (n = 76) of patients, of which 49% (n = 45) were classed as ventricular fibrillation and 9% (n = 8) as ventricular tachycardia. The presence of a shockable rhythm, as well as shorter duration of cardiac arrest, was associated with increased survival, whereas time to target temperature was not. The presence of a preexisting neurologic disease was associated with a 10-fold increase in estimated odds of mortality. Age, serum lactate, ionized calcium, arterial pH, estimated glomerular filtration rate, and APACHE score were all predictors of mortality. Cardiac arrest is a devastating condition with a high

mortality rate. Given the limited resources of the resuscitation community, the ability to predict survivors based on routinely obtained measures upon admission would be of tremendous value. In this study, we show a series of admission parameters that demonstrate predictive ability in identifying patients more likely to survive with therapeutic hypothermia.

Early Prognosticators for Induction of Therapeutic Hypothermia Following Cardiac Arrest.
Tasan E1, Jesinger ME1, Charnigo RJ2, Kramer SP3, Kim S3, Clements L4, Bailey AL5, Campbell CL5.
Abstract
The American Heart Association recommends therapeutic hypothermia for comatose patients with return of spontaneous circulation after out-of-hospital ventricular fibrillation cardiac arrest. While there is a growing body of evidence for the general efficacy of therapeutic hypothermia, the individualized benefit of therapy is not currently predictable. Ninety-one consecutive patients, from April 2011 to July 2014, were treated at the University of Kentucky Medical Center with the therapeutic hypothermia protocol. Medical records were reviewed retrospectively. Data, such as preexisting comorbidities, cardiac arrest characteristics, and hospital course, were used to compose a multivariate logistic regression with mortality serving as the primary endpoint. The overall in-hospital mortality was 64% (n = 58) in this group. The arrest was considered cardiac etiology in 84% (n = 76) of patients, of which 49% (n = 45) were classed as ventricular fibrillation and 9% (n = 8) as ventricular tachycardia. The presence of a shockable rhythm, as well as shorter duration of cardiac arrest, was associated with increased survival, whereas time to target temperature was not. The presence of a preexisting neurologic disease was associated with a 10-fold increase in estimated odds of mortality. Age, serum lactate, ionized calcium, arterial pH, estimated glomerular filtration rate, and APACHE score were all predictors of mortality. Cardiac arrest is a devastating condition with a high mortality rate. Given the limited resources of the resuscitation community, the ability to predict survivors based on routinely obtained measures upon admission would be of tremendous value. In this study, we show a series of admission parameters that demonstrate predictive ability in identifying patients more likely to survive with therapeutic hypothermia.

Still cooling after all these years: Meta-analysis of pre-clinical trials of therapeutic hypothermia for acute ischemic stroke.
Dumitrascu OM1, Lamb J2, Lyden PD2.
Abstract
Therapeutic hypothermia is the most potent neuroprotectant for experimental cerebral ischemia, illustrated in a 2007 meta-analysis published in this journal. To address recent therapeutic nihilism, we systematically reviewed recent experimental literature. Quality scoring showed considerable improvement in study design. Using several outcome measures in a variety of models and species, therapeutic hypothermia was protective compared with normothermia, with powerful and statistically significant normalized treatment effect sizes, in 60 papers comprising 216 comparisons. In the past 5 years, preclinical studies of ischemic stroke re-emphasize that therapeutic hypothermia is potently effective, justifying further development in larger human clinical trials.

POST ACR

Delayed awakening after cardiac arrest: prevalence and risk factors in the Parisian registry.
Paul M1, Bougouin W1,2,3,4, Geri G1,2,3,4, Dumas F2, 3,4,5, Champigneulle B1,3, Legriel S2,4,6, Charpentier J1,3, Mira JP1,3, Sandroni C7, Cariou A8,9,10,11.
Abstract
PURPOSE:
Although prolonged unconsciousness after cardiac arrest (CA) is a sign of poor neurological outcome, limited evidence shows that a late recovery may occur in a minority of patients. We

investigated the prevalence and the predictive factors of delayed awakening in comatose CA survivors treated with targeted temperature management (TTM).

METHODS:
Retrospective analysis of the Parisian Region Out-of-Hospital CA Registry (2008-2013). In adult comatose CA survivors treated with TTM, sedated with midazolam and fentanyl, time to awakening was measured starting from discontinuation of sedation at the end of rewarming. Awakening was defined as delayed when it occurred after more than 48 h.

RESULTS:
A total of 326 patients (71 % male, mean age 59 ± 16 years) were included, among whom 194 awoke. Delayed awakening occurred in 56/194 (29 %) patients, at a median time of 93 h (IQR 70-117) from discontinuation of sedation. In 5/56 (9 %) late awakeners, pupillary reflex and motor response were both absent 48 h after sedation discontinuation. In multivariate analysis, age over 59 years (OR 2.1, 95 % CI 1.0-4.3), post-resuscitation shock (OR 2.6 [1.3-5.2]), and renal insufficiency at admission (OR 3.1 [1.4-6.8]) were associated with significantly higher rates of delayed awakening.

CONCLUSIONS:
Delayed awakening is common among patients recovering from coma after CA. Renal insufficiency, older age, and post-resuscitation shock were independent predictors of delayed awakening. Presence of unfavorable neurological signs at 48 h after rewarming from TTM and discontinuation of sedation did not rule out recovery of consciousness in late

RECERCA EXPERIMENTAL

The effects of proximal and distal routes of intraosseous epinephrine administration on short-term resuscitative outcome measures in an adult swine model of ventricular fibrillation: a randomized controlled study.

Burgert JM1, Johnson AD2, Garcia-Blanco J3, Froehle J4, Morris T4, Althuisius B4, Richards J4, Castano C4.

Abstract

INTRODUCTION:
It is unknown if the anatomical distance of intraosseous (i.o.) epinephrine injection from the heart affects resuscitative outcome. The purpose of this study was to explore the relationships between the anatomical distance of i.o. epinephrine injection and measures of resuscitative outcome in an adult swine model of ventricular fibrillation (VF).

METHODS:
Thirty-two Yorkshire-cross swine (60-80 kg) were randomly assigned to four groups: humeral i.o. (HIO), tibial i.o. (TIO), i.v. with defibrillation and epinephrine, and i.v. control: with defibrillation but no epinephrine. Ventricular fibrillation was induced. Swine remained in VF for 4 minutes prior to mechanical chest compressions. After 6 minutes in VF, swine were defibrillated and epinephrine (0.01 mg/kg) administered by group assignment. Defibrillation was repeated every 2 minutes. Epinephrine was repeated every 4 minutes. Interventions continued until return of spontaneous circulation (ROSC) or 26 post-arrest minutes elapsed. Swine achieving ROSC were observed for 30 minutes post-ROSC.

RESULTS:
There were no significant differences between the HIO, TIO, and i.v. groups relative to the occurrence of ROSC (P > .05 in all cases), 30-minute post-ROSC survival (P > .05 in all cases), and time to ROSC (P = .43). There were significant differences between the HIO, TIO, and i.v. groups compared to the control group relative to the occurrence of ROSC (P = .02, .01, and .007 respectively), and 30 minute post-ROSC survival (P = .05, .03, and .007, respectively).

CONCLUSION:
The anatomical distance of i.o. epinephrine injection from the heart did not affect short-term measures of resuscitative outcome in an adult swine model of VF including the occurrence of ROSC, 30 minute post-ROSC survival, and time to ROSC. Rapidly administered epinephrine, irrespective of route of administration, increased the chance ROSC and survival to 30 minutes post-ROSC would occur in this study.

Monitoring of brain oxygenation during hypothermic CPR - A prospective porcine study.

Putzer G1, Braun P2, Strapazzon G3, Toferer M2, Mulino M4, Glodny B5, Falk M6, Brugger H3, Paal P7, Helbok R8, Mair P2.

Abstract

BACKGROUND AND AIM:

Limited data are available concerning the impact of CPR interventions on cerebral oxygenation during hypothermic cardiac arrest. We therefore studied cerebral perfusion pressure (CPP), brain tissue oxygen tension (Pbt O2), cerebral venous oxygen saturation (ScvO2) and regional cerebral oxygen saturation (rSO2) in an animal model of hypothermic CPR. We also assessed the correlation between rSO2 and CPP, PbtO2 and ScvO2 to clarify whether near-infrared spectroscopy (NIRS) may be used to non-invasively monitor changes in cerebral oxygenation during hypothermic CPR.

METHODS:

Nine pigs were surface-cooled to a core temperature of 28°C and underwent a period of asphyxia before cardiac arrest was induced. After 2min of untreated cardiac arrest they were resuscitated for 45min. CPP, PbtO2, ScvO2 and rSO2 were monitored after periods of stable external chest compression, a short interruption of CPR and after epinephrine administration.

RESULTS:

During external chest-compressions before adrenalin administration CPP, PbtO2, ScvO2 and rSO2 increased in parallel and changes in rSO2 closely correlated with changes in CPP (r=.844; p<.001) and ScvO2 (r=.868; p<.001). After adrenaline administration CPP and PbtO2 increased, ScvO2 decreased and rSO2 values did not change and there was no significant correlation between rSO2 and CPP, PbtO2, or ScvO2.

CONCLUSION:

In this animal model of hypothermic cardiac arrest adrenaline was associated with an increase in global cerebral oxygen extraction despite an increase in CPP. Discrepancies in the time course of PbtO2 and ScvO2 suggest differences in regional oxygen metabolism after adrenalin. rSO2 values correlated closely with CPP and ScvO2 only during periods of external chest compression without adrenaline administration.

Intestinal Conditioning After Cardiac Arrest: The Use of Normothermic Extracorporeal Membrane Oxygenation in the Nonheart Beating Animal Model.

Guo M1, Yao D2, Li L3, Lu C1, Li Y2, Li J2.

Abstract

The effect of normothermic extracorporeal membrane oxygenation (NECMO) on small bowel preservation in a clinically relevant large animal model of expected donation after cardiac death (eDCD) was evaluated. Thirty domestic crossbred donor pigs were divided into five groups. The first group served as the live donation (LD) group, the second group served as the donation after cardiac death (DCD) group, and the remaining were further assigned into three subgroups: E1 group (1 h NECMO support), E3 group (3 h NECMO support), and E5 group (5 h NECMO support). Pathology, electron microscopy, energy metabolism, cell apoptosis, and tight junction (TJ) protein expression level of intestinal mucosa and the level of plasma d-lactic acid were evaluated in normal, cardiac death and at the end of extracorporeal support, respectively. The mean arterial pressure and PaO2 were maintained over 60 and 267 mm Hg during NECMO support, respectively. One hour of extracorporeal support could improve the energy status in intestines of the DCD group. Although the histologic damage and apoptosis of the E1 group had no significant difference with those of the LD and DCD groups (P > 0.05), the levels of intestinal mucosa TJ protein decreased (P < 0.05), and plasma d-lactic acid increased progressively (P < 0.05). With the extension of extracorporeal support, the degree of intestinal mucosa damage and intestinal permeability gradually increased, as well as the content of adenosine triphosphate in intestinal mucosa. The normothermic extracorporeal support for 1 h in DCD is beneficial for improving the energy status and viability of the bowel. However, the integrity of intestinal mucosa was destroyed gradually as extracorporeal support time went by.

And the activation of intestinal epithelial apoptosis and hyperoxia might be the factors that lead to intestinal mucosa injury.

4. J Neurosci Methods. 2016 Apr 20;267:55-61. doi: 10.1016/j.jneumeth.2016.04.011. [Epub ahead of print]

Novel method for inducing rapid, controllable therapeutic hypothermia in rats using a perivascular implanted closed-loop cooling circuit.

Lamb JA1, Rajput PS2, Lyden PD2.

Abstract

BACKGROUND:

Hypothermia is the most potent protective therapy available for cerebral ischemia. In experimental models, cooling the brain even a single degree Celsius alters outcome after global and focal ischemia. Difficulties translating therapeutic hypothermia to patients with stroke or after cardiac arrest include: uncertainty as to the optimal treatment duration; best target-depth temperature; and longest time delay after which therapeutic hypothermia won't benefit. Recent results from human clinical trials suggest that cooling with surface methods provides insufficient cooling speed or control over target temperature.

COMPARISON WITH EXISTING METHODS:

Available animal models incorporate surface cooling methods that are slow, and do not allow for precise control of the target temperature.

NEW METHOD:

To address this need, we developed a rapid, simple, inexpensive model for inducing hypothermia using a perivascular implanted closed-loop cooling circuit. The method allows precise control of the target temperature.

RESULTS:

Using this method, target temperature for therapeutic hypothermia was reached within 13±1.07min (Mean±SE). Once at target, the temperature was maintained within 0.09°C for 4h.

CONCLUSIONS:

This method will allow future experiments to determine under what conditions therapeutic hypothermia is effective, determine the optimal relationship among delay, duration, and depth, and provide the research community with a new model for conducting further research into mechanistic questions underlying the efficacy of therapeutic hypothermia.

REGISTRES I REVISIONS

1. J Intensive Care. 2016 Apr 27;4:30. doi: 10.1186/s40560-016-0139-2. eCollection 2016.

Targeted temperature management for adult out-of-hospital cardiac arrest: current concepts and clinical applications.

Fukuda T1.

Author information:

Abstract

Targeted temperature management (TTM) (primarily therapeutic hypothermia (TH)) after out-of-hospital cardiac arrest (OHCA) has been considered effective, especially for adult-witnessed OHCA with a shockable initial rhythm, based on pathophysiology and on several clinical studies (especially two randomized controlled trials (RCTs) published in 2002). However, a recently published large RCT comparing TTM at 33 °C (TH) and TTM at 36 °C (normothermia) showed no advantage of 33 °C over 36 °C. Thus, this RCT has complicated the decision to perform TH after cardiac arrest. The results of this RCT are sometimes interpreted fever control alone is sufficient to improve outcomes after cardiac arrest because fever control was not strictly performed in the control groups of the previous two RCTs that showed an advantage for TH. Although this may be possible, another interpretation that the optimal target temperature for TH is much lower than 33 °C may be also possible. Additionally, there are many points other than target temperature that are unknown, such as the optimal timing to initiate TTM, the period between OHCA and initiating TTM, the period between OHCA and achieving the target temperature, the duration of maintaining the target temperature, the TTM technique, the rewarming method, and the management protocol after rewarming. RCTs are currently

underway to shed light on several of these underexplored issues. In the present review, we examine how best to perform TTM after cardiac arrest based on the available evidence.

Ethnic differences in sudden cardiac arrest resuscitation.
Ghobrial J1, Heckbert SR2, Bartz TM3, Lovasi G4, Wallace E5, Lemaitre RN6, Mohanty AF7, Rea TD8, Siscovick DS9, Yee J6, Lentz MS6, Sotoodehnia N10.
Author information:
Abstract
OBJECTIVE:
Ethnic differences in sudden cardiac arrest resuscitation have not been fully explored and studies have yielded inconsistent results. We examined the association of ethnicity with factors affecting sudden cardiac arrest outcomes.
METHODS:
Retrospective cohort study of 3551 white, 440 black and 297 Asian sudden cardiac arrest cases in Seattle and King County, Washington, USA.
RESULTS:
Compared with whites, blacks and Asians were younger, had lower socioeconomic status and were more likely to have diabetes, hypertension and end-stage renal disease (all p<0.001). Blacks and Asians were less likely to have a witnessed arrest (whites 57.6%, blacks 52.1%, Asians 46.1%, p<0.001) or receive bystander cardiopulmonary resuscitation (whites 50.9%, blacks 41.4%, Asians 47.1%, p=0.001), but had shorter average emergency medical services response time (mean in minutes: whites 5.18, blacks 4.75, Asians 4.85, p<0.001). Compared with whites, blacks were more likely to be found in pulseless electrical activity (blacks 20.9% vs whites 16.6%, p<0.001), and Asians were more likely to be found in asystole (Asians 41.1% vs whites 30.0%, p<0.001). One of the strongest predictors of resuscitation outcomes was initial cardiac rhythm with 25% of ventricular fibrillation, 4% of patients with pulseless electrical activity and 1% of patients with asystole surviving to hospital discharge (adjusted OR of resuscitation in pulseless electrical activity compared with ventricular fibrillation: 0.30, 95% CI 0.24 to 0.34, p<0.001, adjusted OR of resuscitation in asystole relative to ventricular fibrillation 0.21, 95% CI 0.17 to 0.26, p<0.001). Survival to hospital discharge was similar across all three ethnicities.
CONCLUSIONS:
While there were differences in some prognostic characteristics between blacks, whites and Asians, we did not detect a significant difference in survival following sudden cardiac arrest between the three ethnic groups. There was, however, an ethnic difference in presenting rhythm, with pulseless electrical activity more prevalent in blacks and asystole more prevalent in Asians.

Long-Term Post-Discharge Risks in Older Survivors of Myocardial Infarction With and Without Out-of-Hospital Cardiac Arrest.
Fordyce CB1, Wang TY2, Chen AY3, Thomas L3, Granger CB2, Scirica BM4, Henry TD5, Wong GC6, Ramanathan K7, Hansen CM3, Kragholm K3, Peterson ED2, Anderson ML2.
Abstract
BACKGROUND:
Out-of-hospital cardiac arrest (OHCA) associated with acute myocardial infarction (MI) confers high in-hospital mortality; however, among those patients who survive, little is known regarding their post-discharge mortality and health care use rates.
OBJECTIVES:
The purpose of this study was to determine 1-year survival and readmission rates after hospital discharge of older MI survivors with and without OHCA.
METHODS:

Using linked Acute Coronary Treatment and Intervention Outcomes Network Registry-Get With the Guidelines and Medicare data, this study analyzed 54,860 patients with MI who were older than 65 years of age and who had been discharged alive from 545 U.S. hospitals between April 2011 and December 2012. Multivariable models examined the associations between MI-associated OHCA and 1-year post-discharge mortality or all-cause readmission rates. Patients discharged to hospice were excluded, given their known poor prognosis.

RESULTS:

Following hospital discharge, compared with older MI survivors without OHCA (n = 54,219), those with OHCA (n = 641, 1.2%) were more likely to be younger, male, and smokers, but less likely to have diabetes, heart failure, or prior revascularization. OHCA patients presented more often with ST-segment elevation myocardial infarction (63.2% vs. 29.6%) and cardiogenic shock (29.0% vs. 2.2%); however, among in-hospital MI survivors, OHCA was not associated with 1-year post-discharge mortality (unadjusted 13.8% vs. 15.8%, p = 0.17, adjusted hazard ratio [HR]: 0.89; 95% confidence interval [CI]: 0.68 to 1.15). In contrast, MI survivors with OHCA actually had lower unadjusted and adjusted risk of the composite outcome of 1-year mortality or all-cause readmission than patients without OHCA (44.0% vs. 50.0%, p = 0.03, adjusted HR: 0.84; 95% CI: 0.72 to 0.97).

CONCLUSIONS:

Among older patients with MI who survived to hospital discharge and were not discharged to hospice, those presenting with OHCA did not have higher 1-year mortality or health care use rates compared with those MI survivors without OHCA. These findings show that the early risk of adverse events in patients with OHCA does not persist after hospital discharge, and they support efforts to improve initial survival rates of older patients with MI and OHCA.

ENTRENAMENT

1. BMJ Open. 2016 Apr 25;6(4):e010481. doi: 10.1136/bmjopen-2015-010481.
What are the barriers to implementation of cardiopulmonary resuscitation training in secondary schools? A qualitative study. **RCP A LES ESCOLES!**
Zinckernagel L1, Malta Hansen C2, Rod MH1, Folke F3, Torp-Pedersen C4, Tjørnhøj-Thomsen T1.

Abstract

OBJECTIVE:

Cardiopulmonary resuscitation (CPR) training in schools is recommended to increase bystander CPR and thereby survival of out-of-hospital cardiac arrest, but despite mandating legislation, low rates of implementation have been observed in several countries, including Denmark. The purpose of the study was to explore barriers to implementation of CPR training in Danish secondary schools.

DESIGN:

A qualitative study based on individual interviews and focus groups with school leadership and teachers. Thematic analysis was used to identify regular patterns of meaning both within and across the interviews.

SETTING:

8 secondary schools in Denmark. Schools were selected using strategic sampling to reach maximum variation, including schools with/without recent experience in CPR training of students, public/private schools and schools near to and far from hospitals.

PARTICIPANTS:

The study population comprised 25 participants, 9 school leadership members and 16 teachers.

RESULTS:

School leadership and teachers considered it important for implementation and sustainability of CPR training that teachers conduct CPR training of students. However, they preferred external instructors to train students, unless teachers acquired the CPR skills which they considered were needed. They considered CPR training to differ substantially from other teaching subjects because it is a matter of life and death, and they therefore believed extraordinary skills were required for conducting the training. This was mainly rooted in their

insecurity about their own CPR skills. CPR training kits seemed to lower expectations of skill requirements to conduct CPR training, but only among those who were familiar with such kits.
CONCLUSIONS:
To facilitate implementation of CPR training in schools, it is necessary to have clear guidelines regarding the required proficiency level to train students in CPR, to provide teachers with these skills, and to underscore that extensive skills are not required to provide CPR. Further, it is important to familiarise teachers with CPR training kits.

OFEGAMENT

Extracorporeal life support for victims of drowning.
Burke CR1, Chan T2, Brogan TV2, Lequier L3, Thiagarajan RR4, Rycus PT5, Michael McMullan D6.
Abstract
AIM:
Unintentional drowning is a significant public health concern in the United States and represents a leading cause of death in the pediatric population. Extracorporeal life support (ECLS) may be used to support drowning victims, but outcomes have not been well defined. This study examined survival rates and risk factors for death in this population.
METHODS:
Retrospective data from the Extracorporeal Life Support Organization registry was examined to determine outcomes of ECLS and risk factors for death in drowning victims.
RESULTS:
Two hundred forty-seven patients who received ECLS following a drowning event between 1986 and 2015 were identified. Eighty-four (34%) did not experience cardiac arrest prior to ECLS, whereas 86 (35%) experienced a pre-ECLS cardiac arrest but had return of spontaneous circulation prior to ECLS, and 77 (31%) were placed on ECLS during cardiopulmonary resuscitation (ECPR). Overall survival was 51.4%; 71.4% in patients who did not experience a cardiac arrest, 57.0% in patients who required cardiopulmonary resuscitation prior to ECLS, and 23.4% in patients who received ECPR (p<0.001). Logistic regression analysis identified ECPR, venoarterial mode of ECLS, renal failure, and cardiopulmonary resuscitation during ECLS as risk factors associated with mortality.
CONCLUSIONS:
Outcomes in drowning victims supported with ECLS are encouraging; particularly in patients who do not experience cardiac arrest. These data suggest that early initiation of ECLS in drowning patients with respiratory insufficiency may be beneficial to reduce the likelihood of complete cardiopulmonary failure and ECPR. Additionally, ECLS appears to improve survival in patients who experience post-drowning cardiac arrest.

PEDIATRIA

Family Burden After Out-of-Hospital Cardiac Arrest in Children.
Meert KL1, Slomine BS, Christensen JR, Telford R, Holubkov R, Dean JM, Moler FW; Therapeutic Hypothermia after Pediatric Cardiac Arrest Trial Investigators.
Abstract
OBJECTIVES:
To describe family burden among caregivers of children who survived out-of-hospital cardiac arrest and who were at high risk for neurologic disability and examine relationships between family burden, child functioning, and other factors during the first year post arrest.
DESIGN:
Secondary analysis of data from the Therapeutic Hypothermia after Pediatric Cardiac Arrest Out-of-Hospital trial.
SETTING:
Thirty-six PICUs in the United States and Canada.

PATIENTS:

Seventy-seven children recruited to the Therapeutic Hypothermia after Pediatric Cardiac Arrest Out-of-Hospital trial who had normal prearrest neurologic functioning and were alive 1 year post arrest.

INTERVENTIONS:

Family burden was assessed using the Infant Toddler Quality of Life Questionnaire for children less than 5 years old and the Child Health Questionnaire for children 5 years old or older at baseline (reflecting prearrest status), 3 months, and 12 months post arrest. Child functioning was assessed using the Vineland Adaptive Behavior Scale II, the Pediatric Overall Performance Category, and Pediatric Cerebral Performance Category scales and caregiver perception of global functioning.

MEASUREMENTS AND MAIN RESULTS:

Fifty-six children (72.7%) were boys, 48 (62.3%) were whites, and 50 (64.9%) were less than 5 years old prior to out-of-hospital cardiac arrest. Family burden at baseline was not significantly different from reference values. Family burden was increased at 3 and 12 months post arrest compared with reference values (p < 0.001). Worse Pediatric Overall Performance Category and Pediatric Cerebral Performance Category, lower adaptive behavior, lower global functioning, and higher family burden all measured 3 months post arrest were associated with higher family burden 12 months post arrest (p < 0.05). Sociodemographics and prearrest child functioning were not associated with family burden 12 months post arrest.

CONCLUSIONS:

Families of children who survive out-of-hospital cardiac arrest and have high risk for neurologic disability often experience substantial burden during the first year post arrest. The extent of child dysfunction 3 months post arrest is associated with family burden at 12 months.

The number of tracheal intubation attempts matters! A prospective multi-institutional pediatric observational study.

Lee JH1,2, Turner DA3, Kamat P4,5, Nett S6, Shults J7, Nadkarni VM8, Nishisaki A8; Pediatric Acute Lung Injury and Sepsis Investigators (PALISI); National Emergency Airway Registry for Children (NEAR4KIDS).

Abstract

BACKGROUND:

The impact of multiple tracheal intubation (TI) attempts on outcomes in critically ill children with acute respiratory failure is not known. The objective of our study is to determine the association between number of TI attempts and severe desaturation (SpO2 < 70 %) and adverse TI associated events (TIAEs).

METHODS:

We performed an analysis of a prospective multicenter TI database (National Emergency Airway Registry for Children: NEAR4KIDS). Primary exposure variable was number of TI attempts trichotomized as one, two, or ≥3 attempts. Estimates were adjusted for history of difficult airway, upper airway obstruction, and age. We included all children with initial TI performed with direct laryngoscopy for acute respiratory failure between 7/2010-3/2013. Our main outcome measures were desaturation (<80 % during TI attempt), severe desaturation (<70 %), adverse and severe TIAEs (e.g., cardiac arrest, hypotension requiring treatment).

RESULTS:

Of 3382 TIs, 2080(65 %) were for acute respiratory failure. First attempt success was achieved in 1256/2080(60 %), second attempt in 503/2080(24 %), and ≥3 attempts in 321/2080(15 %). Higher number of attempts was associated with younger age, history of difficult airway, signs of upper airway obstruction, and first provider training level. The proportion of TIs with desaturation increased with increasing number of attempts (1 attempt:16 %, 2 attempts:36 %, ≥3 attempts:56 %, p < 0.001; adjusted OR for 2 attempts: 2.9[95 % CI:2.3-3.7]; ≥3 attempts: 6.5[95 % CI: 5.0-8.5], adjusted for patient factors). Proportion of TIs with severe desaturation also increased with increasing number of attempts (1 attempt:12 %, 2 attempts:30 %, ≥3 attempts:44 %, p < 0.001; adjusted OR for 2 attempts: 3.1[95 % CI:2.4-4.0]; ≥3 attempts: 5.7[95 % CI: 4.3-7.5]). TIAE rates increased from 10 to 29 to 38 % with increasing number of attempts (p < 0.001; adjusted OR for 2 attempts: 3.7[95 % CI:2.9-4.9] ; ≥3 attempts: 5.5[95 %

CI: 4.1-7.4]. Severe TIAE rates went from 5 to 8 to 9 % (p = 0.008); adjusted OR for 2 attempts: 1.6 [95 % CI:1.1-2.4]; ≥3 attempts: 1.8[95 % CI:1.1-2.8].
CONCLUSIONS:
Number of TI attempts was associated with desaturations and increased occurrence of TIAEs in critically ill children with acute respiratory failure. Thoughtful attention to initial provider as well as optimal setting/preparation is important to maximize the chance for first attempt success and to avoid desaturation.

CURES POST

Prophylactic antibiotics are associated with a lower incidence of pneumonia in cardiac arrest survivors treated with targeted temperature management.
Gagnon DJ1, Nielsen N2, Fraser GL3, Riker RR4, Dziodzio J5, Sunde K6, Hovdenes J7, Stammet P8, Friberg H9, Rubertsson S10, Wanscher M11, Seder DB4.
Comment in: Prophylactic antibiotic therapy for all out-of-hospital cardiac arrest survivors? [Resuscitation. 2015]
Abstract
INTRODUCTION:
Prophylactic antibiotics (PRO) reduce the incidence of early-onset pneumonia in comatose patients with structural brain injury, but have not been examined in cardiac arrest survivors undergoing targeted temperature management (TTM). We investigated the effect of PRO on the development of pneumonia in that population.
METHODS:
We conducted a retrospective cohort study comparing patients treated with PRO to those not receiving PRO (no-PRO) using Northern Hypothermia Network registry data. Cardiac arrest survivors ≥ 18 years of age with a GCS<8 at hospital admission and treated with TTM at 32-34 °C were enrolled in the registry. Differences were analyzed in univariate analyses and with logistic regression models to evaluate independent associations of clinical factors with incidence of pneumonia and good functional outcome.
RESULTS:
416 of 1240 patients (33.5%) received PRO. Groups were similar in age, gender, arrest location, initial rhythm, and time from collapse to return of spontaneous circulation. PRO patients had less pneumonia (12.6% vs. 54.9%, p < 0.001) and less sepsis (1.2 vs. 5.7%, p < 0.001) compared to no-PRO patients. ICU length of stay (98 vs. 100 h, p = 0.2) and incidence of a good functional outcome (41.1 vs. 36.6%, p = 0.19) were similar between groups. Backwards stepwise logistic regression demonstrated PRO were independently associated with a lower incidence of pneumonia (OR 0.09, 95% 0.06-0.14, p < 0.001) and a similar incidence of good functional outcome.
CONCLUSIONS:
Prophylactic antibiotics were associated with a reduced incidence of pneumonia but a similar rate of good functional outcome.

Early Withdrawal Decision-Making in Patients with Coma After Cardiac Arrest: A Qualitative Study of Intensive Care Clinicians.
Ong CJ1, Dhand A2, Diringer MN2.
Abstract
INTRODUCTION:
Neurologists are often asked to define prognosis in comatose patients. However, comatose patients following cardiac arrest are usually cared for by cardiologists or intensivists, and it is their approach that will influence decisions regarding withdrawal of life-sustaining interventions (WLSI). We observed that factors leading to these decisions vary across specialties and considered whether they could result in self-fulfilling prophecies and early WLSI. We conducted a hypothesis-generating qualitative study to identify factors used by non-

neurologists to define prognosis in these patients and construct an explanatory model for how early WLSI might occur.

METHODS:

This was a single-center qualitative study of intensivists caring for cardiac arrest patients with hypoxic-ischemic coma. Thirty attending physicians (n = 16) and fellows (n = 14) from cardiac (n = 8), medical (n = 6), surgical (n = 10), and neuro (n = 6) intensive care units underwent semi-structured interviews. Interview transcripts were analyzed using grounded theory techniques.

RESULTS:

We found three components of early WLSI among non-neurointensivists: (1) development of fixed negative opinions; (2) early framing of poor clinical pictures to families; and (3) shortened windows for judging recovery potential. In contrast to neurointensivists, non-neurointensivists' negative opinions were frequently driven by patients' lack of consciousness and cardiopulmonary resuscitation circumstances. Both groups were influenced by age and comorbidities.

CONCLUSIONS:

The results demonstrate that factors influencing prognostication differ across specialties. Some differ from those recommended by published guidelines and may lead to self-fulfilling prophecies and early WLSI. Better understanding of this framework would facilitate educational interventions to mitigate this phenomenon and its implications on patient care.

TARGET TEMPERATURE MANAGEMENT

A Descriptive Analysis of Therapeutic Hypothermia Application Across Adult Age Groups.
Mader TJ1, Nathanson BH2, Coute RA3, McNally BF4.
Abstract

Therapeutic hypothermia (TH) has been recommended for comatose adults recovering from out-of-hospital cardiac arrest (OHCA) for a decade. However, TH has never been evaluated in a randomized control trial in patients aged 75 or older. How the administration of TH varies across age groups experiencing an OHCA is unknown. The objective was to describe the use of TH across predefined age groups with an emphasis on geriatric OHCA survivors using data compiled through Cardiac Arrest Registry to Enhance Survival (CARES). We hypothesized that TH provision would decline in patients aged 75 or older. This was a secondary analysis of prospectively collected and verified registry data. The study was Institutional Review Board exempt. Through December 2013, CARES had 130,852 completed records for consideration. All nontraumatic adult index arrests of presumed cardiac etiology with attempted resuscitation were study eligible. Sustained return of spontaneous circulation with survival to hospital admission was a prerequisite for inclusion. Exclusion criteria were as follows: records before November 2010 when TH became a mandatory reporting field; pre-existing Do Not Resuscitate directive; missing TH status or outcome classification; and OHCA location and timing variables potentially affecting treatment decisions or eligibility. All records in our final sample were categorized (TH or no TH) for descriptive analysis. Our final sample size was 11,533. The percentage of patients <75 who received TH was 58.5% (95% CI: 57.5-59.6) and 46.4% (95% CI: 44.5-48.3) for those 75 or older. There was no difference in the rate of TH across the age groups from <25 to 65-74 (p = 0.205). Treatment rates significantly decreased from age 75-84 to 95+ (p < 0.001). There is a significant decline in the provision of TH at age 75 years within CARES. Further research is needed to determine if age is an independent predictor of TH underutilization in the elderly.

Targeted temperature management for adult out-of-hospital cardiac arrest: current concepts and clinical applications.
Fukuda T1.
Abstract

Targeted temperature management (TTM) (primarily therapeutic hypothermia (TH)) after out-of-hospital cardiac arrest (OHCA) has been considered effective, especially for adult-witnessed OHCA with a shockable initial rhythm, based on pathophysiology and on several clinical studies (especially two randomized controlled trials (RCTs) published in 2002). However, a recently published large RCT comparing TTM at 33 °C (TH) and TTM at 36 °C (normothermia) showed no advantage of 33 °C over 36 °C. Thus, this RCT has complicated the decision to perform TH after cardiac arrest. The results of this RCT are sometimes interpreted fever control alone is sufficient to improve outcomes after cardiac arrest because fever control was not strictly performed in the control groups of the previous two RCTs that showed an advantage for TH. Although this may be possible, another interpretation that the optimal target temperature for TH is much lower than 33 °C may be also possible. Additionally, there are many points other than target temperature that are unknown, such as the optimal timing to initiate TTM, the period between OHCA and initiating TTM, the period between OHCA and achieving the target temperature, the duration of maintaining the target temperature, the TTM technique, the rewarming method, and the management protocol after rewarming. RCTs are currently underway to shed light on several of these underexplored issues. In the present review, we examine how best to perform TTM after cardiac arrest based on the available evidence.

Influence of temperature on thromboelastometry and platelet aggregation in cardiac arrest patients undergoing targeted temperature management.
Jeppesen AN1,2, Kirkegaard H3,4, Ilkjær S4, Hvas AM5 .
Abstract
BACKGROUND:
Coagulation can be visualised using whole blood coagulation analyses such as thromboelastometry and platelet aggregation tests; however, the role of temperature in the analyses is ambiguous. The aim was to examine whether temperature influences the whole blood coagulation tests.
METHODS:
We included 40 patients treated with targeted temperature management (33 ± 1 °C) after out-of-hospital cardiac arrest. The blood samples were obtained on hypothermia and normothermia. Each blood sample was analysed simultaneously at 33 °C and 37 °C by thromboelastography (ROTEM®) employing the assays EXTEM®, INTEM®, FIBTEM® and HEPTEM®, and by Multiplate®Analyzer, using COLtest®, ADPtest®, ASPItest® and TRAPtest® as agonists. Data on antithrombotic drugs were collected systematically from medical records, and data were analysed using repeated measurement analysis of variance (ANOVA).
RESULTS:
The ROTEM® analyses showed increased clotting time, lower maximum velocity and increased time to maximum velocity (all p values <0.02) when performed at 33 °C compared with 37 °C, irrespective of the patients being hypothermic (median 33.1 °C) or normothermic (median 37.5 °C). However, EXTEM® time to maximum velocity showed no difference between the analyses performed at 33 °C and 37 °C when the patients were hypothermic (p = 0.83). No differences were found in maximum clot firmness (all p values >0.09) analysed at 33 °C and 37 °C, independent of the body temperature. In the hypothermic blood sample, no difference was found when using the COLtest®, ASPItest® or TRAPtest® to compare platelet aggregation analysed at 33 °C and 37 °C (all p values >0.19), but platelet aggregation was significantly higher using the ADPtest® (p < 0.001) when analysed at 33 °C. In the normothermic blood sample, the TRAPtest® showed no difference (p = 0.73) when performed at 33 °C; however, significantly lower aggregation was found using the COLtest® and ASPItest® (all p values <0.001), while a higher aggregation at 33 °C was found using the ADPtest® (p = 0.003).
CONCLUSION:
ROTEM® analyses seemed not to be dependent on body temperature but showed a slower initiation of coagulation when analysed at 33 °C compared with 37 °C. The Multiplate®Analyzer results were dependent on the temperature used in the analyses and the body temperature. In whole blood coagulation tests, the temperature used in the analyses should be kept at 37 °C irrespective of the patient's body temperature being 33 °C or 37 °C.

VIA AÈRIA

An exploration of the views of paramedics regarding airway management.
Brandling J1, Rhys M2, Thomas M3, Voss S1, Davies SE4, Benger J5.
Abstract
BACKGROUND:
Paramedics are a skilled group of clinicians with expertise in airway management. Our research group has completed a trial comparing supraglottic airway devices with tracheal intubation during out of hospital cardiac arrest. This is a contentious topic amongst paramedics in the United Kingdom (UK). We explored the customs and beliefs of UK paramedics in relation to airway management, and whether tracheal intubation contributes to and sustains paramedic professional identity.
METHODS:
The study took place within South Western Ambulance Service NHS Foundation Trust. We used a qualitative approach, conducting interviews and focus groups with paramedics. The themes arising from interviews were discussed in focus groups, developing a deeper understanding and providing insight and recommendations for future research and policy. Purposive sampling accounted for differing training and for participation in the main trial. There were 17interviews and five focus groups with a further 17 participants. Data saturation was achieved.
RESULTS:
Four domains were identified. Pride - The ability to use a life-saving skill in austere conditions. Utility - Different training routes and experience have led to different attitudes towards airway management. Inconsistent expectations - Paramedics felt that there were different perceptions of their abilities amongst hospital staff and the general public. Professionalization - Debate over airway management is not founded on good evidence.
CONCLUSION:
We have demonstrated that UK paramedics have a wide range of views regarding airway management, and that these are based on evidence and experience rather than dogma. Airway management contributes to paramedics' professional identity, but is not reliant on this.

RECERCA EXPERIMENTAL

Comparing anesthesia with isoflurane and fentanyl/fluanisone/midazolam in a rat model of cardiac arrest.
Secher N1, Malte CL2, Tønnesen E3, Østergaard L2, Granfeldt A4.
Abstract
BACKGROUND:
Only one in ten patients survives cardiac arrest (CA), underscoring the need to improve CA management. Isoflurane has shown cardio- and neuroprotective effects in animal models of ischemia/reperfusion injury. Therefore, beneficial effect of isoflurane should be tested in an experimental CA model. We hypothesize that isoflurane anesthesia improves short-term outcome following resuscitation from CA compared with a subcutaneous fentanyl/fluanisone/midazolam anesthesia.
METHODS:
Male Sprague Dawley rats were randomized to anesthesia with isoflurane (n=11) or fentanyl/fluanisone/midazolam (n=11). After 10 min of asphyxial CA, animals were resuscitated by mechanical chest compressions, ventilations, and epinephrine and observed for 30 min. Hemodynamics including coronary perfusion pressure, systemic O_2 consumption, and arterial blood gases were recorded throughout the study. Plasma samples for Endothelin-1 and cathecolamines were drawn before and after CA.
KEY FINDINGS:
Compared with fentanyl/fluanisone/midazolam anesthesia, isoflurane resulted in a shorter time to return of spontaneous circulation (ROSC), less use of epinephrine, increased coronary perfusion pressure during CPR, higher mean arterial pressure post ROSC, increased plasma

levels of Endothelin-1 and decreased levels of epinephrine. The choice of anesthesia did not affect ROSC rate or systemic O2 consumption.

CONCLUSION:

Isoflurane reduces time to ROSC, increases coronary perfusion pressure, and improves hemodynamic function, all of which are important parameters in CA models.

A quantitative comparison of physiologic indicators of cardiopulmonary resuscitation quality: Diastolic blood pressure versus end-tidal carbon dioxide.

Morgan RW1, French B2, Kilbaugh TJ1, Naim MY1, Wolfe H1, Bratinov G1, Shoap W1, Hsieh TC1, Nadkarni VM1, Berg RA1, Sutton RM1.

Abstract

AIM:

The American Heart Association (AHA) recommends monitoring invasive arterial diastolic blood pressure (DBP) and end-tidal carbon dioxide (ETCO2) during cardiopulmonary resuscitation (CPR) when available. In intensive care unit patients, both may be available to the rescuer. The objective of this study was to compare DBP vs. ETCO2 during CPR as predictors of cardiac arrest survival.

METHODS:

In two models of cardiac arrest (primary ventricular fibrillation [VF] and asphyxia-associated VF), 3-month old swine received either standard AHA guideline-based CPR or patient-centric, BP-guided CPR. Mean values of DBP and ETCO2 in the final 2min before the first defibrillation attempt were compared using receiver operating characteristic curves (area under curve [AUC] analysis). The optimal DBP cut point to predict survival was derived and subsequently validated in two independent, randomly generated cohorts.

RESULTS:

Of 60 animals, 37 (61.7%) survived to 45min. DBP was higher in survivors than in non-survivors (40.6±1.8mmHg vs. 25.9±2.4mmHg; p<0.001), while ETCO2 was not different (30.0±1.5mmHg vs. 32.5±1.8mmHg; p=0.30). By AUC analysis, DBP was superior to ETCO2 (0.82 vs. 0.60; p=0.025) in discriminating survivors from non-survivors. The optimal DBP cut point in the derivation cohort was 34.1mmHg. In the validation cohort, this cut point demonstrated a sensitivity of 0.78, specificity of 0.81, positive predictive value of 0.64, and negative predictive value of 0.89 for survival.

CONCLUSIONS:

In both primary and asphyxia-associated VF porcine models of cardiac arrest, DBP discriminates survivors from non-survivors better than ETCO2. Failure to attain a DBP >34mmHg during CPR is highly predictive of non-survival.

Effect of a pharmacologically induced decrease in core temperature in rats resuscitated from cardiac arrest.

Katz LM1, Frank JE2, Glickman LT3, McGwin G Jr4, Lambert BH4, Gordon CJ5.

Abstract

AIM:

Hypothermia is recommended by international guidelines for treatment of unconscious survivors of cardiac arrest to improve neurologic outcomes. However, temperature management is often underutilized because it may be difficult to implement. The present study evaluated the efficacy of pharmacologically induced hypothermia on survival and neurological outcome in rats resuscitated from cardiac arrest.

METHODS:

Cardiac arrest was induced for 10 min in 120 rats. Sixty-one rats were resuscitated and randomized to normothermia, physical cooling or pharmacological hypothermia 5 min after resuscitation. Pharmacological hypothermia rats received a combination of ethanol, vasopressin and lidocaine (HBN-1). Physical hypothermia rats were cooled with intravenous

iced saline and cooling pads. Rats in the pharmacological hypothermia group received HBN-1 at ambient temperature (20 °C). Normothermic rats were maintained at 37.3 ± 0.2 °C.
RESULTS:
HBN-1 ($p < 0.0001$) shortened the time (85 ± 71 min) to target temperature (33.5 °C) versus physical hypothermia (247 ± 142 min). The duration of hypothermia was 17.0 ± 6.8h in the HBN-1 group and 17.3 ± 7.5h in the physical hypothermia group ($p = 0.918$). Survival ($p = 0.034$), neurological deficit scores ($p < 0.0001$) and Morris Water Maze performance after resuscitation ($p = 0.041$) was improved in the HBN-1 versus the normothermic group. HBN-1 improved survival and early neurological outcome compared to the physical hypothermia group while there was no significant difference in performance in the Morris water maze.
CONCLUSION:
HBN-1 induced rapid and prolonged hypothermia improved survival with good neurological outcomes after cardiac arrest suggesting that pharmacologically induced regulated hypothermia may provide a practical alternative to physical cooling.

Evaluation of cyclosporine a as a cardio- and neuroprotective agent after cardiopulmonary resuscitation in a rat model.
Knapp J1, Roewer J, Bruckner T, Böttiger BW, Popp E.
Abstract
The immunosuppressant drug cyclosporine A (CsA) is a direct inhibitor of the mitochondrial permeability transition pore, which is the common end point of many pathways of ischemic preconditioning and postconditioning. We studied the neuroprotective and cardioprotective effect of CsA after cardiac arrest (CA) in a rat model of cardiopulmonary resuscitation. After institutional approval by the Governmental Animal Care Committee, 83 rats were subjected to 6 min of CA and were randomly and investigator-blinded allocated either to placebo (n = 15) or interventional group (n = 15; 10-mg/kg body weight CsA intravenously) after restoration of spontaneous circulation (ROSC). Before CA (baseline) as well as 1 h and 3 h after ROSC, continuous measurement of stroke volume, left ventricular ejection fraction, preload adjusted maximum power, and end diastolic volume was performed using a conductance catheter. One day, 3 days, and 7 days after ROSC, neurological outcome was evaluated by a tape removal test. After 7 days of reperfusion, coronal brain sections were analyzed by counting Nissl-positive (i.e., viable) neurons and terminal deoxynucleotidyl transferase dUTP nick end labeling positive (i.e., apoptotic) cells. Animals treated with CsA had a higher stroke volume (96 [93; 107] μL vs. 78 [73; 94] μL; P = 0.02), higher ejection fraction (58% [51%; 63%] vs. 42% [35%; 51%]; P = 0.002), and higher preload adjusted maximum power (4.8 [3.9; 6.1] vs. 2.3 [2.0; 2.6] mW/μL; P < 0.001). End diastolic volume remained stable in the CsA group 3 h after ROSC in comparison to baseline (160 [143; 181] μL vs. 157 [148; 192] μL; P = 0.56), whereas it increased in the placebo group (169 [153; 221] μL vs. 156 [138; 166] μL, P = 0.05). More neurons survived after administration of CsA (2.5 [1.6; 4.9] vs. 0.7 [0.4; 1.4]; P = 0.005). Compared to placebo-treated animals, the time in the tape removal test 7 days after ROSC was reduced by half in the CsA group without reaching statistical significance (26 [22; 51] vs. placebo 53 [38; 56] s; P = 0.13). Cyclosporine A treatment neither affected the number of terminal deoxynucleotidyl transferase dUTP nick end labeling-positive cells nor the survival rate. Pharmacological postconditioning with CsA after successful cardiopulmonary resuscitation attenuates myocardial dysfunction and reduces neuronal damage