This week's PubMed 15th – 21st October 2023: articles of interest n = 35

CPR AND COVID-19

No articles identified.

CPR/MECHANICAL CHEST COMPRESSION

No articles identified.

REGISTRIES, REVIEWS AND EDITORIALS

1. Resusc Plus. 2023 Oct 12;16:100481. doi: 10.1016/j.resplu.2023.100481. eCollection 2023 Dec.
Long-term heart function in cardiac-arrest survivors.
Raphalen JH(1), Soumagnac T(1), Delord M(2)(3), Bougouin W(4)(5), Georges JL(6), Paul M(7), Legriel S(7)(8).

ABSTRACT
PURPOSE: To assess outcomes and predictors of long-term myocardial dysfunction after cardiac arrest (CA) of cardiac origin. METHODS: We retrospectively included consecutive, single-center, prospective-registry patients who survived to hospital discharge for adult out-of-hospital and in-hospital CA of cardiac origin in 2005-2019. The primary objective was to collect the 1-year New York Heart Association Functional Class (NYHA-FC) and major adverse cardiovascular events (MACE). RESULTS: Of 135 patients, 94 (72%) had their NYHA-FC determined after 1 year, including 75 (75/94, 80%) who were I, 17 (17/94, 18%) II, 2 (2/94, 2%) III, and none IV. The echocardiographic left ventricular ejection fraction was abnormal in 87/130 (67%) patients on day 1, 52/123 (42%) at hospital discharge, and 17/52 (33%) at 6 months. During the median follow-up of 796 [283-1975] days, 38/119 (32%) patients experienced a MACE. These events were predominantly related to acute heart failure (13/38) or ischemic cardiovascular events (16/38), with acute coronary syndrome being the most prevalent among them (8/16). Pre-CA cardiovascular disease was a risk factor for 1-year NYHA-FC > I (P = 0.01), absence of bystander cardiopulmonary resuscitation was significantly associated with NYHA-FC > I at 1 year. CONCLUSION: Most patients had no heart-failure symptoms a year after adult out-of hospital or in-hospital CA of cardiac origin, and absence of bystander Cardio-pulmonary resuscitation was the only treatment component significantly associated with NYHA-FC > I at 1 year. Nearly a third experienced MACE and the most common types of MACE were ischemic cardiovascular events and acute heart failure. Early left ventricular dysfunction recovered within 6 months in half the patients with available values.

2. Resuscitation. 2023 Oct 19:110006. doi: 10.1016/j.resuscitation.2023.110006. Online ahead of print.
Epinephrine and brain perfusion during cardiac arrest: every minute counts.
Segond N(1), Jaeger D(2), Debaty G(3).
NO ABSTRACT AVAILABLE

3. Eur Heart J. 2023 Oct 17:ehad641. doi: 10.1093/eurheartj/ehad641. Online ahead of print.
Pre-race aspirin to attenuate the risk for marathon-related cardiac arrest: deconstructing the legacy of Pheidippides.

Siegel AJ(1)(2)(3).
NO ABSTRACT AVAILABLE

4. PLoS One. 2023 Oct 16;18(10):e0293159. doi: 10.1371/journal.pone.0293159. eCollection 2023.
Correction: Evaluation of class participation in non-face-to-face CPR training for medical students.
Cho YS, Park HJ, Choi D, Park HA, Kim S, Park JO, Wang SJ, Lee CA.
NO ABSTRACT AVAILABLE

IN-HOSPITAL CARDIAC ARREST

1. Indian Heart J. 2023 Oct 18:S0019-4832(23)00168-2. doi: 10.1016/j.ihj.2023.10.004. Online ahead of print.
Outcomes in non-ST-segment elevation myocardial infarction complicated by in-hospital cardiac arrest based on management strategy.
Verghese D(1), Bhat AG(2), Patlolla SH(3), Naidu SS(4), Basir MB(5), Cubeddu RJ(1), Navas V(1), Zhao DX(6), Vallabhajosyula S(7).
ABSTRACT
BACKGROUND: There are limited data on in-hospital cardiac arrest (IHCA) complicating non-ST-segment-elevation myocardial infarction (NSTEMI) based on management strategy. METHODS: We used National Inpatient Sample (2000-2017) to identify adults with NSTEMI (not undergoing coronary artery bypass grafting) and concomitant IHCA. The cohort was stratified based on use of early (hospital day 0) or delayed (≥hospital day 1) coronary angiography (CAG), percutaneous coronary intervention (PCI), and medical management. Outcomes included incidence of IHCA, in-hospital mortality, adverse events, length of stay, and hospitalization costs. RESULTS: Of 6,583,662 NSTEMI admissions, 375,873 (5.7 %) underwent early CAG, 1,133,143 (17.2 %) received delayed CAG, 2,326,391 (35.3 %) underwent PCI, and 2,748,255 (41.7 %) admissions were managed medically. The medical management cohort was older, predominantly female, and with higher comorbidities. Overall, 63,085 (1.0 %) admissions had IHCA, and incidence of IHCA was highest in the medical management group (1.4 % vs 1.1 % vs 0.7 % vs 0.6 %, $p < 0.001$) compared to early CAG, delayed CAG and PCI groups, respectively. In adjusted analysis, early CAG (adjusted OR [aOR] 0.67 [95 % confidence interval {CI} 0.65-0.69]; $p < 0.001$), delayed CAG (aOR 0.49 [95 % CI 0.48-0.50]; $p < 0.001$), and PCI (aOR 0.42 [95 % CI 0.41-0.43]; $p < 0.001$) were associated with lower incidence of IHCA compared to medical management. Compared to medical management, early CAG (adjusted OR 0.53, CI: 0.49-0.58), delayed CAG (adjusted OR 0.34, CI: 0.32-0.36) and PCI (adjusted OR 0.19, CI: 0.18-0.20) were associated with lower in-hospital mortality (all $p < 0.001$). CONCLUSION: Early CAG and PCI in NSTEMI was associated with lower incidence of IHCA and lower mortality among NSTEMI-IHCA admissions.

INJURIES AND CPR

No articles identified.

CAUSE OF THE ARREST

1. Curr Environ Health Rep. 2023 Oct 17. doi: 10.1007/s40572-023-00414-7. Online ahead of print.
Air Pollution and Temperature: a Systematic Review of Ubiquitous Environmental Exposures and Sudden Cardiac Death.

Borchert W(1)(2)(3), Grady ST(4), Chen J(5)(6), DeVille NV(6)(7)(8), Roscoe C(5)(6), Chen F(5)(9), Mita C(10), Holland I(5)(6), Wilt GE(5)(9)(6), Hu CR(5)(9)(6), Mehta U(5)(9)(6), Nethery RC(11), Albert CM(12)(13), Laden F(5)(6)(7), Hart JE(5)(6).

ABSTRACT

PURPOSE OF REVIEW: Environmental exposures have been associated with increased risk of cardiovascular mortality and acute coronary events, but their relationship with out-of-hospital cardiac arrest (OHCA) and sudden cardiac death (SCD) remains unclear. SCD is an important contributor to the global burden of cardiovascular disease worldwide. RECENT FINDINGS: Current literature suggests a relationship between environmental exposures and cardiovascular disease, but their relationship with OHCA/SCD remains unclear. A literature search was conducted in PubMed, Embase, Web of Science, and Global Health. Of 5138 studies identified by our literature search, this review included 30 studies on air pollution, 42 studies on temperature, 6 studies on both air pollution and temperature, and 1 study on altitude exposure and OHCA/SCD. Particulate matter air pollution, ozone, and both hot and cold temperatures are associated with increased risk of OHCA/SCD. Pollution and other exposures related to climate change play an important role in OHCA/SCD incidence.

END-TIDAL CO_2

1. Ann Emerg Med. 2023 Nov;82(5):558-563. doi: 10.1016/j.annemergmed.2023.03.001. Epub 2023 Apr 13.

Out-of-Hospital Arterial to End-Tidal Carbon Dioxide Gradient in Patients With Return of Spontaneous Circulation After Out-of-Hospital Cardiac Arrest: A Retrospective Study.

Eichlseder M(1), Eichinger M(1), Pichler A(2), Freidorfer D(1), Rief M(1), Zoidl P(1), Zajic P(1).

ABSTRACT

STUDY OBJECTIVE: End-tidal carbon dioxide (etCO2) is used to guide ventilation after achieving return of spontaneous circulation (ROSC) in certain out-of-hospital systems, despite an unknown difference between arterial and end-tidal CO2 (partial pressure of carbon dioxide [paCO2]-etCO2 difference) levels in this population. The primary aim of this study was to evaluate and quantify the paCO2-etCO2 difference in out-of-hospital patients with ROSC after nontraumatic cardiac arrest. METHODS: This retrospective single-center study included patients aged 18 years and older with sustained ROSC after nontraumatic out-of-hospital cardiac arrest. In patients with an existing out-of-hospital arterial blood gas analysis within 30 minutes after achieving ROSC, matching etCO2 values were evaluated. Linear regression and Bland-Altman plot analysis were performed to ascertain the primary endpoint of interest. RESULTS: We included data of 60 patients in the final analysis. The mean paCO2-etCO2 difference was 32 (±18) mmHg. Only a moderate correlation (R2=0.453) between paCO2 and etCO2 was found. Bland-Altman analysis showed a bias of 32 mmHg (95% confidence interval [CI], 27 to 36) [the upper limit of agreement of 67 mmHg (95% CI, 59 to 74) and the lower limit of agreement of -3 mmHg (95% CI, -11 to 5)]. CONCLUSION: The paCO2-etCO2 difference in patients with ROSC after out-of-hospital cardiac arrest is far from physiologic ranges, and the between-patient variability is high. Therefore, etCO2-guided adaption of ventilation might not provide adequate accuracy in this setting.

ORGAN DONATION

1. Transplantation. 2023 Oct 1;107(10S1):31. doi: 10.1097/01.tp.0000993160.57764.9a. Epub 2023 Oct 16.

210.1: Examining the potential for uncontrolled organ donation subsequent to out-of-hospital cardiac arrest in Canada.
Lanos C(1)(2), Batt AM(3), Drennan I(4), Dhanani S(5), Vaillancourt C(2), Lin S(6), Solimon K(7), Cook D(1).
NO ABSTRACT AVAILABLE

FEEDBACK

No articles identified.

DRUGS

No articles identified.

TRAUMA

No articles identified.

VENTILATION

1. Resusc Plus. 2023 Oct 6;16:100480. doi: 10.1016/j.resplu.2023.100480. eCollection 2023 Dec.
Implementation and use of a supraglottic airway device in the management of out-of-hospital cardiac arrest by firefighter first responders - A prospective feasibility study.
Andresen ÅEL(1)(2)(3)(4), Varild Lauritzen M(4)(5), Kramer-Johansen J(2)(6), Kristiansen T(2)(7).
ABSTRACT
AIM: We wanted to assess the implementation and use of a supraglottic airway (SGA) for on-call firefighter first responders in out-of-hospital cardiac arrest. METHODS: We trained 502 firefighter first responders, located at 35 fire stations in the South-East of Norway, in the use of SGA during cardiopulmonary resuscitation in adult out-of-hospital cardiac arrest. Training consisted of 45 minutes of theoretical and practical training in small groups.Primary outcome was successful ventilation with SGA assessed by both firefighter first responders and first paramedic arriving on-scene. Secondary outcomes included time expenditure and complications related to the procedure, evaluation of the training, and descriptive characteristics of the out-of-hospital cardiac arrest cases. RESULTS: An SGA was used by firefighter first responders in 23 out-of-hospital cardiac arrests, and successful ventilation was achieved in 20 (87%) cases. Air-leak was described in the three unsuccessful cases. The median procedural time was 30 seconds (IQR = 15-40), with no observed procedural complications. Firefighter first responders arrived in median time 9 minutes (IQR = 6-10 min) before the ambulance. They performed chest compressions on all patients and 6 (26%) of the patients received shock with semi-automatic external defibrillator. After training, all participants were able to successfully ventilate a manikin with the SGA. The cost of the SGA equipment for all fire stations was 3955 GBP. CONCLUSION: Implementation of an SGA for firefighter first responders in out-of-hospital cardiac arrest management seems feasible, safe and can be introduced with limited amount of training and limited use of resources.

2. Resuscitation. 2023 Oct 16:110001. doi: 10.1016/j.resuscitation.2023.110001. Online ahead of print.
To bag or not to bag? - The use of mechanical ventilation in prolonged cardiac arrest.
Field RA(1).

NO ABSTRACT AVAILABLE

3. Resuscitation. 2023 Oct 12:109999. doi: 10.1016/j.resuscitation.2023.109999. Online ahead of print.

Performances and limits of Bag-Valve-Device for pre-oxygenation and manual ventilation: a comparative bench and cadaver study.

Broc A(1), Morin F(2), Schmit H(3), Taillantou-Candau M(4), Vuillermoz A(4), Drouet A(5), Hutin A(6), Polard L(1), Lamhaut L(6), Brisset U(7), Charbonney E(8), Delisle S(9), Beloncle F(4), Richard JC(10), Savary D(2); CAVIAR Cardiac Arrest, Ventilation International Association for Research Group.

ABSTRACT

INTRODUCTION: Bag-Valve-Device (BVD) is the most frequently used device for pre-oxygenation and ventilation during cardiopulmonary resuscitation (CPR). A minimal expired fraction of oxygen (FeO2) above 0.85 is recommended during pre-oxygenation while insufflated volume (VTi) should be reduced during manual ventilation. The objective was to compare the performances of different BVD in simulated conditions. METHODS: Nine BVD were evaluated during pre-oxygenation: spontaneous breathing patients were simulated on a test lung (mild and severe conditions). FeO2 was measured with and without positive end-expiratory pressure (PEEP). CO2 rebreathing was evaluated. Then, manual ventilation was performed by 36 caregivers (n=36) from three hospitals on a specific manikin; same procedure was repeated by 3 caregivers (n=3) on two human cadavers with three of the nine BVD: In non-CPR scenario and during mechanical CPR with Interrupted Chest Compressions strategy (30:2). RESULTS: Pre-oxygenation: FeO2 was lower than 0.85 for three BVD in severe condition and for two BVD in mild condition. FeO2 was higher than 0.85 in eight of nine BVD with an additional PEEP valve (PEEP 5 cmH2O). One BVD induced CO2 rebreathing. Manual ventilation: For non-CPR manual ventilation, mean VTi was within the predefined lung protective range (4-8 mL/kg PBW) for all BVD on the bench. For CPR manual ventilation, mean VTi was above the range for three BVD on the bench. Similar results were observed on cadavers. CONCLUSIONS: Several BVD did not reach the FeO2 required during pre-oxygenation. Manual ventilation was significantly less protective in three BVD. These observations are related to the different BVD working principles.

CERERBRAL MONITORING

1. J Intensive Care Soc. 2023 Nov;24(4):386-391. doi: 10.1177/17511437231160089. Epub 2023 Jun 29.

The use of neurone specific enolase to prognosticate neurological recovery and long term neurological outcomes in OOHCA patients.

Maher C(1), Cadd M(2), Nunn M(3), Worthy J(4), Gray R(5), Boyd O(5).

ABSTRACT

INTRODUCTION: Hypoxic-ischaemic brain injury (HIBI), is a common sequalae following out-of-hospital cardiac arrest (OOHCA), it is reported as the cause of death in 68% of patients who survive to ICU admission, while other patients can be left with permanent neurological disability. Prediction of neurological outcome follows a multimodal approach, including use of the biomarker, neurone specific enolase (NSE). There is however no definitive cut-off value for poor neurological outcome, and little research has analysed NSE and long-term outcomes in survivors. We investigated an NSE threshold for poor short-term neurological outcome and the relationship between NSE and poor neurological outcome in survivors. METHODS: A retrospective study was conducted of all adult OOHCA patients admitted to the Royal County Sussex Hospital ICU between April 2017 and November 2018. NSE levels, Targeted Temperature Management (TTM), cross-sectional imaging, mortality and GCS on ICU discharge were recorded. Assessment of neurological function after a median of 19 months (range 14-32 months) post ICU discharge was undertaken following ICU discharge and related to NSE. RESULTS: NSE levels were measured in 59 patients; of these 36 (61%)

had a poor neurological outcome due to hypoxic ischaemic brain injury. Youden's index and ROC analysis established an NSE cut-off value of 64.5 µg/L, with AUC of 0.901, sensitivity of 77.8% and specificity of 100%. Follow-up of 26 survivors after 19 months did not show a significant relationship between NSE after OOHCA and long-term neurological outcome. CONCLUSION: Our results show that NSE >64.5 µg/L has a poor short-term neurological outcome with 100% specificity. Whilst limited by a low sample size, NSE in survivors showed no relationship with neurological outcome post OOHCA in the long term.

2. Crit Care Med. 2023 Oct 19. doi: 10.1097/CCM.0000000000006074. Online ahead of print.
The International Cardiac Arrest Research Consortium Electroencephalography Database.
Amorim E(1)(2), Zheng WL(3), Ghassemi MM(4), Aghaeeaval M(1), Kandhare P(1), Karukonda V(1), Lee JW(5), Herman ST(6), Sivaraju A(7), Gaspard N(7)(8), Hofmeijer J(9)(10), van Putten MJAM(9)(11), Sameni R(12), Reyna MA(12), Clifford GD(12)(13), Westover MB(14).
ABSTRACT
OBJECTIVES: To develop the International Cardiac Arrest Research (I-CARE), a harmonized multicenter clinical and electroencephalography database for acute hypoxic-ischemic brain injury research involving patients with cardiac arrest. DESIGN: Multicenter cohort, partly prospective and partly retrospective. SETTING: Seven academic or teaching hospitals from the United States and Europe. PATIENTS: Individuals 16 years old or older who were comatose after return of spontaneous circulation following a cardiac arrest who had continuous electroencephalography monitoring were included. INTERVENTIONS: Not applicable. MEASUREMENTS AND MAIN RESULTS: Clinical and electroencephalography data were harmonized and stored in a common Waveform Database-compatible format. Automated spike frequency, background continuity, and artifact detection on electroencephalography were calculated with 10-second resolution and summarized hourly. Neurologic outcome was determined at 3-6 months using the best Cerebral Performance Category (CPC) scale. This database includes clinical data and 56,676 hours (3.9 terabytes) of continuous electroencephalography data for 1,020 patients. Most patients died (n = 603, 59%), 48 (5%) had severe neurologic disability (CPC 3 or 4), and 369 (36%) had good functional recovery (CPC 1-2). There is significant variability in mean electroencephalography recording duration depending on the neurologic outcome (range, 53-102 hr for CPC 1 and CPC 4, respectively). Epileptiform activity averaging 1 Hz or more in frequency for at least 1 hour was seen in 258 patients (25%) (19% for CPC 1-2 and 29% for CPC 3-5). Burst suppression was observed for at least 1 hour in 207 (56%) and 635 (97%) patients with CPC 1-2 and CPC 3-5, respectively. CONCLUSIONS: The I-CARE consortium electroencephalography database provides a comprehensive real-world clinical and electro-encephalography dataset for neurophysiology research of comatose patients after cardiac arrest. This dataset covers the spectrum of abnormal electroencephalography patterns after cardiac arrest, including epileptiform patterns and those in the ictal-interictal continuum.

ULTRASOUND AND CPR

No articles identified.

ORGANISATION AND TRAINING

1. Curr Opin Crit Care. 2023 Oct 6. doi: 10.1097/MCC.0000000000001112. Online ahead of print.
Telephone cardiopulmonary resuscitation, first responder systems, cardiac arrest centers, and global campaigns to save lives.

Müller MP(1), Jonsson M(2), Böttiger BW(3), Rott N(3).

ABSTRACT

PURPOSE OF REVIEW: The latest resuscitation guidelines contain a new chapter, which focuses on systems improving care for patients with out-of-hospital cardiac arrest (OHCA). In this article, we describe recent developments regarding telephone cardiopulmonary resuscitation (CPR), first responder systems, cardiac arrest centers, and global campaigns. RECENT FINDINGS: Telephone CPR has been implemented in many countries, and recent developments include artificial intelligence and video calls to improve dispatch assisted CPR. However, the degree of implementation is not yet satisfying. Smartphone alerting systems are effective in reducing the resuscitation-free interval, but many regions do not yet use this technology. Further improvements are needed to reduce response times. Cardiac arrest centers increase the survival chance after OHCA. Specific criteria need to be defined and professional societies should establish a certification process. Global campaigns are effective in reaching people around the world. However, we need to evaluate the effects of the campaigns. SUMMARY: Telephone CPR, first responder systems, cardiac arrest centers, and global campaigns are highlighted in the recent resuscitation guidelines. However, the degree of implementation is not yet sufficient. We do not only need to implement these measures, but we should also aim to monitor the systems regarding their performance and further improve them.

2. Resusc Plus. 2023 Oct 11;16:100485. doi: 10.1016/j.resplu.2023.100485. eCollection 2023 Dec.

Resuscitative endovascular balloon occlusion of the aorta in out-of-hospital cardiac arrest - A Delphi consensus study for uniform data collection.

Haugland H(1)(2), Gamberini L(3), Hoareau GL(4), Haenggi M(5), Greif R(6)(7)(8), Brede JR(1)(2); REBOA OHCA expert panel and other Collaborators.

ABSTRACT

BACKGROUND: Evolving research on resuscitative endovascular balloon occlusion of the aorta (REBOA) as an adjunct treatment for out-of-hospital cardiac arrest mandates uniform recording and reporting of data. A consensus on which variables need to be collected may enable comparing and merging data from different studies. We aimed to establish a standard set of variables to be collected and reported in future REBOA studies in out-of-hospital cardiac arrest. METHODS: A four-round stepwise Delphi consensus process first asked experts to propose without restraint variables for future REBOA research in out-of-hospital cardiac arrest. The experts then reviewed the variables on a 5-point Likert scale and ≥75% agreement was defined as consensus. First authors of published papers on REBOA in out-of-hospital cardiac arrest over the last five years were invited to join the expert panel. RESULTS: The data were collected between May 2022 and December 2022. A total of 28 experts out of 34 primarily invited completed the Delphi process, which developed a set of 31 variables that might be considered as a supplement to the Utstein style reporting of research in out-of-hospital cardiac arrest. CONCLUSIONS: This Delphi consensus process suggested 31 variables that enable future uniform reporting of REBOA in out-of-hospital cardiac arrest.

3. Resusc Plus. 2023 Oct 13;16:100486. doi: 10.1016/j.resplu.2023.100486. eCollection 2023 Dec.

Technology activated community first responders in Singapore: Real-world care delivery & outcome trends.

Siddiqui FJ(1), Fook-Chong S(2), Shahidah N(2)(3), Tan CK(4), Poh JY(5), Ng WM(6), Quah D(7), Ng YY(8)(9), Leong BS(10), Ong ME(1)(3).

ABSTRACT

BACKGROUND: Community first responders (CFRs) strengthen the Chain of Survival for out-of-hospital cardiac arrest (OHCA) care. Considerable efforts have been invested in Singapore's CFR program, during the years 2016-2020, by developing an app-based activation system called

myResponder. This paper reports on national CFR response indicators to evaluate the real-world impact of these efforts. METHODS: We matched data from the Singapore Civil Defence Force's CFR registry with the Pan Asian Resuscitation Outcomes Study (PAROS) registry data to calculate performance indicators. These included the number of CFRs receiving and accepting an issued alert per OHCA event. Also calculated were the fraction of OHCA events where CFRs received an issued alert, or accepted the alert, and arrived at the scene either before or after EMS. We also present trends of these indicators and compare the prevalence of these fractions between the CFR-attended and CFR-unattended OHCA events. RESULTS: Of 6577 alerted OHCA events, 42.7% accepted an alert, 50% of these arrived at the scene and 71% of them arrived before EMS. Almost all CFR response indicators improved over time even for the pandemic year (2020). The fraction of OHCA events where >2 CFRs received an alert increased from 62% to 96%; the same figure for accepting an alert did not change much but >2 CFRs arriving at the scene increased from 0% to 7.5%. The fraction of OHCA events with an automated external defibrillator applied and defibrillation performed by CFR increased from 4.2% to 10.3% and 1.6% to 3%, respectively. Statistically significant differences were observed in these indicators when CFR-attended and CFR-unattended OHCA events were compared. CONCLUSION: This real-world study shows that activating CFRs using mobile technology can improve community response to OHCA and are bearing fruit in Singapore at a national level. Some targets for improvement and future research are highlighted in this report.

4. Resusc Plus. 2023 Oct 11;16:100483. doi: 10.1016/j.resplu.2023.100483. eCollection 2023 Dec.
Survey of resuscitation practices at emergency medical service agencies in the U.S.
Chan PS(1), McNally B(2)(3), Al-Araji R(2), Kennedy K(1), Kennedy M(1), Del Rios M(4), Sperling J(5), Sasson C(6)(7), Breathett K(8), Dukes KC(4), Girotra S(9); CARES Surveillance Group.
ABSTRACT
BACKGROUND: Survival for out-of-hospital cardiac arrest (OHCA) varies across emergency medical service (EMS) agencies. Yet, little is known about resuscitation response and quality improvement activities at EMS agencies. We describe herein a novel survey to EMS agencies in a U.S. registry for OHCA. METHODS: Using data from the Cardiac Arrest Registry to Enhance Survival (CARES), we identified 577 EMS agencies with ≥10 OHCA cases annually between 2015 and 2019 that remained active in CARES. We administered a survey to EMS directors regarding agency characteristics, cardiac arrest response, relationships with first responders and dispatchers, quality improvement activities and perceived barriers in the community. RESULTS: Of eligible EMS agencies, 470 (81.5%) completed the survey. The high completion rate was likely due to frequent personalized emails and phone calls, liaising with CARES state coordinators to encourage survey response, and multiple periodic drawings of an automated external defibrillator during the survey period for participating EMS agencies. The survey examined rates of resuscitation training modalities; use of resuscitation equipment and devices in the field; frequency of simulation; non-EMS stakeholder response to OHCA (dispatchers, fire, police); quality improvement; and community factors affecting bystander response to OHCA. CONCLUSIONS: In this study design paper on the RED-CASO survey, we provide summary data on EMS agency characteristics in the U.S. Upon linkage to CARES patient-level data, this survey will provide critical insights into 'best practices' at EMS agencies with the highest OHCA survival rates as well as provide insights into current disparities in outcomes.

5. Resuscitation. 2023 Oct 16:109974. doi: 10.1016/j.resuscitation.2023.109974. Online ahead of print.
Resuscitation of Out-of-Hospital Cardiac Arrest in China: A Systematic Review and Utstein-Style Data Analysis Based on the Chain of Survival.
Hou L(1), Wang Y(2), Chen B(3), Ji Y(3), Wang B(3).

ABSTRACT
AIM: Out-of-hospital cardiac arrest (OHCA) contributes to substantial mortality, but its resuscitation status in China is unknown. We aimed to describe and analyze out-of-hospital cardiac arrest in terms of Chain of Survival. METHODS: We systematically collected Utstein-style publications. Scenarios were prespecified, including either emergency medical service (EMS) assessing and attending cardiac arrest, resuscitation attempted by a bystander, resuscitation attempted by EMS, or in-hospital treatment. Random-effect models were used in a meta-analysis to pool rate ratios (RRs) with 95% confidence intervals (CIs) from multiple cohorts. RESULTS: We analyzed 59 Chains involving 233,376 Chinese patients. The median rate of survival to discharge (interquartile range) was 0.35% (0.06%-0.61%), 3.66% (3.06%-3.85%), 1.23% (0.57%-1.36%), and 2.73% (2.04%-3.42%) for four scenarios. The rate was significantly higher for bystander resuscitation than for EMS (P=0.025) or in-hospital treatment (P=0.301). However, only 4.8% (1.6%-8.2%) of patients received bystander resuscitation, with no bystander defibrillation and a median response time of 9-15 minutes for EMS. Compared with controls without witnesses, arrest being witnessed and with bystander resuscitation increased rates of survival to discharge by 1.97 (I2=0, P for I2=0.583; pooled RR 2.97; 95% CI 1.47-6.02) and 6.79 (I2=0, P for I2=0.593; pooled RR 7.79; 95% CI 3.40-17.84) times, following a markedly increasing trend. CONCLUSIONS: A low probability of first aid at multiple points is linked to poor survival following OHCA. It is essential to strengthen front links in the Chain of Survival in China, including among witnesses, bystanders, and emergency response.

6. Comput Methods Programs Biomed. 2023 Oct 10;242:107847. doi: 10.1016/j.cmpb.2023. 107847. Online ahead of print.

Characterization of mechanical properties of adult chests during pre-hospital manual chest compressions through a simple viscoelastic model.

Ruiz de Gauna S(1), Gutiérrez JJ(2), Sandoval CL(3), Russell JK(4), Azcarate I(5), Urigüen JA(5), González-Otero DM(6), Daya MR(4).

ABSTRACT
AIM: The purpose of this study was to develop a simple viscoelastic model to characterize the mechanical properties of chests during manual chest compressions in pre-hospital cardiopulmonary resuscitation (CPR). METHODS: Force and acceleration signals were extracted from CPR monitors used during pre-hospital resuscitation attempts on adult patients. Individual chest compressions were identified and segmented from the chest displacement computed using the force and acceleration. Each compression-recoil cycle was characterized by its elastic coefficient k (a measure of stiffness) and its compression and recoil damping coefficients, dc and dr, respectively (measures of viscosity). We compared the estimated and the calculated chest displacement to assess the goodness of fit of the model. We characterized the chest of patients at the beginning of CPR in relation to sex and age, and their variation as CPR progressed. RESULTS: A total of 1,156,608 chest compressions from 615 patients were analysed. Mean (95% CI) coefficient of determination R2 for the viscoelastic model was 97.9% (97.8-98.1). At the beginning of CPR, k was 104.9 N·cm-1 (102.0-107.8), dc was 2.868 N·s·cm-1 (2.751-2.984) and dr was 4.889 N·s·cm-1 (4.648-5.129). Damping during recoil was significantly higher than during compression. Stiffness was lower in women than in men. There were no differences in damping coefficients with sex but a higher dr with increasing age. All model coefficients decreased with compression count, with an overall decrease after 3,000 chest compressions of 34.6%, 48.8% and 37.2%, respectively. CONCLUSION: The model accurately described adult chest mechanical properties during CPR, highlighting differences between compression and recoil, sex and age, and a progressive reduction in chest stiffness and viscosity along resuscitation. Our findings may merit further investigation into whether patient-tailored and time-sensitive chest compression technique may be appropriate.

7. J Acute Med. 2023 Sep;13(3):91-103. doi: 10.6705/j.jacme.202309_13(3).0001.
Emergency Medical Services in Taiwan: Past, Present, and Future.
Huan TL(1), Lee AF(2), Chien YC(3), Lin CH(4), Lee BC(5), Chung YT(6), Cheng HH(7), Chen CY(8), Lin HY(9), Sun JT(10), Hsieh MJ(8), Ma MH(2)(9), Chiang WC(2)(9).
ABSTRACT
This review assessed the development of Taiwan's emergency medical services (EMS) and focused on the optimizing initiatives of the EMS systems, the current state of Taiwan's EMS system, EMS benchmarks in different regions of Taiwan, EMS response during the coronavirus disease 2019 (COVID-19) pandemic, and future design. In the past decade, there has been a noticeable increase in prehospital services, numerous optimizing initiatives to improve patient prognosis, and the medical oversight model. Taiwan's current EMS system, including the dispatch system, out-of-hospital cardiac arrest (OHCA) patient management, time-sensitive critical illness in prehospital settings, and disaster response, has undergone significant improvements. These improvements have been demonstrated to have a measurable impact on patient outcomes, as supported by medical literature. Each region in Taiwan has developed a unique EMS system with local characteristics, such as the implementation of the Global Resuscitation Alliance 10 steps for OHCA-related quality control, hearing automated external defibrillator program, a five-level prehospital triage system, an island-hopping strategy for patients with major trauma, dispatcher-assisted teamwork for OHCA resuscitation, and optimized prehospital care for acute coronary syndrome patients. In response to the COVID-19 pandemic from 2019 to 2023, Taiwan's EMS implemented measures to combat the outbreak such as interagency collaboration to obtain patient's personal information, to optimize prehospital management initiatives, and to provide financial compensation and personal insurance for emergency medical technicians. The areas that need focus include integrating prehospital and in-hospital information to build a national-level database (One-Stop Emergency Management), increasing public awareness of first responders and emergency casualty care, and evolving the EMS system by incorporating private EMS system, initiating school-based education of paramedicine, and legally recognizing paramedics as medical and health care personnel. By improving these areas, we can better prepare for the future and ensure that Taiwan's EMS system continues to provide high-quality care to those in need.

8. Curr Opin Crit Care. 2023 Oct 10. doi: 10.1097/MCC.0000000000001111. Online ahead of print.
Education of schoolchildren in cardiopulmonary resuscitation - overview of the current literature.
Schroeder DC(1)(2), Finke SR(1), Grübl T(2), Jänig CW(2), Böttiger BW(1).
ABSTRACT
PURPOSE OF REVIEW: Recognition of cardiac arrest and initiation of cardiopulmonary resuscitation (CPR) can be learned and adequately replicated by schoolchildren. Regular instruction of school-children in CPR is therefore a core element to increase low bystander CPR rates. Thereby, schoolchildren CPR training evolved as own scientific field within the last decade. Aim was to describe current evidence in terms of epidemiology, teaching approaches and political aspects.
RECENT FINDINGS: Schoolchildren demonstrate a high motivation to be trained in CPR. Teaching approaches that combine theoretical and practical learning sessions guarantee a sustainable learning effect. Schoolchildren can adequately perform chest compressions and mouth-to-mouth ventilation from the age of 12 years. Use of digital media is a highly promising teaching approach. CPR training conducted by teachers from the own school is effective and guarantees continuous development of CPR skills. Integration of schoolchildren CPR training into school curricula is the foundation for a sustainable increase of lay resuscitation rates in the population. Scientific and political promotion of schoolchildren CPR training is needed to sensitize the population and move

bystander CPR in the social focus. SUMMARY: While bystander CPR rates are low in Europe comprehensive establishment of schoolchildren CPR training may sustainably increase survival after cardiac arrest.

POST-CARDIAC ARREST TREATMENTS

1. Resuscitation. 2023 Oct 18:110007. doi: 10.1016/j.resuscitation.2023.110007. Online ahead of print.

Treatment Effects of Blood Pressure Targets and Hemodynamics According to Initial Blood Lactate Levels in Comatose Out-of-hospital Cardiac Arrest Patients - A Sub Study of the BOX Trial.

Beske RP(1), Søndergaard FT(2), Eifer Møller J(3), Schmidt H(4), Kjaergaard J(2), Obling L(2), Meyer MAS(2), Mølstrøm S(5), Winter-Jensen M(2), Frederiksen Højgaard H(5), Korsholm Jeppesen K(6), Sarkisian L(6), Grand J(2), Hassager C(3).

ABSTRACT

BACKGROUND: Out-of-hospital cardiac arrest (OHCA) survivors remaining comatose are often circulatory unstable with high mortality in the first days following resuscitation. Elevated lactate will reflect the severity and duration of hypoperfusion in cardiac arrest. Further, the severity of hypoperfusion could modify the effect on survival of different mean arterial blood pressure (MAP) targets. METHODS: In this sub-study of the BOX trial, adult successfully resuscitated comatose OHCA patients (n=789) with a presumed cardiac cause were randomized to a MAP target of 63 mmHg vs. 77 mmHg. Patients were arbitrarily grouped in low-lactate: <25% of sample, medium-lactate: 25%-75%, and high >75 percentile according to blood lactate levels at hospital arrival as a surrogate of the severity of hypoperfusion. Invasive hemodynamic evaluations were performed using an arterial catheter and pulmonary artery catheter (PAC), and data from admission to 48 hours (h) were recorded. Logistic regression analysis evaluated whether lactate levels (as continuous and categorical) modify the effect of MAP targets on mortality at 365 days. RESULTS: The three lactate groups had initial lactate levels of low-lactate: <2.9 mmol/L, medium-lactate: 2.9-7.9 mmol/L, and high-lactate >7.9 mmol/L. All patients were randomized to a 63 mmHg or 77 mmHg MAP target. The proportion of patients in the high-MAP target group was 100/201 (50%), 178/388 (46%), and 114/197 (58%) for low, medium, and high-lactate groups respectively. At admission, the high-lactate groups had a lower MAP compared to the medium-lactate (2.6 mmHg (95% CI: 0.1 - 5.0 mmHg, p=0.02), and the low-lactate group, (3.6 mmHg (95% CI: 0.8 - 6.5 mmHg, p<0.01). Accordingly, the vasoactive inotropic score was 79% (95%CI: 42% - 124%) higher with increasing initial lactate level (High-lactate vs. low-lactate) with the largest difference at 6 hours (110.6% (95%CI: 54.4% - 187.2%) higher in high-lactate patients). No difference in the cardiac index or systemic vascular resistance was observed between lactate groups. The initial lactate level (continuous) modified the effect of the two MAP targets (p=0.04). In the highest lactate group, the mortality was 100/197 (51%), and with an odds ratio (OR): 1.7 (95%CI: 0.9-3.0) if randomized to MAP 77 mmHg compared to MAP 63 mmHg. In the lowest lactate group, the mortality was 35/201(17%) and similar if randomized to a MAP target of 77 mmHg (OR: 1.1 (95% CI: 0.5- 2.3)). CONCLUSION: Comatose OHCA patients with high initial lactate levels required more vasoactive drugs on the first two days of ICU admission to meet the blood pressure target and had a poorer prognosis. No indication that aiming for a higher MAP target is beneficial in patients with an initial high lactate level was found, however, given the post-hoc nature of this study, these results should be considered hypothesis-generating.

2. Resuscitation. 2023 Oct 18:110005. doi: 10.1016/j.resuscitation.2023.110005. Online ahead of print.

Postresuscitation oxygen reserve index-guided oxygen titration in out-of-hospital cardiac arrest survivors: a randomised controlled trial.

Malinverni S(1), Wilmin S(2), Stoll T(3), de Longueville D(3), Preseau T(2), Mohler A(2), Zohra Bouazza F(3), Annoni F(4), Gerard L(5), Denoel P(6), Boutrika I(3).

ABSTRACT

BACKGROUND AND PURPOSE: Hyperoxia after return of spontaneous circulation is potentially harmful, and oxygen titration in a prehospital setting is challenging. This study aimed to compare outcomes of oxygen reserve index-supported prehospital oxygen titration during prehospital transport with those of standard oxygen titration. METHODS AND TRIAL DESIGN: We enrolled patients who experienced return of spontaneous circulation after cardiac arrest in a prospective randomized study. Patients were randomly divided (1:1) to undergo oxygen titration based on the oxygen reserve index and SpO2 (intervention) or SpO2 only (control). FIO2 titration targeted SpO2 level maintenance at 94-98%. The primary outcome was the normoxia index, reflecting the proportion of both hyperoxia- and hypoxia-free time during prehospital intervention. RESULTS: A total of 92 patients were included in the study. The mean normoxia index was 0.828 in the control group and 0.847 in the intervention group (difference=0.019 [95% CI, -0.056-0.095]), with no significant difference between the groups. No significant differences were found in the incidence of hypoxia or hyperoxia between groups. No difference was found in the mean PaO2 at hospital admission (116 mmHg [IQR: 89-168 mmHg] in the control group vs 115 mmHg [IQR: 89-195 mmHg] in the intervention group; p=0.86). No difference was observed in serum neuron-specific enolase levels 48 h post-ROSC after adjustment for known confounders. CONCLUSION: Oxygen reserve index- combined with pulse oximetry-based prehospital oxygen titration did not significantly improve the normoxia index compared with standard oxygen titration based on pulse oximetry alone.

3. J Crit Care. 2023 Oct 18;79:154448. doi: 10.1016/j.jcrc.2023.154448. Online ahead of print.

Lower versus higher oxygen targets after resuscitation from out-of-hospital cardiac arrest: A systematic review and meta-analysis of randomized controlled trials.

Xu Y(1), Peng F(1), Wang S(1), Yu H(2).

ABSTRACT

PURPOSE: To update the existing evidence and gain further insight into effects of lower versus higher oxygen targets on the outcomes in patients resuscitated from out-of-hospital cardiac arrest (OHCA). METHODS: We performed a systematic review and meta-analysis of randomized controlled trials (RCTs) comparing lower versus higher oxygen targets on the outcomes among adults resuscitated from OHCA. The primary outcome was short-term survival (in hospital or within 30 days). Subgroup analyses were performed according to timing of study interventions. RESULTS: Seven RCTs with 1454 patients were finally included. The short-term survival did not differ between the two groups with a relative risk (RR) of 0.98 (95% CI, 0.86 to 1.11). There were no significant differences in survival at longest follow-up (RR, 1.01; 95% CI, 0.91 to 1.14), favorable neurological outcome (RR, 1.00; 95% CI, 0.91 to 1.11), length of intensive care unit stay (mean difference, -4.94 h; 95% CI, -14.83 to 4.96 h), or risk of re-arrest (RR, 0.68; 95% CI, 0.21 to 2.19). The quality of evidence ranged from moderate to very low. CONCLUSION: Current evidence suggests that targeting a lower or higher oxygen therapy in patients after resuscitation from OHCA results in similar short-term survival and other clinical outcomes.

4. Coron Artery Dis. 2023 Oct 11. doi: 10.1097/MCA.0000000000001298. Online ahead of print.

Coronary angiography after out-of-hospital cardiac arrest without ST-segment elevation: a systematic review and meta-analysis of randomised trials.

Ferraz Costa G(1)(2)(3), Santos I(4), Sousa J(4), Beirão S(4), Teixeira R(1)(2)(3).

ABSTRACT

BACKGROUND: Out-of-hospital cardiac arrest (OHCA) has a poor prognosis. The optimal timing and role of early coronary angiography (CAG) in OHCA patients without ST-segment elevation remains unclear. The goal of this study is to compare an early CAG versus delayed CAG strategy in OHCA

patients without ST elevation. METHODS: We systematically searched PubMed, Embase and Cochrane databases, in June 2022, for randomised controlled trials (RCTs) comparing early versus delayed early CAG. A random effects meta-analysis was performed. RESULTS: A total of seven RCTs were included, providing a total of 1625 patients: 816 in an early strategy and 807 in a delayed strategy. In terms of outcomes assessed, our meta-analysis revealed a similar rate of all-cause mortality (pooled odds ratio [OR] 1.22 [0.99-1.50], P = 0.06, I2 = 0%), neurological status (pooled OR 0.94 [0.74-1.21], = 0.65, I2 = 0%), need of renal replacement therapy (pooled OR 1.11 [0.78-1.74], P = 0.47, I2 = 0%) and major bleeding events (pooled OR 1.51 [0.95-2.40], P = 0.08, I2 = 69%). CONCLUSION: According to our meta-analysis, in patients who experienced OHCA without ST elevation, early CAG is not associated with reduced mortality or an improved neurological status.

5. Front Neurol. 2023 Oct 4;14:1222401. doi: 10.3389/fneur.2023.1222401. eCollection 2023.
Transcranial Doppler during the first week after cardiac arrest and association with 6-month outcomes.
Reichenbach A(1), Alteheld L(2), Henriksen J(2), Nakstad ER(3)(4), Andersen GØ(5), Sunde K(6)(7), Šaltytė Benth J(8)(9), Lundqvist C(1)(8)(9).
ABSTRACT
BACKGROUND: Early prediction of outcomes in comatose patients after out-of-hospital cardiac arrest is challenging. Prognostication tools include clinical examination, biomarkers, and neuroradiological and neurophysiological tests. We studied the association between transcranial Doppler (TCD) and the outcome. METHODS: This was a pre-defined sub-study of the prospective observational Norwegian Cardiorespiratory Arrest Study. Patients underwent standardized post-resuscitation care, including target temperature management (TTM) to 33°C for 24 h. TCD was performed at days 1, 3, and 5-7. The primary endpoint was cerebral performance category (CPC) at 6 months, dichotomized into good (CPC 1-2) and poor (CPC 3-5) outcomes. We used linear mixed modeling time-series analysis. RESULTS: Of 139 TCD-examined patients, 81 (58%) had good outcomes. Peak systolic velocity in the middle cerebral artery (PSV) was low during TTM (Day 1) and elevated after rewarming (Day 3). Thereafter, it continued to rise in patients with poor, but normalized in patients with good, outcomes. At days 5-7, PSV was 1.0 m/s (95% CI 0.9; 1.0) in patients with good outcomes and 1.3 m/s (95% CI 1.1; 1.4) in patients with poor outcomes ($p < 0.001$). CONCLUSION: Elevated PSV at days 5-7 indicated poor outcomes. Our findings suggest that serial TCD examinations during the first week after cardiorespiratory arrest may improve our understanding of serious brain injury.

TARGETED TEMPERATURE MANAGEMENT

1. Acute Med Surg. 2023 Oct 11;10(1):e897. doi: 10.1002/ams2.897. eCollection 2023 Jan-Dec.
Rapid rewarming rate associated with favorable neurological outcomes in patients with post-cardiac arrest syndrome patients treated with targeted temperature management.
Shin M(1), Fujita M(2), Hifumi T(3), Koga Y(1), Yagi T(1), Nakahara T(1), Todani M(2), Kaneda K(1), Tsuruta R(1)(2).
ABSTRACT
AIM: To determine whether the rewarming rate is associated with neurological outcomes in patients with post-cardiac arrest syndrome treated with targeted temperature management (TTM) at 34°C. METHODS: We conducted a retrospective analysis of a nationwide cohort study of out-of-hospital cardiac arrest in Japan. Adult patients who experienced a return of spontaneous circulation and completed TTM at 34°C between June 2014 and December 2019 were divided equally into three groups (slow, moderate, and rapid) according to their rewarming rates from 34°C to 36°C. The rates of favorable neurological outcomes (Cerebral Performance Category of 1-2 after 30 days) were compared among the groups, and the adjusted odds ratios for a favorable neurological outcome

were calculated for the groups. RESULTS: We analyzed 348, 357, and 358 patients in the slow, moderate, and rapid groups, respectively. The periods of rewarming from 34°C to 36°C were 41.9 ± 10.5, 22.4 ± 1.8, and 12.2 ± 3.6 h, respectively. The number of favorable neurological outcomes after 30 days was 121 (34.8%), 125 (35.0%), and 147 (41.1%), respectively, with no significant differences among the three groups (p = 0.145). Rapid rewarming was independently associated with a favorable neurological outcome compared with slow rewarming (adjusted odds ratio 1.57 [95% confidence interval 1.04-2.37]; p = 0.031). CONCLUSIONS: Rapid rewarming after TTM at 34°C was associated with a more favorable neurological outcome than slow rewarming.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

1. Curr Opin Crit Care. 2023 Oct 5. doi: 10.1097/MCC.0000000000001109. Online ahead of print.
Automated external defibrillators and the link to first responder systems.
Jonsson M(1), Berglund E(1), Müller MP(2).

ABSTRACT

PURPOSE OF REVIEW: Automated external defibrillators are a very effective treatment to convert ventricular fibrillation (VF) in out-of-hospital cardiac arrest. The purpose of this paper is to review recent publications related to automated external defibrillators (AEDs). RECENT FINDINGS: Much of the recent research focus on ways to utilize publicly available AEDs included in different national/regional registers. More and more research present positive associations between engaging volunteers to increase the use of AEDs. There are only a few recent studies focusing on professional first responders such as fire fighters/police with mixed results. The use of unmanned aerial vehicles (drones) lacks clinical data and is therefore difficult to evaluate. On-site use of AED shows high survival rates but suffers from low incidence of out-of-hospital cardiac arrest (OHCA). SUMMARY: The use of public AEDs in OHCA are still low. Systems focusing on engaging volunteers in the cardiac arrest response have shown to be associated with higher AED usage. Dispatching drones equipped with AEDs is promising, but research lacks clinical data. On-site defibrillation is associated with high survival rates but is not available for most cardiac arrests.

2. Eur Rev Med Pharmacol Sci. 2023 Oct;27(19):9363-9374. doi: 10.26355/eurrev_202310_33964.
The Sapienza University of Rome network of automated external defibrillators: a prototype webMap developed to speed access to community defibrillators and increase survival from out-of-hospital cardiac arrest.
Pesaresi C(1), Pavia D, Casini L, Renzi E, Failla G, Kerr M, Villari P, De Vito C.

ABSTRACT

OBJECTIVE: In Italy, only around 10% of people who experience out-of-hospital cardiac arrest (OHCA) survive. A large portion of OHCA events in public settings are characterized by an initial shockable rhythm, which requires prompt defibrillation. We aimed to create a system to quickly locate nearby public access automated external defibrillators (AEDs) on the campus of Sapienza University of Rome, the largest public university in Europe. MATERIALS AND METHODS: We developed the AED webMap through a 6-step process involving the: 1) collection of information and geographical coordinates for each AED from the university management system; 2) development of a new geolocation database; 3) integration of information contained in the new database with data provided by university departments; 4) geolocation of AEDs in the Google MyMaps environment; 5) graphic representation of all AEDs on digital map templates using specific symbols, with pop-ups containing additional information for each AED; and 6) publication of the webMap on the university website. RESULTS: The AED webMap was published on the university website (https://www.uniroma1.it/it/pagina/defibrillatori-sapienza-in-rete) and facilitates prompt

identification of nearby AEDs by providing: 1) detailed AED geolocalization with interactive pop-up information for each AED, including whether the AED is located internally or externally; 2) the option to use different base maps (e.g., digital street map); 3) calculation and display of the route to reach the chosen AED; and 4) the possibility to migrate towards multiple platforms. CONCLUSIONS: The webMap can help bystanders quickly identify, locate, and reach nearby AEDs present on the campus of the largest public university in Europe, a measure that could help speed defibrillation and maximize the life-saving potential of AEDs in the event of OHCA.

PEDIATRICS AND CHILDREN

No articles identified.

EXTRACORPOREAL LIFE SUPPORT

1. Curr Opin Crit Care. 2023 Oct 23. doi: 10.1097/MCC.0000000000001102. Online ahead of print.
Extracorporeal cardiopulmonary resuscitation in out-of-hospital cardiac arrest - current status.
Suverein MM(1), Maessen JG(2), van de Poll MCG(3).

ABSTRACT

PURPOSE OF REVIEW: Extracorporeal cardiopulmonary resuscitation (ECPR) is an emerging treatment for refractory cardiac arrest. In recent years, several randomized controlled trials have been published that aimed to address the efficacy and effectiveness of ECPR for out-of-hospital cardiac arrest (OHCA). Despite the lack of high-quality evidence concerning clinical effectiveness and cost-effectiveness, ECPR is increasingly implemented throughout the world. In this review, we aim to provide an overview of the current status of ECPR for OHCA. RECENT FINDINGS: Randomized controlled trials showed diverging results, largely due to differences in selection criteria and study design. Single-center studies, performed in centers with extraordinary expertise and dedication consistently achieve a low-flow time of around 60 min, but such achievements are rarely reproduced outside these centers. Strict patient selection can improve outcome but simultaneously limits the caseload. Preliminary data suggest that outcome may also be improved by avoiding hyperoxia postresuscitation. SUMMARY: The potential of ECPR to increase survival in selected patients in highly dedicated systems seems to be proven, the question remains whether ECPR for OHCA can be widely implemented successfully and can develop into a sustainable, commonplace resource-effective treatment.

2. Resuscitation. 2023 Oct 18:110004. doi: 10.1016/j.resuscitation.2023.110004. Online ahead of print.
Prognostic Factors Associated with Favourable Functional Outcome among Adult Patients Requiring Extracorporeal Cardiopulmonary Resuscitation for Out-of-Hospital Cardiac Arrest: A Systematic Review and Meta-Analysis.
Tran A(1), Rochwerg B(2), Fan E(3), Belohlavek J(4), Suverein MM(5), C G van de Poll M(5), Lorusso R(6), Price S(7), Yannopoulos D(8), MacLaren G(9), Ramanathan K(9), Ruiyang Ling R(10), Thiara S(11), Tonna JE(12), Shekar K(13), Hodgson CL(14), Scales DC(15), Sandroni C(16), Nolan JP(17), Slutsky AS(18), Combes A(19), Brodie D(20), Fernando SM(21).

ABSTRACT

BACKGROUND: Extracorporeal cardiopulmonary resuscitation (ECPR), has demonstrated promise in the management of refractory out-of-hospital cardiac arrest (OHCA). However, evidence from observational studies and clinical trials are conflicting and the factors influencing outcome have not been well established. METHODS: We conducted a systematic review and meta-analysis summarizing the association between pre-ECPR prognostic factors and likelihood of good functional

outcome among adult patients requiring ECPR for OHCA. We searched Medline and Embase databases from inception to February 28, 2023 and screened studies with two independent reviewers. We performed meta-analyses of unadjusted and adjusted odds ratios, adjusted hazard ratios and mean differences separately. We assessed risk of bias using the QUIPS tool and certainty of evidence using the GRADE approach. FINDINGS: We included 29 observational and randomized studies involving 7,397 patients. Factors with moderate or high certainty of association with increased survival with favourable functional outcome include pre-arrest patient factors, such as younger age (odds ratio (OR) 2.13, 95% CI 1.52 to 2.99) and female sex (OR 1.37, 95% CI 1.11 to 1.70), as well as intra-arrest factors, such as shockable rhythm (OR 2.79, 95% CI 2.04 to 3.80), witnessed arrest (OR 1.68 (95% CI 1.16 to 2.42), bystander CPR (OR 1.55, 95% CI 1.19 to 2.01), return of spontaneous circulation (OR 2.81, 95% CI 2.19 to 3.61) and shorter time to cannulation (OR 1.14, 95% CI 1.17 to 1.69 per 10 minutes). INTERPRETATION: The findings of this review confirm several clinical concepts wellestablished in the cardiac arrest literature and their applicability to the patient for whom ECPR is considered - that is, the impact of pre-existing patient factors, the benefit of timely and effective CPR, as well as the prognostic importance of minimizing low-flow time. We advocate for the thoughtful consideration of these prognostic factors as part of a risk stratification framework when evaluating a patient's potential candidacy for ECPR.

EXPERIMENTAL RESEARCH

1. ASAIO J. 2023 Oct 20. doi: 10.1097/MAT.0000000000002079. Online ahead of print.
Albumin Infusion Reduces Fluid Loading for Postresuscitation Syndrome in a Pig Model of Refractory Cardiac Arrest Resuscitated With Venoarterial Extra Corporeal Membrane Oxygenation.
Lescroart M(1)(2)(3), Pequignot B(1)(2)(3), Orlowski S(2)(3)(4), Reynette N(5), Martini B(5), Albuisson E(3)(6), Tran N(3)(5), Grandmougin D(2)(7), Levy B(1)(2)(3).
ABSTRACT
Hemodynamic instability in postresuscitation syndrome worsens survival and neurological outcomes. Venoarterial extracorporeal membrane oxygenation (VA ECMO) for refractory cardiac arrest might improve outcomes. Hemodynamical support under VA ECMO relies on norepinephrine and crystalloids. The present work aims to assess the effects of albumin (ALB) infusion in a swine model of ischemic refractory cardiac arrest implanted by VA ECMO. Cardiac arrest was performed in 18 pigs and VA ECMO was initiated after 30 minutes cardiopulmonary resuscitation (CPR). Pigs were randomly assigned to standard care (norepinephrine + crystalloids) versus ALB group (ALB + standard care). Hemodynamical assessments were performed over 6 hours. Severe hypoalbuminemia was observed in the control group and could be reversed with ALB infusion. Total crystalloid load was significantly reduced with ALB infusion (1,000 [1,000-2,278] ml vs. 17,000 [10,000-19,000] ml, ALB versus control group, respectively, $p < 0.001$). There was no significant impact with regard to lactate clearance (29.16% [12.5-39.32] and 10.09% [6.78-29.36] for control versus ALB groups, respectively, $p = 0.185$), sublingual capillary microvascular parameters, or cerebral near-infrared spectrometer (NIRS) values. Compared to standard care, ALB infusion was

highly effective in reducing fluid loading in a porcine model of postresuscitation syndrome after refractory cardiac arrest treated with VA ECMO.

2. Adv Exp Med Biol. 2023;1438:217-222. doi: 10.1007/978-3-031-42003-0_34.
Insufficient Oxygen Supplementation During Cardiopulmonary Resuscitation Leads to Unfavorable Biological Response While Hyperoxygenation Contributes to Metabolic Compensation.
Aoki T(1), Wong V(2), Hayashida K(2), Becker LB(2), Shinozaki K(2).
ABSTRACT
Sudden cardiac arrest (CA) is the third leading cause of death. Immediate reoxygenation with high concentrations of supplemental oxygen (O2) during cardiopulmonary resuscitation (CPR) is recommended according to the current guidelines for adult CA. However, a point in controversy exists because of the known harm of prolonged exposure to 100% O2. Therefore, there have been much debate on an optimal use of supplemental O2, yet little is known about the duration and dosage of O2 administration. To test whether supplying a high concentration of O2 during CPR and post resuscitation is beneficial or harmful, rats subjected to 10-minute asphyxia CA were administered either 100% O2 (n = 8) or 30% O2 (n = 8) for 2 hours after CPR. Two hours after initiating CPR, the brain, lung, and heart tissues were collected to compare mRNA gene expression levels of inflammatory cytokines, apoptotic and oxidative stress-related markers. The 100% O2 group had significantly shorter time to return of spontaneous circulation (ROSC) than the 30% O2 group (62.9 ± 2.2 and 77.5 ± 5.9 seconds, respectively, $P < 0.05$). Arterial blood gas analysis revealed that the 100% O2 group had significantly higher PaCO2 (49.4 ± 4.9 mmHg and 43.0 ± 3.0 mmHg, $P < 0.01$), TCO2 (29.8 ± 2.7 and 26.6 ± 1.1 mmol/L, $P < 0.05$), HCO3- (28.1 ± 2.4 and 25.4 ± 1.2 mmol/L, $P < 0.05$), and BE (2.6 ± 2.3 and 0.1 ± 1.4 mmol/L, $P < 0.05$) at 2 hours after initiating CPR, but no changes in pH (7.37 ± 0.03 and 7.38 ± 0.03, ns). Inflammation- (Il6, Tnf) and apoptosis- (Casp3) related mRNA gene expression levels were significantly low in the 100% O2 group in the brain, however, oxidative stress moderator Hmox1 increased in the 100% O2 group. Likewise, mRNA gene expression of Icam1, Casp9, Bcl2, and Bax were low in the 100% O2 group in the lung. Contrarily, mRNA gene expression of Il1b and Icam1 were low in the 30% O2 group in the heart. Supplying 30% O2 during and after CPR significantly delayed the time to ROSC and increased inflammation-/apoptosis- related gene expression in the brain and lung, indicating that insufficient O2 was associated with unfavorable biological responses post CA, while prolonged exposure to high-concentration O2 should be still cautious in general.

CASE REPORTS

1. Cardiol Young. 2023 Oct 18:1-4. doi: 10.1017/S1047951123003657. Online ahead of print.
Myocardial bridge in a child with cardiac arrest and ventricular fibrillation: a bridge over troubled water?
McHale J(1), Ngha B(1), Kurtz J(2), Kozik D(3), Johnsrude C(2), Dasgupta S(2).
ABSTRACT
Resuscitated cardiac arrest in a child triggers a comprehensive workup to identify an aetiology and direct management. The presence of a myocardial bridge does not automatically imply causation. Careful determination of the haemodynamic significance of the myocardial bridge is critical to avoid an unnecessary sternotomy and to provide appropriate treatment.

2. J Med Toxicol. 2023 Oct 16. doi: 10.1007/s13181-023-00970-2. Online ahead of print.
A Case of Severe Lead Encephalopathy with Cardiac Arrest Managed During a Chelation Shortage.
Idowu D(1)(2), Gray Z(3), Stanton M(4)(5), Rushton W(6), Gummin D(4)(5).

ABSTRACT

INTRODUCTION: For many years, the standard of care in the USA has been to treat acute lead encephalopathy with a combination parenteral dimercaprol (BAL) and CaNa2EDTA. We present a case of a pediatric patient with severe lead encephalopathy, complicated by cardiac arrest, who was treated with an alternative regimen when CaNa2EDTA was unavailable. CASE REPORT: A 24-month-old male was brought by ambulance to an emergency department (ED) with new onset seizures and sustained a cardiac arrest. An initial blood lead concentration returned at 263 mcg/dl. The hospital was unable to obtain CaNa2EDTA due to the nationwide shortage. For this reason, the patient was chelated with BAL IM for 12 days and dimercaptosuccinic acid (DMSA) for 28 days. He received a second 5-day course of BAL due to rebounding blood lead concentrations. Eight days after cardiac arrest, he was extubated; however, despite ongoing therapy, subsequent follow-up 2 months later demonstrated persistent cognitive deficits. DISCUSSION: The combination of DMSA and BAL was effective in rapidly decreasing whole blood lead concentrations. Drug shortages continue to have implications for the management of poisoned patients. This case highlights how shortages of chelating agents complicate patient care.