

This week's PubMed 1st – 7th October 2023: articles of interest n = 42

CPR AND COVID-19

1. JAMA Netw Open. 2023 Oct 2;6(10):e2336992. doi: 10.1001/jamanetworkopen.2023.36992.

Acute SARS-CoV-2 Infection and Incidence and Outcomes of Out-of-Hospital Cardiac Arrest.

Liu JZ(1), Counts CR(2)(3), Drucker CJ(1), Emert JM(1), Murphy DL(1)(3), Schwarcz L(1), Kudenchuk PJ(1)(4), Sayre MR(2)(3), Rea TD(1)(5).

ABSTRACT

IMPORTANCE: Little is known about how COVID-19 affects the incidence or outcomes of out-of-hospital cardiac arrest (OHCA), and it is possible that more generalized factors beyond SARS-CoV-2 infection are primarily responsible for changes in OHCA incidence and outcome. **OBJECTIVE:** To assess whether COVID-19 is associated with OHCA incidence and outcomes. **DESIGN, SETTING, AND PARTICIPANTS:** This retrospective cohort study was conducted in Seattle and King County, Washington. Participants included persons aged 18 years or older with nontraumatic OHCA attended by emergency medical services (EMS) between January 1, 2018, and December 31, 2021. Data analysis was performed from November 2022 to March 2023. **EXPOSURES:** Prepandemic (2018-2019) and pandemic (2020-2021) periods and SARS-CoV-2 infection. **MAIN OUTCOMES AND MEASURES:** The primary outcomes were OHCA incidence and patient outcomes (ie, survival to hospital discharge). Mediation analysis was used to determine the percentage change in OHCA incidence and outcomes between prepandemic and pandemic periods that was attributable to acute SARS-CoV-2 infection vs conventional Utstein elements related to OHCA circumstances (ie, witness status and OHCA location) and resuscitation care (ie, bystander cardiopulmonary resuscitation, early defibrillation, and EMS response intervals). **RESULTS:** There were a total of 13 081 patients with OHCA (7102 dead upon EMS arrival and 5979 EMS treated). Among EMS-treated patients, the median (IQR) age was 64.0 (51.0-75.0) years, 3864 (64.6%) were male, and 1027 (17.2%) survived to hospital discharge. The total number of patients with OHCA increased by 19.0% (from 5963 in the prepandemic period to 7118 in the pandemic period), corresponding to an incidence increase from 168.8 to 195.3 events per 100 000 person-years. Of EMS-treated patients with OHCA during the pandemic period, 194 (6.2%) were acutely infected with SARS-CoV-2 compared with 7 of 191 EMS-attended but untreated patients with OHCA (3.7%). In time-series correlation analysis, there was a positive correlation between community SARS-CoV-2 incidence and overall OHCA incidence ($r = 0.27$; $P = .01$), as well as OHCA incidence with acute SARS-CoV-2 infection ($r = 0.43$; $P < .001$). The survival rate during the pandemic period was lower than that in the prepandemic period (483 patients [15.4%] vs 544 patients [19.2%]). During the pandemic, those with OHCA and acute SARS-CoV-2 infection had lower likelihood of survival compared with those without acute infection (12 patients [6.2%] vs 471 patients [16.0%]). SARS-CoV-2 infection itself accounted for 18.5% of the pandemic survival decline, whereas Utstein elements mediated 68.2% of the survival decline. **CONCLUSIONS AND RELEVANCE:** In this cohort study of COVID-19 and OHCA, a substantial proportion of the higher OHCA incidence and lower survival during the pandemic was not directly due to SARS-CoV-2 infection but indirect factors that challenged OHCA prevention and treatment.

2. Chest. 2023 Sep 29:S0012-3692(23)05546-0. doi: 10.1016/j.chest.2023.09.024. Online ahead of print.

Do-Not-Resuscitate Orders by COVID-19 Status Throughout the First Year of the Coronavirus Disease 2019 Pandemic.

Piscitello GM(1), Parker WF(2).

ABSTRACT

BACKGROUND: At the beginning of the COVID-19 pandemic, it was unclear whether performing cardiopulmonary resuscitation on COVID-19 patients would be effective or increase COVID-19 transmission to health care workers. **RESEARCH QUESTION:** Did the prevalence of do-not-resuscitate (DNR) orders by COVID-19 status change over the first year of the pandemic as risks such as COVID-19 transmission to healthcare workers improved? **STUDY DESIGN AND METHODS:** This cross-sectional study assessed DNR orders for all adult patients admitted to intensive care units at two academic medical centers in Chicago, Illinois between April 2020 to April 2021. DNR orders by COVID-19 status were assessed using risk adjusted mixed-effects logistic regression and propensity score matching by patient severity of illness. **RESULTS:** The study population of 3070 critically ill patients were 46% Black, 53% male, with median age (IQR) 63 (50-73) years. Eighteen percent were COVID-19 positive and 27% had a DNR order. Black and Latinx patients had higher absolute rates of DNR orders than White patients (30% vs. 29% vs. 23%, $p=0.006$). After adjustment for patient characteristics, illness severity, and hospital location, DNR orders were more likely in COVID-19 patients in the non-propensity score matched ($n=3070$; aOR 2.01, 95% CI 1.64-2.38) and propensity score matched ($n=1118$; aOR 1.91, 95% CI 1.45-2.52) cohorts. The prevalence of DNR orders remained higher for COVID-19 patients than non-COVID-19 patients during all months of the study period (difference in prevalence over time $p=0.751$). **INTERPRETATION:** In this multihospital study, DNR orders remained persistently higher for COVID-19 patients versus non-COVID-19 patients with similar severity of illness during the first year of the pandemic. Identifying the specific reasons why DNR orders remained persistently elevated for COVID-19 patients should be assessed in future studies, as these changes may continue to affect COVID-19 patient care and outcomes.

CPR/MECHANICAL CHEST COMPRESSION

No articles identified.

REGISTRIES, REVIEWS AND EDITORIALS

1. Soud Lek. 2023 Fall;68(3):33-36.

Pulmonary fat embolism after cardiopulmonary resuscitation.

Rudinská LI, Delongová P, Vaculová J, Ihnát P.

ABSTRACT

Pulmonary fat embolism (PFE) is usually observed in patients with long bone fractures, patients with extensive subcutaneous fat contusions or skin burns. Chest compressions during cardiopulmonary resuscitation (CPR) present powerful repetitive violence against victim's chest. Skeletal chest fractures are the most frequent complication of CPR, and probably the most important cause of PFE autopsy finding in persons, which have been resuscitated before death. The aim of the present paper was to investigate the prevalence and seriousness of PFE in non-survivors after out-of-hospital cardiac arrest. During autopsy, PFE can be diagnosed in 30 - 42 % of persons after unsuccessful CPR; skeletal chest fractures are associated with significantly higher prevalence of PFE. After successful CPR, fat embolism may contribute significantly to acute respiratory distress syndrome, or multiorgan failure. The issue of CPR associated injuries has two medical aspects - clinical and forensic. From clinical point of view, the presence of CPR associated injuries must be acknowledged when offering healthcare to patients after successful CPR. During autopsy, CPR associated injuries should be diagnosed and evaluated as these injuries may contribute to death or may be potentially lethal.

2. Resuscitation. 2023 Oct 5:109990. doi: 10.1016/j.resuscitation.2023.109990. Online ahead of print.

Refining the continuum of neurologic prognosis - predicting brain death after cardiac arrest.

Bever MB(1).

NO ABSTRACT AVAILABLE

3. Curr Cardiol Rep. 2023 Oct 4. doi: 10.1007/s11886-023-01964-w. Online ahead of print.

Artificial Intelligence and Machine Learning Applications in Sudden Cardiac Arrest Prediction and Management: A Comprehensive Review.

Aqel S(1), Syaj S(2), Al-Bzour A(2), Abuzanouneh F(2), Al-Bzour N(2), Ahmad J(3).

ABSTRACT

PURPOSE OF REVIEW: This literature review aims to provide a comprehensive overview of the recent advances in prediction models and the deployment of AI and ML in the prediction of cardio-pulmonary resuscitation (CPR) success. The objectives are to understand the role of AI and ML in healthcare, specifically in medical diagnosis, statistics, and precision medicine, and to explore their applications in predicting and managing sudden cardiac arrest outcomes, especially in the context of prehospital emergency care. **RECENT FINDINGS:** The role of AI and ML in healthcare is expanding, with applications evident in medical diagnosis, statistics, and precision medicine. Deep learning is gaining prominence in radiomics and population health for disease risk prediction. There's a significant focus on the integration of AI and ML in prehospital emergency care, particularly in using ML algorithms for predicting outcomes in COVID-19 patients and enhancing the recognition of out-of-hospital cardiac arrest (OHCA). Furthermore, the combination of AI with automated external defibrillators (AEDs) shows potential in better detecting shockable rhythms during cardiac arrest incidents. AI and ML hold immense promise in revolutionizing the prediction and management of sudden cardiac arrest, hinting at improved survival rates and more efficient healthcare interventions in the future. Sudden cardiac arrest (SCA) continues to be a major global cause of death, with survival rates remaining low despite advanced first responder systems. The ongoing challenge is the prediction and prevention of SCA. However, with the rise in the adoption of AI and ML tools in clinical electrophysiology in recent times, there is optimism about addressing these challenges more effectively.

4. Semin Neurol. 2023 Oct 3. doi: 10.1055/s-0043-1775749. Online ahead of print.

Clinical Grading Scales and Neuroprognostication in Acute Brain Injury.

Reyes-Esteves S(1), Kumar M(1), Kasner SE(1), Witsch J(1).

ABSTRACT

Prediction of neurological clinical outcome after acute brain injury is critical because it helps guide discussions with patients and families and informs treatment plans and allocation of resources. Numerous clinical grading scales have been published that aim to support prognostication after acute brain injury. However, the development and validation of clinical scales lack a standardized approach. This in turn makes it difficult for clinicians to rely on prognostic grading scales and to integrate them into clinical practice. In this review, we discuss quality measures of score development and validation and summarize available scales to prognosticate outcomes after acute brain injury. These include scales developed for patients with coma, cardiac arrest, ischemic stroke, nontraumatic intracerebral hemorrhage, subarachnoid hemorrhage, and traumatic brain injury; for each scale, we discuss available validation studies.

IN-HOSPITAL CARDIAC ARREST

1. BMJ Open. 2023 Oct 5;13(10):e074214. doi: 10.1136/bmjopen-2023-074214.

How to predict the death risk after an in-hospital cardiac arrest (IHCA) in intensive care unit? A retrospective double-centre cohort study from a tertiary hospital in China.

Zhang Y(1)(2), Rao C(3), Ran X(1)(2), Hu H(1), Jing L(1)(2), Peng S(4), Zhu W(1)(2), Li S(5)(2).

ABSTRACT

OBJECTIVES: Our objective is to develop a prediction tool to predict the death after in-hospital cardiac arrest (IHCA). **DESIGN:** We conducted a retrospective double-centre observational study of IHCA patients from January 2015 to December 2021. Data including prearrest diagnosis, clinical features of the IHCA and laboratory results after admission were collected and analysed. Logistic regression analysis was used for multivariate analyses to identify the risk factors for death. A nomogram was formulated and internally evaluated by the boot validation and the area under the curve (AUC). Performance of the nomogram was further accessed by Kaplan-Meier survival curves for patients who survived the initial IHCA. **SETTING:** Intensive care unit, Tongji Hospital, China. **PARTICIPANTS:** Adult patients (≥ 18 years) with IHCA after admission. Pregnant women, patients with 'do not resuscitation' order and patients treated with extracorporeal membrane oxygenation were excluded. **INTERVENTIONS:** None. **PRIMARY AND SECONDARY OUTCOME MEASURES:** The primary outcome was the death after IHCA. **RESULTS:** Patients (n=561) were divided into two groups: non-sustained return of spontaneous circulation (ROSC) group (n=241) and sustained ROSC group (n=320). Significant differences were found in sex (p=0.006), cardiopulmonary resuscitation (CPR) duration (p<0.001), total duration of CPR (p=0.014), rearrest (p<0.001) and length of stay (p=0.004) between two groups. Multivariate analysis identified that rearrest, duration of CPR and length of stay were independently associated with death. The nomogram including these three factors was well validated using boot calibration plot and exhibited excellent discriminative ability (AUC 0.88, 95% CI 0.83 to 0.93). The tertiles of patients in sustained ROSC group stratified by anticipated probability of death revealed significantly different survival rate (p<0.001). **CONCLUSIONS:** Our proposed nomogram based on these three factors is a simple, robust prediction model to accurately predict the death after IHCA.

2. Glob Heart. 2023 Sep 28;18(1):52. doi: 10.5334/gh.1266. eCollection 2023.

Association of Outdoor Relative Humidity and Temperature on In-Hospital Cardiac Arrest Prognosis.

Lazzarin T(1), Fávero Junior EL(1), Delai CC(1), Pinheiro VR(1), Ballarin RS(1), Rischini FA(1), Polegato BF(1), Azevedo PS(1), de Paiva SAR(1), Zornoff L(1), da Cunha AR(2), do Valle AP(1), Minicucci MF(1).

NO ABSTRACT AVAILABLE

INJURIES AND CPR

No articles identified.

CAUSE OF THE ARREST

1. JACC Clin Electrophysiol. 2023 Sep 6:S2405-500X(23)00630-8. doi: 10.1016/j.jacep.2023.08.017.

Online ahead of print.

The Prevalence and Characteristics of Arrhythmic Mitral Valve Prolapse in Patients With Unexplained Cardiac Arrest.

Alqarawi W(1), Tadros R(2), Roberts JD(3), Cheung CC(4), Green MS(5), Burwash IG(5), Steinberg C(6), Healey JS(3), Khan H(7), McIntyre C(8), Cadrin-Touringy J(2), Laksman ZWM(4), Simpson CS(9),

Sanatani S(10), Gardner M(11), Angaran P(12), Ilhan E(13), Talajic M(2), Arbour L(4), Leather R(4), Seifer C(14), Joza J(15), Lee F(5), Lau L(5), Nair G(5), Wells G(5), Krahn AD(4).

ABSTRACT

BACKGROUND: There is growing evidence that mitral valve prolapse (MVP) is associated with otherwise unexplained cardiac arrest (UCA). However, reports are hindered by the absence of a systematic ascertainment of alternative diagnoses. **OBJECTIVES:** This study reports the prevalence and characteristics of MVP in a large cohort of patients with UCA. **METHODS:** Patients were enrolled following an UCA, defined as cardiac arrest with no coronary artery disease, preserved left ventricular ejection fraction, and no apparent explanation on electrocardiogram. A comprehensive evaluation was performed, and patients were diagnosed with idiopathic ventricular fibrillation (IVF) if no cause was found. Echocardiography reports were reviewed for MVP. Patients with MVP were divided into 2 groups: those with IVF (AMVP) and those with an alternative diagnosis (nonarrhythmic MVP). Patient characteristics were then compared. The long-term outcomes of AMVP were reported. **RESULTS:** Among 571 with an initially UCA, 34 patients had MVP (6%). The prevalence of definite MVP was significantly higher in patients with IVF than those with an alternative diagnosis (24 of 366 [6.6%] vs 5 of 205 [2.4%]; $P = 0.03$). Bileaflet prolapse was significantly associated with AMVP (18 of 23 [78%] vs 1 of 8 [12.5%]; $P = 0.001$; OR: 25.2). The proportion of patients with AMVP who received appropriate implantable cardioverter-defibrillator therapies over a median follow-up of 42 months was 21.1% (4 of 19). **CONCLUSIONS:** MVP is associated with otherwise UCA (IVF), with a prevalence of 6.6%. Bileaflet prolapse appears to be a feature of AMVP, although future studies need to ascertain its independent association. A significant proportion of patients with AMVP received appropriate implantable cardioverter-defibrillator therapies during follow-up.

2. *Anaesth Intensive Care*. 2023 Oct 6:310057X231196912. doi: 10.1177/0310057X231196912. Online ahead of print.

Adult perioperative cardiac arrest: An overview of 684 cases reported to webAIRS.

Bright MR(1)(2), Endlich Y(3)(4)(5), King ZD(6), White LD(7), Concha Blamey SI(2)(6), Culwick MD(5).

ABSTRACT

There were 684 perioperative cardiac arrests reported to webAIRS between September 2009 and March 2022. The majority involved patients older than 60 years, classified as American Society of Anesthesiologists Physical Status 3 to 5, undergoing an emergency or major procedure. The most common precipitants included airway events, cardiovascular events, massive blood loss, medication issues, and sepsis. The highest mortality rate was 54% of the 46 cases in the miscellaneous category (this included 34 cases of severe sepsis, which had a mortality of 65%). This was followed by cardiovascular precipitants ($n = 424$) in which there were 147 deaths (35% mortality): these precipitants included blood loss (53%), embolism (61%) and myocardial infarction (70%). Airway and breathing events accounted for 25% and anaphylaxis 8%. A specialist anaesthetist attended the majority of these cardiac arrests. As webAIRS is a voluntary database, it is not possible to determine the incidence of perioperative cardiac arrest and only descriptive information on factors associated with cardiac arrest can be obtained. Nevertheless, the large number of reports includes a wide range of cases, precipitants, demographics and outcomes, providing ample opportunity to learn from these events. The data also provide rich scope for further research into further initiatives to prevent cardiac arrest in the perioperative period, and to improve outcomes, should a cardiac arrest occur.

3. *Appl Immunohistochem Mol Morphol*. 2023 Oct 5. doi: 10.1097/PAI.0000000000001163. Online ahead of print.

From Death to Life/Back to the Future: Detailed Premorbid Clinical and Family History Can Save Lives and Address the Final Diagnosis in Sudden Unexplained Deaths With Negative Autopsy.

Turkgenç B(1), Baydar CL(2)(3), Deniz I(4), Akçay A(5), Ergoren MC(6), Sağ SO(7), Yakicier MC(8), Temel SG(7)(9).

ABSTRACT

Sudden cardiac death is a sudden, unexpected death developed by one of the many different causes of cardiac arrest that occur within 1 hour of the onset of new symptoms. Sudden unexplained death (SUD) comprises a normal heart at postmortem examination and negative toxicological analysis. SUD often arises from cardiac genetic disease, particularly channelopathies. Channelopathies, or inherited arrhythmia syndromes, are a group of disorders characterized by an increased risk of sudden cardiac death, abnormal cardiac electrical function, and, typically, a structurally normal heart. They share an underlying genetic etiology where disease-causing genetic variants may lead to the absence or dysfunction of proteins involved in the generation and propagation of the cardiac action potential. Our study aimed to evaluate the importance of next-generation sequencing in the postmortem investigations of SUD cases. In this study, 5 forensic SUD cases were investigated for inherited cardiac disorders. We screened a total of 68 cardiac genes for the sibling of case 1, as well as case 2, and 51 genes for cases 3, 4, and 5. Of the 12 variants identified, 2 likely pathogenic variants (16.7%) were the TMEM43_ c.1000+2T>C splice site mutation and the SCN5A_ p.W703X nonsense mutation. The remaining 10 variants of uncertain significance were detected in the TRPM4, RANGRF, AKAP9, KCND3, KCNE1, DSG2, CASQ1, and SNTA1 genes. Irrespective of genetic testing, all SUD families require detailed clinical testing to identify relatives who may be at risk. Molecular autopsy and detailed premorbid clinical and family histories can survive family members of SUD cases.

4. Anesth Analg. 2023 Oct 3. doi: 10.1213/ANE.0000000000006664. Online ahead of print.

Causes of Perioperative Cardiac Arrest: Mnemonic, Classification, Monitoring, and Actions.

Meng L(1), Rasmussen M(2), Abcejo AS(3), Meng DM(4), Tong C(5), Liu H(6).

ABSTRACT

Perioperative cardiac arrest (POCA) is a catastrophic complication that requires immediate recognition and correction of the underlying cause to improve patient outcomes. While the hypoxia, hypovolemia, hydrogen ions (acidosis), hypo-/hyperkalemia, and hypothermia (Hs) and toxins, tamponade (cardiac), tension pneumothorax, thrombosis (pulmonary), and thrombosis (coronary) (Ts) mnemonic is a valuable tool for rapid differential diagnosis, it does not cover all possible causes leading to POCA. To address this limitation, we propose using the preload-contractility-afterload-rate and rhythm (PCARR) construct to categorize POCA, which is comprehensive, systemic, and physiologically logical. We provide evidence for each component in the PCARR construct and emphasize that it complements the Hs and Ts mnemonic rather than replacing it. Furthermore, we discuss the significance of utilizing monitored variables such as electrocardiography, pulse oxygen saturation, end-tidal carbon dioxide, and blood pressure to identify clues to the underlying cause of POCA. To aid in investigating POCA causes, we suggest the Anesthetic care, Surgery, Echocardiography, Relevant Check and History (A-SERCH) list of actions. We recommend combining the Hs and Ts mnemonic, the PCARR construct, monitoring, and the A-SERCH list of actions in a rational manner to investigate POCA causes. These proposals require real-world testing to assess their feasibility.

END-TIDAL CO₂

No articles identified.

ORGAN DONATION

1. Eur J Emerg Med. 2023 Oct 6. doi: 10.1097/MEJ.0000000000001098. Online ahead of print.

Out of hospital cardiac arrest and organ donation: the innovative approach for emergency physicians.

Lazzeri C(1), Manuela B, Peris A.

NO ABSTRACT AVAILABLE

2. Resuscitation. 2023 Oct 6:109993. doi: 10.1016/j.resuscitation.2023.109993. Online ahead of print.

Extracorporeal Cardiopulmonary Resuscitation-Based Approach to Refractory Out-of-Hospital Cardiac Arrest: a Focus on Organ Donation, a Secondary Analysis of a Prague OHCA Randomized Study.

Jana S(1), Stepan H(2), Eva P(3), Ondrej F(4), Michal H(5), Petra K(2), Jan P(2), Daniel R(2), Milan D(2), Jan B(6).

ABSTRACT

BACKGROUND: Refractory out-of-hospital cardiac arrest (OHCA) has a poor outcome. In patients, who cannot be rescued despite using advanced techniques like extracorporeal cardiopulmonary resuscitation (ECPR), organ donation may be considered. This study aims to evaluate, in refractory OHCA, how ECPR versus a standard-based approach allows organ donorship. **METHODS:** The Prague OHCA trial randomized adults with a witnessed refractory OHCA of presumed cardiac origin to either an ECPR-based or standard approach. Patients who died of brain death or those who died of primary circulatory reasons and were not candidates for cardiac transplantation or durable ventricle assist device were evaluated as potential organ donors by a transplant center. In this post-hoc analysis, the effect on organ donation rates and one-year organ survival in recipients was examined. **RESULTS:** Out of 256 enrolled patients, 75 (29%) died prehospitally or within 1 hour after admission and 107 (42%) during the hospital stay. From a total of 24 considered donors, 21 and 3 ($p=0.01$) were recruited from the ECPR vs standard approach arm, respectively. Fifteen brain-dead and none cardiac-dead subjects were ultimately accepted, 13 from the ECPR and two from the standard strategy group. A total of 36 organs were harvested. The organs were successfully transplanted into 34 recipients. All transplanted organs were fully functional, and none of the recipients died due to graft failure within the one-year period post-transplant. **CONCLUSION:** The ECPR-based approach in the refractory OHCA trial is associated with increased organ donorship and an excellent outcome of transplanted organs.

FEEDBACK

1. BMC Anesthesiol. 2023 Oct 5;23(1):334. doi: 10.1186/s12871-023-02304-9.

The effect of audiovisual feedback of monitor/defibrillators on percentage of appropriate compression depth and rate during cardiopulmonary resuscitation.

Lee H(1), Kim J(2), Joo S(1), Na SH(3), Lee S(4), Ko SB(5), Lee J(4), Oh SY(6), Ha EJ(7), Ryu HG(8).

ABSTRACT

BACKGROUND: High quality cardiopulmonary resuscitation (CPR) is one of the key elements of the survival chain in cardiac arrest. Audiovisual feedback of chest compressions have been suggested to be beneficial by increasing the quality of CPR in the simulated cardiac arrests. **METHODS:** A prospective before and after study was performed to investigate the effect of a real-time audiovisual feedback system on CPR quality during in-hospital cardiac arrest in intensive care units from November 2018 to February 2022. In the feedback period, CPR was performed with the aid of the

real-time audiovisual feedback system. The primary outcome was the percentage of compressions with both adequate depth (5.0-6.0 cm) and rate (100-120/minute). RESULTS: A total of 27,295 compressions in 30 cardiac arrests in the no-feedback period and 27,965 compressions in 30 arrests in the feedback period were analyzed. The percentage of compressions with both adequate depth and rate was 11.8% in the feedback period and 16.8% in the no-feedback period ($P < 0.01$). The percentage of compressions with adequate rate in the feedback period was lower than that in the no-feedback period (67.3% vs. 75.5%, $P < 0.01$). The percentage of beyond-target depth with the feedback was significantly higher than that without feedback (64.2% vs. 51.4%, $P < 0.01$). CONCLUSION: Real-time audiovisual feedback system did not increase CPR quality and was associated with a higher percentage of compression depth deeper than the recommended 5.0-6.0 cm. It is essential to explore more effective ways of implementing feedback in real clinical settings to improve of the quality of CPR.

DRUGS

1. J Cardiothorac Surg. 2023 Oct 6;18(1):271. doi: 10.1186/s13019-023-02376-1.

Changes in vital signs during adrenaline administration for hemostasis in intracordal injection: an observational study with a hypothetical design of endotracheal adrenaline administration in cardiopulmonary arrest.

Hasegawa T(1), Watanabe Y(2).

ABSTRACT

BACKGROUND: The background is that intravenous adrenaline administration is recommended for advanced cardiovascular life support in adults and endotracheal administration is given low priority. The reason is that the optimal dose of adrenaline in endotracheal administration is unknown, and it is ethically difficult to design studies of endotracheal adrenaline administration with non-cardiopulmonary arrest. We otolaryngologists think so because we administered adrenaline to the vocal folds for hemostasis after intracordal injection under local anesthesia, but have had few cases of vital changes. We hypothesized that examining vital signs before and after adrenaline administration for hemostasis would help determine the optimal dose of endotracheal adrenaline. **METHODS:** We retrospectively examined the medical records of 79 patients who visited our hospital from January 2018 to December 2020 and received adrenaline in the vocal folds and trachea for hemostasis by intracordal injection under local anesthesia to investigate changes in heart rate and systolic blood pressure before and after the injection. **RESULTS:** The mean heart rates before and after injection were 83.96 ± 18.51 (standard deviation) beats per minute (bpm) and 81.50 ± 15.38 (standard deviation) bpm, respectively. The mean systolic blood pressure before and after the injection were 138.13 ± 25.33 (standard deviation) mmHg and 135.72 ± 22.19 (standard deviation) mmHg, respectively. Heart rate and systolic blood pressure had P-values of 0.136, and 0.450, respectively, indicating no significant differences. **CONCLUSIONS:** Although this study was an observational, changes in vital signs were investigated assuming endotracheal adrenaline administration. The current recommended dose of adrenaline in endotracheal administration with cardiopulmonary arrest may not be effective. In some cases of cardiopulmonary arrest, intravenous and intraosseous routes of adrenaline administration may be difficult and the opportunity for resuscitation may be missed. Therefore, it is desirable to have many options for adrenaline administration. Therefore, if the optimal dose and efficacy of endotracheal adrenaline administration can be clarified, early adrenaline administration will be possible, which will improve return of spontaneous circulation (ROSC) and survival discharge rates.

TRAUMA

No articles identified.

VENTILATION

1. Am J Emerg Med. 2023 Sep 29:S0735-6757(23)00521-1. doi: 10.1016/j.ajem.2023.09.047. Online ahead of print.

Ventilation assisted feedback in out of hospital cardiac arrest: A case series.

Gerber S(1), Pourmand A(2), Sullivan N(3), Shapovalov V(3), Pourmand A(3).

ABSTRACT

Excessive ventilatory volumes and rates during cardiopulmonary resuscitation (CPR) can lead to adverse effects, such as elevated intrathoracic pressure and decreased coronary blood flow. The 2020 American Heart Association (AHA) guidelines acknowledge the value of real-time feedback devices in improving CPR performance. In this case series, three out-of-hospital cardiac arrest cases received ventilation feedback during prehospital resuscitation and the initial in-hospital care phase. In each case, a notable increase in ventilation rate and volume was observed following the transfer of care from emergency medical services to hospital staff. This deviation from established ventilation guidelines emphasizes the importance of monitoring and addressing ventilation strategy during the transition to hospital care. Existing evidence supports the importance of maintaining specific ventilation rates and tidal volumes during cardiac arrest to improve outcomes. We believe further research is essential to establish a definitive link between ventilation strategies and patient outcomes, ultimately enhancing resuscitation efforts and patient survival rates. Integrating real-time ventilation feedback devices both in and out of the hospital during cardiac arrest presents an opportunity for quality improvement and adherence to national standards.

2. Resuscitation. 2023 Oct 5:109991. doi: 10.1016/j.resuscitation.2023.109991. Online ahead of print.

Association of Small Adult Ventilation Bags with Return of Spontaneous Circulation in Out of Hospital Cardiac Arrest.

Snyder BD(1), Van Dyke MR(2), Walker RG(3), Latimer AJ(2), Grabman BC(4), Maynard C(5), Rea TD(2), Johnson NJ(2), Sayre MR(6), Counts CR(6).

ABSTRACT

INTRODUCTION: Little is known about the impact of tidal volumes delivered by emergency medical services (EMS) to adult patients with out-of-hospital cardiac arrest (OHCA). A large urban EMS system changed from standard adult ventilation bags to small adult bags. We hypothesized that the incidence of return of spontaneous circulation (ROSC) at the end of EMS care would increase after this change. **METHODS:** We performed a retrospective analysis evaluating adults treated with advanced airway placement for nontraumatic OHCA between January 1, 2015 and December 31, 2021. We compared rates of ROSC, ventilation rate, and mean end tidal carbon dioxide (ETCO₂) by minute before and after the smaller ventilation bag implementation using linear and logistic regression. **RESULTS:** Of the 1,994 patients included, 1,331 (67%) were treated with a small adult bag. ROSC at the end of EMS care was lower in the small bag cohort than the large bag cohort, 33% vs 40% (p=0.003). After adjustment, small bag use was associated with lower odds of ROSC at the end of EMS care [OR 0.74, 95% CI 0.61 - 0.91]. Ventilation rates did not differ between cohorts. ETCO₂ values were lower in the large bag cohort (33.2±17.2 mmHg vs. 36.9±19.2 mmHg, p<0.01). **CONCLUSION:** Use of a small adult bag during OHCA was associated with lower odds of ROSC at the end of EMS care. The effects on acid base status, hemodynamics, and delivered minute ventilation remain unclear and warrant additional study.

CEREBRAL MONITORING

1. Resuscitation. 2023 Oct 3:109984. doi: 10.1016/j.resuscitation.2023.109984. Online ahead of print.

Cognitive impairment and psychopathology in sudden out-of-hospital cardiac arrest survivors: Results from the REVIVAL cohort study.

Kirstine Wagner M(1), Kikkenborg Berg S(2), Hassager C(2), Borregaard B(3), Bernholdt Rasmussen T(4), Ekholm O(5), Siggaard Stenbæk D(6).

ABSTRACT

AIM: To investigate cognitive impairment and psychopathology in out-of-hospital cardiac arrest (OHCA) survivors using a screening procedure during hospitalisation and examine the evolution of these parameters at three-month follow-up. METHODS: This multicentre cohort study screened for cognitive impairment using the Montreal Cognitive Assessment (MoCA), for symptoms of anxiety, depression and traumatic distress using the Hospital Anxiety and Depression Scale (HADS) and the Impact of Event Scale-revised (IES-R) during hospitalisation. At three-month follow-up, we evaluated cognitive impairment with a neuropsychological test battery and symptoms of psychopathology were re-assessed using HADS and IES-R. Logistic regression models were applied to examine associations between screening results and outcomes. RESULTS: This study included 297 OHCA survivors. During hospitalisation, 65% presented with cognitive impairment, 25% reported symptoms of anxiety, 20% symptoms of depression and 21% symptoms of traumatic distress. At follow-up, 53% reported cognitive impairment, 17% symptoms of anxiety, 15% symptoms of depression and 19% symptoms of traumatic distress. Cognitive impairment during hospitalisation was associated with higher odds (OR (95% CI) 2.55 (1.36-4.75), $p = .02$) of an unfavorable cognitive outcome at follow-up, and symptoms of psychopathology during hospitalisation were associated with higher odds of psychopathology at follow-up across all three symptom groups; anxiety (6.70 (2.40-18.72), $p < .001$), depression (4.69 (1.69-13.02), $p < .001$) and traumatic distress (7.07 (2.67-18.73), $p < .001$). CONCLUSION: OHCA survivors exhibited both cognitive impairment and symptoms of psychopathology during hospitalisation comparable to previous studies, which were associated with unfavorable mental health outcomes at three-month follow-up.

2. Resusc Plus. 2023 Sep 26;16:100475. doi: 10.1016/j.resplu.2023.100475. eCollection 2023 Dec.

Quantitative pupillometry for neuroprognostication in comatose post-cardiac arrest patients: A protocol for a predefined sub-study of the Blood pressure and Oxygenations Targets after Out-of-Hospital Cardiac Arrest (BOX)-trial.

Nyholm B(1), Grand J(1), Obling LER(1), Hassager C(1)(2), Møller JE(1)(3)(4), Schmidt H(4)(5), Othman MH(6), Kondziella D(2)(6), Kjaergaard J(1)(2).

ABSTRACT

BACKGROUND: Resuscitation guidelines propose a multimodal prognostication strategy algorithm at ≥ 72 hours after the return of spontaneous circulation to evaluate neurological outcome for unconscious cardiac arrest survivors. Even though guidelines suggest quantitative pupillometry for assessing pupillary light reflex, threshold values are not yet validated. This study aims to validate pre-specified thresholds of quantitative pupillometry by quantitatively assessing the percentage reduction of pupillary size (qPLR) $< 4\%$ and Neurological Pupil index (NPI) ≤ 2 and in predicting unfavorable neurological outcome. Both as an isolated predictor and combined with guideline-suggested neuron-specific enolase (NSE) threshold $> 60 \mu\text{g L}^{-1}$ in the current prognostication strategy algorithm. METHODS: We conduct this pre-planned diagnostic sub-study in the randomized, controlled, multicenter clinical trial "Blood Pressure and Oxygenation Targets after Out-of-Hospital Cardiac Arrest-trial". Blinded to treating physicians and outcome assessors, measurements of qPLR and NPI are obtained from cardiac arrest survivors at time points (± 6 hours) of admission, after 24,

48, and 72 hours, or until the time of awakening or death. **DISCUSSION:** This study will be the largest prospective study investigating the predictive performance of automated quantitative pupillometry in unconscious patients resuscitated from cardiac arrest. We will test specific threshold values of NPi ≤ 2 and qPLR $< 4\%$ to predict unfavorable outcome following cardiac arrest. The validation of pupillometry alone and combined with NSE with the criteria of the current prognostication strategy algorithm will hopefully increase the level of evidence and support clinical neuroprognostication with automated quantitative pupillometry in unconscious post-cardiac arrest patients.

ULTRASOUND AND CPR

No articles identified.

ORGANISATION AND TRAINING

1. Afr J Emerg Med. 2023 Dec;13(4):281-286. doi: 10.1016/j.afjem.2023.09.008. Epub 2023 Sep 28.

The understandability and quality of telephone-guided bystander cardiopulmonary resuscitation in the Western Cape province of South Africa: A manikin-based study.

De Caires LP(1), Evans K(1), Stassen W(1).

ABSTRACT

BACKGROUND: The incidence of cardiovascular disease is on the increase in Africa and with it, an increase in the incidence of out-of-hospital cardiac arrest (OHCA). OHCA carries a high mortality, especially in low-resource settings. Interventions to treat OHCA, such as mass cardiopulmonary resuscitation (CPR) training campaigns are costly. One cost-effective and scalable intervention is telephone-guided bystander CPR (tCPR). Little data exists regarding the quality of tCPR. This study aimed to determine quality of tCPR in untrained members of the public. Participants were also asked to provide their views on the understandability of the tCPR instructions. **METHODS:** This study followed a prospective, simulation-based observational study design. Adult laypeople who have not had previous CPR training were recruited at public CPR training events and asked to perform CPR on a manikin. Quality was assessed in terms of hand placement, compression rate, compression depth, chest recoil, and chest exposure. tCPR instructions were provided by a trained medical provider, via loudspeaker. Participants were also asked to complete a short questionnaire afterwards, detailing the understandability of the tCPR instructions. Data were analysed descriptively and compared to recommended quality guidance. **RESULTS:** Fifty participants were enrolled. Hand placement was accurate in 74 % (n = 37) of participants, while compression depth and chest recoil only had compliance in 20 % (n = 10) and 24 % (n = 12) of participants, respectively. The mean compression rate was within guidelines in just under half (48 %, n = 24) of all participants. Only 20 (40 %) participants exposed the manikin's chest. Only 46 % (n = 23) of participants felt that the overall descriptions offered during the tCPR guidance were understandable, while 80 % (n = 40) and 36 % (n = 18) felt that the instructions on hand placement and compression rate were understandable, respectively. Lastly, 94 % (n = 47) of participants agreed that they would be more likely to perform bystander CPR if they were provided with tCPR. **CONCLUSION:** The quality of CPR performed by laypersons is generally suboptimal and this may affect patient outcomes. There is an urgent need to develop more understandable tCPR algorithms that may encourage bystanders to start CPR and optimise its quality.

2. Resusc Plus. 2023 Sep 25;16:100469. doi: 10.1016/j.resplu.2023.100469. eCollection 2023 Dec.

A roadmap to building first responder networks: Lessons learned and best practices from Belgium and Switzerland.

Moens E(1), Degraeuwe E(1)(2)(3), Caputo Maria L(4)(5), Cresta R(5), Arys R(3), Van Moorter N(3)(6), Tackaert T(1)(2)(3), Benvenuti C(5), Auricchio A(4)(5), Vercammen S(3).

ABSTRACT

BACKGROUND/AIMS: Limited bystander assistance and delayed emergency medical service arrival reduce the chances of survival in cardiac arrest victims. Early basic life support through trained first responders (FR) and automatic external defibrillation both improve the outcome. Well-organized FR networks have shown promise, but guidance on effective implementation is lacking. This study evaluates two FR networks, in Belgium and in Switzerland, to identify main advancements in the development of such systems. **METHOD:** Direct comparison is made of the barriers and facilitators in the development of both FR systems from 2006 up until December 2022, and summarized within a roadmap. **RESULTS:** The Roadmap comprises four integral steps: exploration, installation, initiation, and implementation. Exploration involves understanding the national legislation, engaging with advisory bodies, and establishing local steering committees. The installation phase focuses on FR recruitment, engaging specific professional groups such as firemen, registering public Automated External Defibrillators (AEDs), and requesting feedback. The initiation step includes implementing improvement cycles and fidelity measures. Finally, implementation expands the network, leading to increased survival rates and the integration of these practices into legislation. A significant focus is placed on FR's psychological wellbeing. Moreover, the roadmap highlights the use of efficient geo-mapping to simplify optimal AED placement and automatically assign FRs to tasks. **CONCLUSION:** The importance of FR networks for early resuscitation is increasingly recognized and various systems are being developed. Key developmental strategies of the EVapp and Ticino Cuore app system may serve as a roadmap for other systems and implementations within Europe and beyond.

3. Resuscitation. 2023 Sep 29:109985. doi: 10.1016/j.resuscitation.2023.109985. Online ahead of print.

Mortality and Healthcare Resource Utilization After Cardiac Arrest in the United States: A Decade of Unclear Progress and Stark Disparities.

Bowman JK(1), Tulskey JA(2), Ouchi K(3).

NO ABSTRACT AVAILABLE

4. Rev Esp Cardiol (Engl Ed). 2023 Oct;76(10):826-828. doi: 10.1016/j.rec.2023.04.013. Epub 2023 Aug 4.

Time trend, willingness and knowledge of law enforcement agencies officers to act as first responders in out-of-hospital cardiac arrests.

[Article in English, Spanish]

Pérez-Regueiro I(1), Carcedo-Argüelles L(2), Menéndez-Angulo P(3), Guinea-Rivera R(4), Lana A(5).

NO ABSTRACT AVAILABLE

5. Resuscitation. 2023 Oct 5:109989. doi: 10.1016/j.resuscitation.2023.109989. Online ahead of print.

Expert consensus on training and accreditation for extracorporeal cardiopulmonary resuscitation an international, multidisciplinary modified Delphi Study.

Kruit N(1), Burrell A(2), Tian D(3), Barrett N(4), Bělohávek J(5), Bernard S(6), Braude D(7), Buscher H(8), Chen YS(9), Donker DW(10), Finney S(11), Forrest P(12), Fowles JA(13), Hifumi T(14), Hodgson C(15), Hutin A(16), Inoue A(17), Jung JS(18), Kruse JM(19), Lamhaut L(20), Ming-Hui Lin R(21), Reis Miranda D(22), Müller T(23), Bhagyalakshmi Nanjayya V(24), Nickson C(25), Pellegrino V(26),

Plunkett B(27), Richardson C(28), Alexander Richardson S(29), Shekar K(30), Shinar Z(31), Singer B(32), Stub D(33), Totaro RJ(34), Vuylsteke A(35), Yannopoulos D(36), Zakhary B(37), Dennis M(38).

ABSTRACT

BACKGROUND: A multidisciplinary group of stakeholders were used to identify: (1) the core competencies of a training program required to perform in-hospital ECPR initiation (2) additional competencies required to perform pre-hospital ECPR initiation and; (3) the optimal training method and maintenance protocol for delivering an ECPR program. **METHODS:** A modified Delphi process was undertaken utilising two web based survey rounds and one virtual meeting. Experts rated the importance of different aspects of ECPR training, competency and governance on a 9-point Likert scale. A diverse, representative group was targeted. Consensus was achieved when greater than 70% respondents rated a domain as critical (> or = 7 on the 9 point Likert scale). **RESULTS:** 35 international ECPR experts from 9 countries formed the expert panel, with a median number of 14 years of ECMO practice (interquartile range 11-38). Participant response rates were 97% (survey round one), 63% (virtual meeting) and 100% (survey round two). After the second round of the survey, 47 consensus statements were formed outlining a core set of competencies required for ECPR provision. We identified key elements required to safely train and perform ECPR including skill pre-requisites, surrogate skill identification, the importance of competency-based assessment over volume of practice and competency requirements for successful ECPR practice and skill maintenance. **CONCLUSIONS:** We present a series of core competencies, training requirements and ongoing governance protocols to guide safe ECPR implementation. These findings can be used to develop training syllabus and guide minimum standards for competency as the growth of ECPR practitioners continues.

6. Resusc Plus. 2023 Sep 26;16:100463. doi: 10.1016/j.resplu.2023.100463. eCollection 2023 Dec.

Outcomes of medical students training schoolchildren of ages 13-18 in cardiopulmonary resuscitation: A systematic review.

Li P(1), Milkovic A(1), Morley P(1)(2), Ng L(1).

ABSTRACT

BACKGROUND: Training schoolchildren in cardiopulmonary resuscitation (CPR) can increase the number of qualified people in the community, which in turn can improve survival rates of out-of-hospital cardiac arrests (OHCA). Medical students could be a valuable resource for providing the training. This systematic review aims to determine the outcomes of medical students providing CPR training to schoolchildren, aged 13-18 (who are thought to have the strength for effective chest compression), specifically CPR skills for both and non-technical skills such as communication and leadership for medical students. **METHODS:** A literature search of academic databases was conducted on 5 July 2023 using the following keywords: cardiopulmonary resuscitation, basic life support, medical students and high/middle/secondary school students. For the purpose of this review, "schoolchildren" refer to those aged 13-18. Studies were included where the primary focus was medical students teaching CPR to schoolchildren. The studies were critically appraised using the Medical Education Research Study Quality Instrument (MERSQI) tool and outcomes categorised by Kirkpatrick's Levels. **RESULTS:** Eleven studies were included, six randomised controlled trials and five cohort studies, with 1670 schoolchildren and 355 medical students as participants. Eight studies examined outcomes targeting schoolchildren, two examined outcomes for medical students and one examined both. Four of the eleven studies used validated outcome measures. Only outcomes at Kirkpatrick Level 1 and 2 were found, and all outcomes for both schoolchildren and medical students were positive. Schoolchildren showed improvements in theoretical and practical elements of CPR post-training, while medical students demonstrated improved professional practice skills such as leadership and mentorship as well as improvements in

their own CPR skills post-teaching. CONCLUSIONS: Schoolchildren can effectively acquire CPR skills through being trained by medical students, who themselves also benefit from improved CPR and professional practice skills after teaching. Further studies with robust methodology such as multi-site randomised controlled trials, the use of consistent and validated outcome measures, and the measurement of outcomes at higher Kirkpatrick levels to determine the impact on bystander CPR rates and community OHCA survival rates, are needed.

POST-CARDIAC ARREST TREATMENTS

1. Zhonghua Wei Zhong Bing Ji Jiu Yi Xue. 2023 Sep;35(9):958-962. doi: 10.3760/cma.j.cn121430-20230207-00066.

[Prognostic value of hemoglobin-to-red cell distribution width ratio in patients with cardiopulmonary resuscitation after out-of-hospital cardiac arrest].

[Article in Chinese]

Wang H(1), Lan C, Luo Y, Zhang T.

ABSTRACT

OBJECTIVE: To investigate the prognostic value of hemoglobin-to-red cell distribution width ratio (HRR) in patients with cardiopulmonary resuscitation (CPR) after out-of-hospital cardiac arrest (OHCA). **METHODS:** A retrospective study was conducted. Patients aged ≥ 18 years with OHCA who were transferred to intensive care unit (ICU) after successful CPR from the emergency room of the First Affiliated Hospital of Zhengzhou University from August 2016 to February 2022 were enrolled. General clinical data, initial vital signs, acute physiology and chronic health evaluation II (APACHE II), Glasgow coma scale (GCS), first laboratory indicators after admission to ICU [including white blood cell count (WBC), red blood cell count (RBC), hemoglobin (Hb), pH value, lactic acid (Lac), 6-hour lactic acid clearance (LCR), red cell distribution width (RDW), HRR], length of ICU stay were collected. According to whether the patients died in hospital, the patients were divided into survival group and death group. Binary Logistic regression was used to analyze the independent factors influencing the prognosis of patients after CPR. Receiver operator characteristic curve (ROC curve) was drawn to analyze the predictive value of independent influencing factors for the prognosis of patients after CPR. **RESULTS:** A total of 122 patients were enrolled after OHCA CPR, of which 88 died in hospital, the in-hospital mortality was 72.13%. There were no significant differences in age, past medical history, initial vital signs and WBC in ICU between the two groups. Compared with the death group, the survival group had higher GCS score, RBC, Hb, pH value, 6-hour LCR, HRR, lower APACHE II score, Lac, RDW level, and longer length of ICU stay. Multivariate Logistic regression analysis showed that APACHE II score, GCS score, 6-hour LCR, HRR, length of ICU stay were independent factors influencing the prognosis of patients after CPR [APACHE II score: odds ratio (OR) = 0.784, 95% confidence interval (95%CI) was 0.683-0.901, $P = 0.001$; GCS score: OR = 1.390, 95%CI was 1.059-1.823, $P = 0.018$; 6-hour LCR: OR = 1.039, 95%CI was 1.015-1.064, $P = 0.001$; HRR: OR = 2.047, 95%CI was 1.383-3.029, $P < 0.001$; length of ICU stay: OR = 1.128, 95%CI was 1.046-1.216, $P = 0.002$]. ROC curve analysis showed that HRR, 6-hour LCR and APACHE II score could predict the prognosis of patients after CPR. The sensitivity was 85.3% and the specificity was 54.5% when the area under the ROC curve (AUC) of HRR was 0.731, and the cut-off value was 8.555. The sensitivity was 88.2% and the specificity was 46.6%, when the AUC of 6-hour LCR was 0.701, and the cut-off value was 28.947%. The sensitivity was 73.9% and the specificity was 79.4% when the AUC of APACHE II score was 0.848, the cut-off value was 22.000. The predictive value of the combination of HRR and 6-hour LCR was higher than that of a single index. The sensitivity was 79.3% and the specificity was 76.1%, when the AUC was 0.796, the cut-off value was 0.296. **CONCLUSIONS:** HRR, 6-hour LCR and APACHE II score have high prognostic value in patients with OHCA after CPR. $HRR < 8.555$, 6-hour LCR $< 28.947\%$ and APACHE II score > 22.000 indicated poor prognosis.

2. Crit Care. 2023 Oct 5;27(1):387. doi: 10.1186/s13054-023-04669-2.

Restrictive versus high-dose oxygenation strategy in post-arrest management following adult non-traumatic cardiac arrest: a meta-analysis.

Macherey-Meyer S(1), Heyne S(2), Meertens MM(2)(3), Braumann S(2), Hueser C(4)(5), Mauri V(2), Baldus S(2), Lee S(2), Adler C(2).

ABSTRACT

PURPOSE: Neurological damage is the main cause of death or withdrawal of care in comatose survivors of cardiac arrest (CA). Hypoxemia and hyperoxemia following CA were described as potentially harmful, but reports were inconsistent. Current guidelines lack specific oxygen targets after return of spontaneous circulation (ROSC). **OBJECTIVES:** The current meta-analysis assessed the effects of restrictive compared to high-dose oxygenation strategy in survivors of CA. **METHODS:** A structured literature search was performed. Randomized controlled trials (RCTs) comparing two competing oxygenation strategies in post-ROSC management after CA were eligible. The primary end point was short-term survival (≤ 90 days). The meta-analysis was prospectively registered in PROSPERO database (CRD42023444513). **RESULTS:** Eight RCTs enrolling 1941 patients were eligible. Restrictive oxygenation was applied to 964 patients, high-dose regimens were used in 977 participants. Short-term survival rate was 55.7% in restrictive and 56% in high-dose oxygenation group (8 trials, RR 0.99, 95% CI 0.90 to 1.10, $P = 0.90$, $I^2 = 18\%$, no difference). No evidence for a difference was detected in survival to hospital discharge (5 trials, RR 0.98, 95% CI 0.79 to 1.21, $P = 0.84$, $I^2 = 32\%$). Episodes of hypoxemia more frequently occurred in restrictive oxygenation group (4 trials, RR 2.06, 95% CI 1.47 to 2.89, $P = 0.004$, $I^2 = 13\%$). **CONCLUSION:** Restrictive and high-dose oxygenation strategy following CA did not result in differences in short-term or in-hospital survival. Restrictive oxygenation strategy may increase episodes of hypoxemia, even with restrictive oxygenation targets exceeding intended saturation levels, but the clinical relevance is unknown. There is still a wide gap in the evidence of optimized oxygenation in post-ROSC management and specific targets cannot be concluded from the current evidence.

3. Circulation. 2023 Oct 4. doi: 10.1161/CIRCULATIONAHA.123.066012. Online ahead of print.

Blood Pressure and Oxygen Targets on Kidney Injury After Cardiac Arrest.

Rasmussen SB(1), Jeppesen KK(2), Kjaergaard J(3)(4), Hassager C(3)(4), Schmidt H(1)(5), Mølstrøm S(1), Beske RP(3), Grand J(3), Ravn HB(1)(5), Winther-Jensen M(3), Stengaard Meyer MA(1), Møller JE(2)(3)(5).

ABSTRACT

BACKGROUND: Acute kidney injury (AKI) represents a common and serious complication to out-of-hospital cardiac arrest. The importance of post-resuscitation care targets for blood pressure and oxygenation for the development of AKI is unknown. **METHODS:** This is a substudy of a randomized 2-by-2 factorial trial, in which 789 comatose adult patients who had out-of-hospital cardiac arrest with presumed cardiac cause and sustained return of spontaneous circulation were randomly assigned to a target mean arterial blood pressure of either 63 or 77 mm Hg. Patients were simultaneously randomly assigned to either a restrictive oxygen target of a partial pressure of arterial oxygen (P_{aO_2}) of 9 to 10 kPa or a liberal oxygenation target of a P_{aO_2} of 13 to 14 kPa. The primary outcome for this study was AKI according to KDIGO (Kidney Disease: Improving Global Outcomes) classification in patients surviving at least 48 hours ($N=759$). Adjusted logistic regression was performed for patients allocated to high blood pressure and liberal oxygen target as reference. **RESULTS:** The main population characteristics at admission were: age, 64 (54-73) years; 80% male; 90% shockable rhythm; and time to return of spontaneous circulation, 18 (12-26) minutes. Patients allocated to a low blood pressure and liberal oxygen target had an increased risk of developing AKI compared with patients with high blood pressure and liberal oxygen target (84/193 [44%] versus 56/187 [30%]; adjusted odds ratio, 1.87 [95% CI, 1.21-2.89]). Multinomial logistic regression revealed that the increased risk of AKI was only related to mild-stage AKI (KDIGO stage 1). There was no difference in risk of AKI in the other groups. Plasma creatinine remained high during hospitalization

in the low blood pressure and liberal oxygen target group but did not differ between groups at 6- and 12-month follow-up. **CONCLUSIONS:** In comatose patients who had been resuscitated after out-of-hospital cardiac arrest, patients allocated to a combination of a low mean arterial blood pressure and a liberal oxygen target had a significantly increased risk of mild-stage AKI. No difference was found in terms of more severe AKI stages or other kidney-related adverse outcomes, and creatinine had normalized at 1 year after discharge.

4. Resuscitation. 2023 Sep 29:109983. doi: 10.1016/j.resuscitation.2023.109983. Online ahead of print.

Neurofilament Light Chain and Glial Fibrillary Acidic Protein as early prognostic biomarkers after Out-of-hospital cardiac arrest.

Klitholm M(1), Nørgaard Jeppesen A(2), Christensen S(3), Parkner T(4), Tybirk L(5), Kirkegaard H(6), Sandfeld-Paulsen B(7), Morten Grejs A(3).

ABSTRACT

AIMS: Neurofilament Light Chain (NfL) and Glial Fibrillary Acidic Protein (GFAP) are proteins released into the bloodstream upon hypoxic brain injury. We evaluated the biokinetics and examined the prognostic performance of serum NfL and GFAP in comatose out-of-hospital cardiac arrest (OHCA) patients. Furthermore, we compared the prognostic performance to that of serum Neuron Specific Enolase (NSE). **METHODS:** This is a sub-study of the "Targeted temperature management for 48 vs 24 hours" (NCT01689077) trial. NfL and GFAP serum values from 82 patients were examined in blood samples collected at 24, 48 and 72 hours (h) after reaching target temperature of 33±1°C. This temperature was reached within a median of 281-320 minutes after intensive care unit admission. GFAP was analysed at 48 and 72h. The neuroprognostic performance of NfL and GFAP was evaluated after 6 months follow-up. **RESULTS:** NfL and GFAP values were significantly higher in patients with a poor outcome (Cerebral Performance Category (CPC) score 3-5) vs. good outcome (CPC 1-2). NfL 24h: 1371.5 (462.0; 2125.1) vs. 24.8 (14.0; 61.6). GFAP 48h: 1285.3 (843.9; 2236.7) vs. 361.2 (200.4; 665.6) (both p<0.001). Both biomarkers were promising markers of poor functional outcome at 24 and 48h respectively: NfL 24h: AUROC 0.95 (95% CI: 0.91-1.00). GFAP 48h: AUROC 0.88 (95% CI: 0.81-0.96). NfL and GFAP both predicted outcome better than NSE at 48h (both p<0.01). At 72h NfL but not GFAP outperformed NSE (p=0.01). **CONCLUSION:** Serum NfL and GFAP may be strong biomarkers of poor functional outcome after OHCA from an early timepoint.

TARGETED TEMPERATURE MANAGEMENT

1. Cardiovasc Revasc Med. 2023 Sep 28:S1553-8389(23)00827-8. doi:10.1016/j.carrev.2023.09.008. Online ahead of print.

Long-term survival after cardiac arrest in patients undergoing emergent coronary angiography.

Vidal-Calés P(1), Ortega-Paz L(2), Brugaletta S(1), García J(1), Rodés-Cabau J(1), Angiolillo DJ(2), Regueiro A(1), Freixa X(1), Abdul-Jawad O(1), Cepas-Guillén PL(1), Andrea R(1), de Diego O(1), Tizón-Marcos H(3), Tomás-Querol C(4), Gómez-Hospital JA(5), Carrillo X(6), Cárdenas M(7), Rojas S(8), Muñoz-Camacho JF(9), García-Picart J(10), Lidón RM(11), Sabaté M(12).

ABSTRACT

AIM: To determine long-term survival of patients after cardiac arrest undergoing emergent coronary angiography and therapeutic hypothermia. **METHODS:** We analysed data from patients treated within the regional STEMI Network from January 2015 to December 2020. The primary endpoint was all-cause mortality at median follow-up. Secondary endpoints were periprocedural complications (arrhythmias, pulmonary edema, cardiogenic shock, mechanical complication, stent thrombosis, reinfarction, bleeding) and 6-month all-cause death. A landmark analysis was performed, studying two time periods; 0-6 months and beyond 6 months. **RESULTS:** From a total of 24,125 patients in the regional STEMI network, 494 patients who suffered from cardiac arrest were included and divided

into two groups: treated with (n = 119) and without therapeutic hypothermia (n = 375). At median follow-up (16.0 [0.2-33.3] months), there was no difference in the adjusted mortality rate between groups (51.3 % with hypothermia vs 48.0 % without hypothermia; HRadj1.08 95%CI [0.77-1.53]; p = 0.659). There was a higher frequency of bleeding in the hypothermia group (6.7 % vs 1.1 %; ORadj 7.99 95%CI [2.05-31.2]; p = 0.002), without difference for the rest of periprocedural complications. At 6-month follow-up, adjusted all-cause mortality rate was similar between groups (46.2 % with hypothermia vs 44.5 % without hypothermia; HRadj1.02 95%CI [0.71-1.47]; p = 0.900). Also, no differences were observed in the adjusted mortality rate between 6 months and median follow-up (9.4 % with hypothermia vs 6.3 % without hypothermia; HRadj2.02 95%CI [0.69-5.92]; p = 0.200). **CONCLUSIONS:** In a large cohort of patients with cardiac arrest within a regional STEMI network, those treated with therapeutic hypothermia did not improve long-term survival compared to those without hypothermia.

2. Ther Hypothermia Temp Manag. 2023 Oct 4. doi: 10.1089/ther.2023.0018. Online ahead of print. Factors Associated with Favorable Outcomes in Cardiac Arrest and Target Temperature Management.

Kimura N(1), Nishimura Y(1), Chung-Esaki H(1).

ABSTRACT

Current guidelines strongly recommend providing targeted temperature management (TTM) after cardiac arrest, but hypothalamic dysregulation may confound TTM's impact on a patient's ultimate outcome. Although time to reach target temperature has largely been viewed as a process measure for TTM protocols, the difference between initial presenting temperature and target temperature (Δ -temperature) may be a potential surrogate marker of hypothalamic dysregulation. We performed a retrospective observational study to explore whether Δ -temperature was associated with neurologic outcomes and mortality. We included 86 patients (53 with out-of-hospital cardiac arrest [OHCA] and 33 with in-hospital cardiac arrest [IHCA]) in our analysis; more than half of the patients were cooled to 33°C (56.9% in OHCA and 57.6% in IHCA). In univariate logistic regression analysis, Δ -temperature alone did not appear to be statistically associated with mortality or neurologic outcomes regardless of target temperature. In exploratory analysis, longer time from TTM initiation-to-target was associated with worse neurological outcomes in the 33°C target (odds ratio = 0.996, 95% confidence interval = 0.992-1.000). Further research investigating the impact of hypothalamic dysregulation and Δ -temperature as well as the rate of cooling may be warranted to elucidate additional factors contributing to outcomes after cardiac arrest. In addition, our study population was noted to have a higher proportion of Asians and Native Hawaiians/Pacific Islanders, with a potential disparity in outcomes. Future studies may be warranted to ensure generalizability of TTM protocols and findings across populations.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

No articles identified.

PEDIATRICS AND CHILDREN

1. Crit Care. 2023 Oct 7;27(1):388. doi: 10.1186/s13054-023-04662-9.

Identification of post-cardiac arrest blood pressure thresholds associated with outcomes in children: an ICU-Resuscitation study.

Gardner MM(1), Hehir DA(2), Reeder RW(3), Ahmed T(4), Bell MJ(5), Berg RA(2), Bishop R(6), Bochkoris M(7), Burns C(8), Carcillo JA(7), Carpenter TC(6), Dean JM(3), Diddle JW(2), Federman M(9), Fernandez R(10), Fink EL(7), Franzon D(11), Frazier AH(12), Friess SH(13), Graham K(2), Hall M(10), Harding ML(3), Horvat CM(7), Huard LL(9), Maa T(10), Manga A(13), McQuillen PS(11), Meert KL(4), Morgan RW(2), Mourani PM(14), Nadkarni VM(2), Naim MY(2), Notterman D(15), Pollack MM(5), Sapru A(9), Schneiter C(6), Sharron MP(5), Srivastava N(9), Tilford B(4), Viteri S(16), Wessel D(5), Wolfe HA(2), Yates AR(10), Zuppa AF(2), Sutton RM(2), Topjian AA(2).

ABSTRACT

INTRODUCTION: Though early hypotension after pediatric in-hospital cardiac arrest (IHCA) is associated with inferior outcomes, ideal post-arrest blood pressure (BP) targets have not been established. We aimed to leverage prospectively collected BP data to explore the association of post-arrest BP thresholds with outcomes. We hypothesized that post-arrest systolic and diastolic BP thresholds would be higher than the currently recommended post-cardiopulmonary resuscitation BP targets and would be associated with higher rates of survival to hospital discharge. **METHODS:** We performed a secondary analysis of prospectively collected BP data from the first 24 h following return of circulation from index IHCA events enrolled in the ICU-RESUSCitation trial (NCT02837497). The lowest documented systolic BP (SBP) and diastolic BP (DBP) were percentile-adjusted for age, height and sex. Receiver operator characteristic curves and cubic spline analyses controlling for illness category and presence of pre-arrest hypotension were generated exploring the association of lowest post-arrest SBP and DBP with survival to hospital discharge and survival to hospital discharge with favorable neurologic outcome (Pediatric Cerebral Performance Category of 1-3 or no change from baseline). Optimal cutoffs for post-arrest BP thresholds were based on analysis of receiver operator characteristic curves and spline curves. Logistic regression models accounting for illness category and pre-arrest hypotension examined the associations of these thresholds with outcomes. **RESULTS:** Among 693 index events with 0-6 h post-arrest BP data, identified thresholds were: SBP > 10th percentile and DBP > 50th percentile for age, sex and height. Fifty-one percent (n = 352) of subjects had lowest SBP above threshold and 50% (n = 346) had lowest DBP above threshold. SBP and DBP above thresholds were each associated with survival to hospital discharge (SBP: aRR 1.21 [95% CI 1.10, 1.33]; DBP: aRR 1.23 [1.12, 1.34]) and survival to hospital discharge with favorable neurologic outcome (SBP: aRR 1.22 [1.10, 1.35]; DBP: aRR 1.27 [1.15, 1.40]) (all p < 0.001). **CONCLUSIONS:** Following pediatric IHCA, subjects had higher rates of survival to hospital discharge and survival to hospital discharge with favorable neurologic outcome when BP targets above a threshold of SBP > 10th percentile for age and DBP > 50th percentile for age during the first 6 h post-arrest.

EXTRACORPOREAL LIFE SUPPORT

1. J Intensive Care. 2023 Oct 6;11(1):43. doi: 10.1186/s40560-023-00692-1.

Long-term prognostic significance of gasping in out-of-hospital cardiac arrest patients undergoing extracorporeal cardiopulmonary resuscitation: a post hoc analysis of a multi-center prospective cohort study.

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ABSTRACT

BACKGROUND: Gasping during resuscitation has been reported as a favorable factor for out-of-hospital cardiac arrest. We examined whether gasping during resuscitation is independently

associated with favorable neurological outcomes in patients with refractory ventricular fibrillation or pulseless ventricular tachycardia (VF/pVT) undergoing extracorporeal cardiopulmonary resuscitation ECPR. METHODS: Data from a 2014 study on advanced cardiac life support for ventricular fibrillation with extracorporeal circulation in Japan (SAVE-J), which examined the efficacy of ECPR for refractory VF/pVT, were analyzed. The primary endpoint was survival with a 6-month favorable neurological outcome in patients who underwent ECPR with or without gasping during resuscitation. Multivariate logistic regression analysis was performed to evaluate the association between gasping and outcomes. RESULTS: Of the 454 patients included in the SAVE-J study, data from 212 patients were analyzed in this study after excluding those with missing information and those who did not undergo ECPR. Gasping has been observed in 47 patients during resuscitation; 11 (23.4%) had a favorable neurological outcome at 6 months. Multivariate logistic regression analysis showed that gasping during resuscitation was independently associated with a favorable neurological outcome (odds ratio [OR], 10.58 [95% confidence interval (CI) 3.22-34.74]). The adjusted OR for gasping during emergency medical service transport and on arrival at the hospital was 27.44 (95% CI 5.65-133.41). CONCLUSIONS: Gasping during resuscitation is a favorable factor in patients with refractory VF/pVT. Patients with refractory VF/pVT with continuously preserved gasping during EMS transportation to the hospital are expected to have more favorable outcomes.

2. Eur J Emerg Med. 2023 Oct 6. doi: 10.1097/MEJ.0000000000001092. Online ahead of print.

Eligibility of cardiac arrest patients for extracorporeal cardiopulmonary resuscitation and their clinical characteristics: a retrospective two-centre study.

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ABSTRACT

BACKGROUND AND IMPORTANCE: Sudden cardiac arrest has a high incidence and often leads to death. A treatment option that might improve the outcomes in refractory cardiac arrest is Extracorporeal Cardiopulmonary Resuscitation (ECPR). OBJECTIVES: This study investigates the number of in-hospital cardiac arrest (IHCA) and out-of-hospital cardiac arrest (OHCA) patients eligible to ECPR and identifies clinical characteristics that may help to identify which patients benefit the most from ECPR. DESIGN, SETTINGS AND PARTICIPANTS: A retrospective two-centre study was conducted in Rotterdam, the Netherlands. All IHCA and OHCA patients between 1 January 2017 and 1 January 2020 were screened for eligibility to ECPR. The primary outcome was the percentage of patients eligible to ECPR and patients treated with ECPR. The secondary outcome was the comparison of the clinical characteristics and outcomes of patients eligible to ECPR treated with conventional Cardiopulmonary Resuscitation (CCPR) vs. those of patients treated with ECPR. MAIN RESULTS: Out of 1246 included patients, 412 were IHCA patients and 834 were OHCA patients. Of the IHCA patients, 41 (10.0%) were eligible to ECPR, of whom 20 (48.8%) patients were actually treated with ECPR. Of the OHCA patients, 83 (9.6%) were eligible to ECPR, of whom 23 (27.7%) were actually treated with ECPR. In the group IHCA patients eligible to ECPR, no statistically significant difference in survival was found between patients treated with CCPR and patients treated with ECPR (hospital survival 19.0% vs. 15.0% respectively, 4.0% survival difference 95% confidence interval - 21.3 to 28.7%). In the group OHCA patients eligible to ECPR, no statistically significant difference in-hospital survival was found between patients treated with CCPR and patients treated with ECPR (13.3% vs. 21.7% respectively, 8.4% survival difference 95% confidence interval -30.3 to 10.2%). CONCLUSION: This retrospective study shows that around 10% of cardiac arrest patients are eligible to ECPR. Less than half of these patients eligible to ECPR were actually treated with ECPR in both IHCA and OHCA.

3. Crit Care Med. 2023 Sep 29. doi: 10.1097/CCM.0000000000006039. Online ahead of print.

Extracorporeal Membrane Oxygenation for Cardiac Arrest: Does Age Matter?

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ABSTRACT

OBJECTIVES: The impact of age on hospital survival for patients treated with extracorporeal cardiopulmonary resuscitation (ECPR) for cardiac arrest (CA) is unknown. We sought to characterize the association between older age and hospital survival after ECPR, using a large international database. **DESIGN:** Retrospective analysis of the Extracorporeal Life Support Organization registry. **PATIENTS:** Patients 18 years old or older who underwent ECPR for CA between December 1, 2016, and October 31, 2020. **MEASUREMENTS AND MAIN RESULTS:** The primary outcome was adjusted odds ratio (aOR) of death after ECPR, analyzed by age group (18-49, 50-64, 65-74, and > 75 yr). A total of 5,120 patients met inclusion criteria. The median age was 57 years (interquartile range, 46-66 yr). There was a significantly lower aOR of survival for those 65-74 (0.68; 95% CI, 0.57-0.81) or those greater than 75 (0.54; 95% CI, 0.41-0.69), compared with 18-49. Patients 50-64 had a significantly higher aOR of survival compared with those 65-74 and greater than 75; however, there was no difference in survival between the two youngest groups (aOR, 0.91; 95% CI, 0.79-1.05). A sensitivity analysis using alternative age categories (18-64, 65-69, 70-74, and ≥ 75) demonstrated decreased odds of survival for age greater than or equal to 65 compared with patients younger than 65 (for age 65-69: odds ratio [OR], 0.71; 95% CI, 0.59-0.86; for age 70-74: OR, 0.84; 95% CI, 0.67-1.04; and for age ≥ 75 : OR, 0.64; 95% CI, 0.50-0.81). **CONCLUSIONS:** This investigation represents the largest analysis of the relationship of older age on ECPR outcomes. We found that the odds of hospital survival for patients with CA treated with ECPR diminishes with increasing age, with significantly decreased odds of survival after age 65, despite controlling for illness severity and comorbidities. However, findings from this observational data have significant limitations and further studies are needed to evaluate these findings prospectively.

4. Resusc Plus. 2023 Sep 26;16:100476. doi: 10.1016/j.resplu.2023.100476. eCollection 2023 Dec.

Association between neuromuscular blocking agent use and outcomes among out-of-hospital cardiac arrest patients treated with extracorporeal cardiopulmonary resuscitation and target temperature management: A secondary analysis of the SAVE-J II study.

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ABSTRACT

BACKGROUND: Neuromuscular blocking agents are used to control shivering in cardiac arrest patients treated with target temperature management. However, their effect on outcomes in patients treated with extracorporeal cardiopulmonary resuscitation is unclear. **METHODS:** This study was a secondary analysis of the SAVE-J II study, a retrospective multicenter study of 2175 out-of-hospital cardiac arrest patients treated with extracorporeal cardiopulmonary resuscitation in Japan. We classified patients into those who received neuromuscular blocking agents and those who did not and compared in-hospital mortality and incidence rates of favorable neurological outcome and in-hospital pneumonia between the groups using multivariable regression models and stabilized inverse probability weighting with propensity scores. **RESULTS:** Six hundred sixty patients from the SAVE-J II registry were analyzed. Neuromuscular blocking agents were used in 451 patients (68.3%). After adjusting for potential confounders, neuromuscular blocking agents use was not significantly associated with in-hospital mortality (aHR 0.88; 95% CI, 0.67-1.14), favorable neurological outcome (aOR 0.85; 95% CI, 0.60-1.11), or pneumonia (aOR 1.52; 95% CI, 0.85-2.71). The results for in-hospital mortality (aHR 0.89; 95% CI, 0.64-1.25), favorable neurological outcome (aOR 0.94; 95% CI, 0.59-1.48) and pneumonia (aOR 1.59; 95% CI, 0.74-3.41) were similar after weighting was performed. **CONCLUSIONS:** Although data on the rationale for using neuromuscular blocking agents were unavailable, their use was not significantly associated with outcomes in out-of-hospital cardiac arrest patients treated with extracorporeal cardiopulmonary resuscitation and targeted temperature

management. Neuromuscular blocking agents should be used based on individual clinical indications.

5. Resuscitation. 2023 Sep 30:109981. doi: 10.1016/j.resuscitation.2023.109981. Online ahead of print.

Coronary features across the spectrum of out-of-hospital cardiac arrest with ST-elevation myocardial infarction (CAD-OHCA study).

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ABSTRACT

AIM: We hypothesized that adult patients with out-of-hospital cardiac arrest (OHCA) and ST-elevation myocardial infarction (STEMI) requiring prolonged resuscitation have more severe coronary artery disease (CAD) than those responding rapidly, and more severe CAD than patients with STEMI without OHCA. METHODS: Consecutive conscious and comatose OHCA patients with STEMI after reestablishment of spontaneous circulation (ROSC), and patients with refractory OHCA undergoing veno-arterial extracorporeal membrane oxygenation (E-CPR OHCA) were compared to STEMI without OHCA (STEMI no OHCA). CAD severity was assessed by a single physician blinded to the resuscitation method, time to ROSC and level of consciousness. RESULTS: Between 2016 and 2022, 71 conscious OHCA, 157 comatose OHCA, 50 E-CPR OHCA and 101 STEMI no OHCA underwent immediate coronary angiography. Acute culprit lesion was documented less often in OHCA (88.1% vs 97%; $p = 0.009$) but complete occlusion was more frequent (68.8% vs 58.4%; $p = 0.038$) than in STEMI no OHCA. SYNTAX score was 5.6 in STEMI no OHCA, 10.2 in conscious OHCA, 13.4 in comatose OHCA and 26.8 in E-CPR OHCA ($p < 0.001$). There was a linear correlation between SYNTAX score and delay to ROSC/ECMO initiation ($r^2 = 0.61$; $p < 0.001$). Post PCI culprit TIMI 3 flow was comparable between the groups ($\geq 86\%$). SYNTAX score was among independent predictors of 5-year survival which was significantly decreased in comatose OHCA (56.1%) and E-CPR OHCA (36.0%) compared to conscious OHCA (83.1%) and STEMI no OHCA (88.1%). CONCLUSION: Compared to STEMI no OHCA, OHCA was associated with increased incidence of acute coronary occlusion and more complex non culprit CAD which progressively increased from conscious OHCA to E-CPR OHCA. Severity of CAD was associated with increased delays to ROSC/ECMO initiation and decreased long term survival.

EXPERIMENTAL RESEARCH

1. J Am Heart Assoc. 2023 Oct 3;12(19):e029774. doi: 10.1161/JAHA.123.029774. Epub 2023 Sep 30.

Assessment of the Effects of Sodium Nitroprusside Administered Via Intracranial Subdural Catheters on the Cerebral Blood Flow and Lactate Using Dynamic Susceptibility Contrast Magnetic Resonance Imaging and Proton Magnetic Resonance Spectroscopy in a Pig Cardiac Arrest Model.

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ABSTRACT

Background Cerebral blood flow (CBF) is impaired in the early phase after return of spontaneous circulation. Sodium nitroprusside (SNP) administration via intracranial subdural catheters improves cerebral cortical microcirculation. We determined whether the SNP treatment improves CBF in the subcortical tissue and evaluated the effects of this treatment on cerebral lactate. Methods and Results Sixty minutes after return of spontaneous circulation following 14 minutes of untreated cardiac arrest, 14 minipigs randomly received 4 mg SNP or saline via intracranial subdural catheters. CBF was measured in regions of interest within the cerebrum and thalamus using dynamic

susceptibility contrast-magnetic resonance imaging. After return of spontaneous circulation, CBF was expressed as a percentage of the baseline value. In the saline group, the %CBF in the regions of interest within the cerebrum remained at approximately 50% until 3.5 hours after return of spontaneous circulation, whereas %CBF in the thalamic regions of interest recovered to approximately 73% at this time point. The percentages of the baseline values in the cortical gray matter and subcortical white matter were higher in the SNP group (group effect $P=0.026$ and 0.025 , respectively) but not in the thalamus. The cerebral lactate/creatinine ratio measured using magnetic resonance spectroscopy increased over time in the saline group but not in the SNP group (group-time interaction $P=0.035$). The thalamic lactate/creatinine ratio was similar in the 2 groups. Conclusions SNP administered via intracranial subdural catheters improved CBF not only in the cortical gray matter but also in the subcortical white matter. The CBF improvement by SNP was accompanied by a decrease in cerebral lactate.

2. PeerJ. 2023 Sep 29;11:e16062. doi: 10.7717/peerj.16062. eCollection 2023.

Analysis of cerebral Interleukin-6 and tumor necrosis factor alpha patterns following different ventilation strategies during cardiac arrest in pigs.

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ABSTRACT

Hypoxia-induced neuroinflammation after cardiac arrest has been shown to be mitigated by different ventilation methods. In this prospective randomized animal trial, 35 landrace pigs were randomly divided into four groups: intermittent positive pressure ventilation (IPPV), synchronized ventilation 20 mbar (SV 20 mbar), chest compression synchronized ventilation 40 mbar (CCSV 40 mbar) and a control group (Sham). After inducing ventricular fibrillation, basic life support (BLS) and advanced life support (ALS) were performed, followed by post-resuscitation monitoring. After 6 hours, the animals were euthanized, and direct postmortem brain tissue samples were taken from the hippocampus (HC) and cortex (Cor) for molecular biological investigation of cytokine mRNA levels of Interleukin-6 (IL-6) and tumor necrosis factor alpha (TNF α). The data analysis showed that CCSV 40 mbar displayed low TNF α mRNA-levels, especially in the HC, while the highest TNF α mRNA-levels were detected in SV 20 mbar. The results indicate that chest compression synchronized ventilation may have a potential positive impact on the cytokine expression levels post-resuscitation. Further studies are needed to derive potential therapeutic algorithms from these findings.

3. Front Cardiovasc Med. 2023 Sep 22;10:1245618. doi: 10.3389/fcvm.2023.1245618. eCollection 2023.

Composition of ex vivo perfusion solutions and kinetics define differential cytokine/chemokine secretion in a porcine cardiac arrest model of lung preservation.

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ABSTRACT

BACKGROUND: Ex vivo lung perfusion (EVLP) uses continuous normothermic perfusion to reduce ischemic damage and to improve post-transplant outcomes, specifically for marginal donor lungs after the donation after circulatory death. Despite major efforts, the optimal perfusion protocol and the composition of the perfusate in clinical lung transplantation have not been identified. Our study aims to compare the concentration levels of cytokine/chemokine in different perfusion solutions during EVLP, after 1 and 9 h of cold static preservation (CSP) in a porcine cardiac arrest model, and to correlate inflammatory parameters to oxygenation capacities. **METHODS:** Following cardiac arrest, the lungs were harvested and were categorized into two groups: immediate (I-EVLP) and delayed EVLP (D-EVLP), after 1 and 9 h of CSP, respectively. The D-EVLP lungs were perfused with

either Steen or modified Custodiol-N solution containing only dextran (CD) or dextran and albumin (CDA). The cytokine/chemokine levels were analyzed at baseline (0 h) and after 1 and 4 h of EVLP using Luminex-based multiplex assays. RESULTS: Within 4 h of EVLP, the concentration levels of TNF- α , IL-6, CXCL8, IFN- γ , IL-1 α , and IL-1 β increased significantly ($P < 0.05$) in all experimental groups. The CD solution contained lower concentration levels of TNF- α , IL-6, CXCL8, IFN- γ , IL-2, IL-12, IL-10, IL-4, IL-1RA, and IL-18 ($P < 0.05$) compared with those of the Steen solution. The concentration levels of all experimental groups have correlated negatively with the oxygenation capacity values ($P < 0.05$). Protein concentration levels did not reach statistical significance for I-EVLP vs. D-EVLP and CD vs. CDA solutions. CONCLUSION: In a porcine cardiac arrest model, a longer period of CSP prior to EVLP did not result in an enhanced protein secretion into perfusates. The CD solution reduced the cytokine/chemokine secretion most probably by iron chelators and/or by the protecting effects of dextran. Supplementing with albumin did not further reduce the cytokine/chemokine secretion into perfusates. These findings may help in optimizing the preservation procedure of the lungs, thereby increasing the donor pool of organs.

CASE REPORTS

1. BMC Med Ethics. 2023 Oct 4;24(1):80. doi: 10.1186/s12910-023-00962-5.

Radiation in an emergency situation: attempting to respect the patient's beliefs as reported by a minor.

Yumoto T(1), Hongo T(2), Koide Y(2), Obara T(2), Tsukahara K(2), Naito H(2), Nakao A(2).

ABSTRACT

BACKGROUND: Each individual's unique health-related beliefs can greatly impact the patient-clinician relationship. When there is a conflict between the patient's preferences and recommended medical care, it can create a serious ethical dilemma, especially in an emergency setting, and dramatically alter this important relationship. CASE PRESENTATION: A 56-year-old man, who remained comatose after out-of-hospital cardiac arrest, was rushed to our hospital. The patient was scheduled for emergency coronary angiography when his adolescent daughter reported that she and her father held sincere beliefs against radiation exposure. We were concerned that she did not fully understand the potential consequences if her father did not receive the recommended treatment. A physician provided her with in depth information regarding the risks and benefits of the treatment. While we did not want to disregard her statement, we opted to save the patient's life due to concerns about the validity of her report. CONCLUSIONS: Variations in beliefs regarding medical care force clinicians to incorporate patient beliefs into medical practice. However, an emergency may require a completely different approach. When faced with a patient in a life-threatening condition and unconscious, we should take action to prioritize saving their life, unless we are highly certain about the validity of their advance directives.