This week's PubMed 6th – 12th February 2022: articles of interest n = 43

CPR AND COVID-19

1. JAMA Netw Open. 2022 Feb 1;5(2):e2147078. doi: 10.1001/jamanetworkopen.2021.47078.
Resuscitation of Drowned Persons During the COVID-19 Pandemic: A Consensus Statement.
Queiroga AC(1)(2)(3)(4), Dunne C(3)(4)(5), Manino LA(3)(4)(6)(7), van der Linden T(8), Mecrow T(4)(9)(10), Bierens J(3)(4)(8)(11).

ABSTRACT
IMPORTANCE: Resuscitation is a niche example of how the COVID-19 pandemic has affected society in the long term. Those trained in cardiopulmonary resuscitation (CPR) face the dilemma that attempting to save a life may result in their own harm. This is most of all a problem for drowning, where hypoxia is the cause of cardiac arrest and ventilation is the essential first step in reversing the situation. OBJECTIVE: To develop recommendations for water rescue organizations in providing their rescuers with safe drowning resuscitation procedures during the COVID-19 pandemic. EVIDENCE REVIEW: Two consecutive modified Delphi procedures involving 56 participants from 17 countries with expertise in drowning prevention research, resuscitation, and programming were performed from March 28, 2020, to March 29, 2021. In parallel, PubMed and Google Scholar were searched to identify new emerging evidence relevant to each core element, acknowledge previous studies relevant in the new context, and identify knowledge gaps. FINDINGS: Seven core elements, each with their own specific recommendations, were identified in the initial consensus procedure and were grouped into 4 categories: (1) prevention and mitigation of the risks of becoming infected, (2) resuscitation of drowned persons during the COVID-19 pandemic, (3) organizational responsibilities, and (4) organizations unable to meet the recommended guidelines. The common measures of infection risk mitigation, personal protective equipment, and vaccination are the base of the recommendations. Measures to increase drowning prevention efforts reduce the root cause of the dilemma. Additional infection risk mitigation measures include screening all people entering aquatic facilities, defining criteria for futile resuscitation, and avoiding contact with drowned persons by rescuers with a high-risk profile. Ventilation techniques must balance required skill level, oxygen delivery, infection risk, and costs of equipment and training. Bag-mask ventilation with a high-efficiency particulate air filter by 2 trained rescuers is advised. Major implications for the methods, facilities, and environment of CPR training have been identified, including nonpractical skills to avoid being infected or to infect others. Most of all, the organization is responsible for informing their members about the impact of the COVID-19 pandemic and taking measures that maximize rescuer safety. Research is urgently needed to better understand, develop, and implement strategies to reduce infection transmission during drowning resuscitation. CONCLUSIONS AND RELEVANCE: This consensus document provides an overview of recommendations for water rescue organizations to improve the safety of their rescuers during the COVID-19 pandemic and balances the competing interests between a potentially lifesaving intervention and risk to the rescuer. The consensus-based recommendations can also serve as an example for other volunteer organizations and altruistic laypeople who may provide resuscitation.

CPR/MECHANICAL CHEST COMPRESSION

No articles identified.

REGISTRIES, REVIEWS AND EDITORIALS

1. Eur J Emerg Med. 2022 Feb 7. doi: 10.1097/MEJ.0000000000000904. Online ahead of print.
Myocardial dysfunction after cardiac arrest: tips and pitfalls.
Ortuno S(1), Geri G, Bouguoin W, Cariou A, Aissaoui N.
ABSTRACT
Postcardiac arrest shock (PCAS) is defined by hemodynamic instability occurring in the first hours after cardiac arrest (CA) and is a major cause of mortality among patients hospitalized after CA. It includes vasoplegia and myocardial dysfunction. This postcardiac arrest myocardial dysfunction is supposed to recover within the 3 days. However, there are many unknowns regarding its definition, its prognosis value and its management. In this review dedicated to emergency physicians, we choose to address tips and pitfalls they should know regarding this prevalent syndrome.

2. Chest. 2022 Feb;161(2):519-523. doi: 10.1016/j.chest.2021.08.064.
The Last Beat: Contemporary Ethical Controversies Surrounding Determination of Cardiopulmonary Death.
Breu AC(1), Rodman A(2).
ABSTRACT
Part one of this series tracked the evolution of the death examination, noting its stability over the last century despite changing diagnostic and therapeutic technologies and social contexts. In part two, we discuss the practical and ethical debates surrounding the exact timing of death. Although the irreversible cessation of cardiopulmonary systems remains the most common criteria used for the determination of death, identification of the moment of irreversibility is imprecise. In most cases, this imprecision is not problematic, but, when the cessation of circulation is used to identify the time of organ procurement for transplantation, it becomes critical. The phenomenon of autoresuscitation highlights these issues because patients who meet all the criteria for circulatory death (sometimes for periods of observation well beyond the norm) apparently return to life. Were these patients resurrected (like Lazarus) or did we simply not wait long enough?

3. Resuscitation. 2022 Feb 3:S0300-9572(22)00034-X. doi: 10.1016/j.resuscitation.2022.01.032. Online ahead of print.
Untreated or early terminated CPR: the untold story….
Van de Voorde P(1).
NO ABSTRACT AVAILABLE

4. J Emerg Nurs. 2022 Feb 7:S0099-1767(21)00338-X. doi: 10.1016/j.jen.2021.12.008. Online ahead of print.
Hypokalemic Cardiac Arrest: Narrative Review of Case Reports and Current State of Science.
Lloyd C, Mohar C, Priano J.
ABSTRACT
PURPOSE: Hypokalemic cardiac arrest is an uncommon occurrence in the emergency department. Electrocardiogram findings related to hypokalemic cardiac arrest include prolonged QT, U waves, and preventricular contractions leading to Torsades de Pointes and then arrest. Literature evaluating the prevalence of hypokalemic cardiac arrest is scarce, and its management is lacking. This review provides a summary of current literature, recommendations from current guidelines, and proposed management strategies of hypokalemic cardiac arrest. SUMMARY: Intravenous potassium administration is the treatment for hypokalemic cardiac arrest. Although the treatment for hypokalemic cardiac arrest is known, there is limited evidence on the proper procedure for administering intravenous potassium appropriately and safely. Owing to the time-sensitive nature of

treating hypokalemic cardiac arrest, rapid administration of intravenous potassium (10 mEq/100 mL of potassium chloride over 5 minutes) is warranted. Concerns regarding rapid potassium administration are not without merit; however, a risk-benefit analysis and potential mitigation strategies for unwanted side effects need to be considered if hypokalemic cardiac arrest is to remain a reversible cause. It is imperative to identify hypokalemia as the cause for arrest as soon as possible and administer potassium before systemic acidosis, ischemia, and irreversible cell death. CONCLUSIONS: More evidence is necessary to support treatment recommendations for hypokalemic cardiac arrest; however, it is the authors' opinion that, if identified early during cardiac arrest, intravenous potassium should be administered to treat a reversible cause for cardiac arrest.

IN-HOSPITAL CARDIAC ARREST

1. J Adv Nurs. 2022 Feb 12. doi: 10.1111/jan.15184. Online ahead of print.
What the curtains do not shield: A phenomenological exploration of patient-witnessed resuscitation in hospital. Part 1: patients' experiences.
Fiori M(1)(2), Latour JM(1)(3)(4), Endacott R(5)(6), Cutello CA(7)(8), Coombs M(1)(9).
ABSTRACT
AIMS: The aim of the study was to explore the experiences of hospital patients who witnessed resuscitation of a fellow patient. DESIGN: Descriptive phenomenology. METHODS: Patients who witnessed resuscitation were recruited from nine clinical wards in a university hospital in England. Data were collected through face-to-face individual interviews. Participants were interviewed twice, in 1 week and 4 to 6 weeks after the resuscitation event. Data were collected between August 2018 and March 2019. Interviews were analysed using Giorgi's phenomenological analysis. RESULTS: Sixteen patients participated in the first interview and two patients completed follow-up interviews. Three themes were developed from the patients' interviews. (1) Exposure to witnessing resuscitation: patients who witness resuscitation felt exposed to a distressing event and not shielded by bed-space curtains, but after the resuscitation attempt, they also felt reassured and safe in witnessing staff's response. (2) Perceived emotional impact: patients perceived an emotional impact from witnessing resuscitation and responded with different coping mechanisms. (3) Patients' support needs: patients needed information about the resuscitation event and emotional reassurance from nursing staff to feel supported, but this was not consistently provided. CONCLUSION: The presence of other patients during resuscitation events must be acknowledged by healthcare professionals, and sufficient information and emotional support must be provided to patients witnessing such events. This study generates new evidence to improve patients' experience and healthcare professionals' support practices. IMPACT: The phenomenon of patient-witnessed resuscitation requires the attention of healthcare professionals, resuscitation officers and policymakers. Study findings indicate that witnessing resuscitation has an emotional impact on patients. Strategies to support them must be improved and integrated into the management of in-hospital resuscitation. These should include providing patients with comprehensive information and opportunities to speak about their experience; evacuating mobile patients when possible; and a dedicated nurse to look after patients witnessing resuscitation events.

INJURIES AND CPR

1. Interact Cardiovasc Thorac Surg. 2022 Feb 3:ivac023. doi: 10.1093/icvts/ivac023. Online ahead of print.
Operative versus non-operative management of rib fractures in flail chest after cardiopulmonary resuscitation manoeuvres.
Dorn P(1), Pfister S(1), Oberhaensli S(2), Gioutsos K(1), Haenggi M(3), Kocher GJ(1).

ABSTRACT
OBJECTIVES: Blunt chest trauma after mechanical resuscitation manoeuvres appears to have a significant impact on the often complicated course. Due to a lack of data in the literature, the purpose of this study was to investigate the feasibility and immediate outcome of chest wall stabilization for flail chest in this vulnerable patient population. METHODS: We retrospectively reviewed the medical records of patients after cardiopulmonary resuscitation between January 2014 and December 2018 who were diagnosed with flail chest. We attempted to compare patients after surgery with those after conservative treatment. RESULTS: Of a total of 56 patients with blunt chest trauma after mechanical resuscitation and after coronary angiography, 25 were diagnosed with flail chest. After the exclusion of 2 patients because of an initial decision to palliate, 13 patients after surgical stabilization could be compared with 10 patients after conservative therapy. Although there was no significant difference in the total duration of ventilatory support, there was a significant advantage when the time after stabilization to extubation was compared with the duration of ventilation in the conservative group. The presence of pulmonary contusion, poor Glasgow Coma Scale score or the development of pneumonia negatively affected the outcome, but additional sternal fracture did not. CONCLUSIONS: Surgical stabilization for chest wall instability is well tolerated even by this vulnerable patient population. Our results should be used for further randomized controlled approaches. It is necessary to evaluate the situation with all parameters in an interdisciplinary manner and to decide on a possible surgical therapy at an early stage if possible.

CAUSE OF THE ARREST

1. Resuscitation. 2022 Feb 8:S0300-9572(22)00035-1. doi: 10.1016/j.resuscitation.2022.01.033. Online ahead of print.

Severe Cerebral Edema in Substance-Related Cardiac Arrest Patients.

Kulpanowski AM(1), Copen WA(2), Hancock B(1), Rosenthal ES(3), Schoenfeld D(4), Dodelson JA(1), Edlow BL(3), Taylor Kimberly W(3), Amorim E(5), Brandon Westover M(3), Ming Ning M(3), Schaefer PW(2), Malhotra R(6), Giacino JT(7), Greer DM(8), Wu O(9).

ABSTRACT
BACKGROUND: Studies of neurologic outcomes have found conflicting results regarding differences between patients with substance-related cardiac arrests (SRCA) and non-SRCA. We investigate the effects of SRCA on severe cerebral edema development, a neuroimaging intermediate endpoint for neurologic injury. METHODS: 327 out-of-hospital comatose cardiac arrest patients were retrospectively analyzed. Demographics and baseline clinical characteristics were examined. SRCA categorization was based on admission toxicology screens. Severe cerebral edema classification was based on radiology reports. Poor clinical outcomes were defined as discharge Cerebral Performance Category scores>3. RESULTS: SRCA patients (N=86) were younger (P<0.001), and more likely to have non-shockable rhythms (P<0.001), be unwitnessed (P<0.001), lower Glasgow Coma Scale scores (P<0.001), absent brainstem reflexes (P<0.05) and develop severe cerebral edema (P<0.001) than non-SRCA patients (N=241). Multivariable analyses found younger age (P<0.001), female sex (P=0.008), non-shockable rhythm (P=0.01) and SRCA (P=0.05) to be predictors of severe cerebral edema development. Older age (P<0.001), non-shockable rhythm (P=0.02), severe cerebral edema (P<0.001), and absent pupillary light reflexes (P=0.004) were predictors of poor outcomes. SRCA patients had higher proportion of brain death (P<0.001) compared to non-SRCA deaths. CONCLUSIONS: SRCA results in higher rates of severe cerebral edema development and brain death. The absence of statistically significant differences in discharge outcomes or survival between SRCA and non-SRCA patients may be related to the higher rate of withdrawal of life-sustaining treatment (WLST) in the non-SRCA group. Future neuroprognostic studies may opt to include neuroimaging

markers as intermediate measures of neurologic injury which are not influenced by WLST decisions.

2. BMJ Open. 2022 Feb 8;12(2):e051721. doi: 10.1136/bmjopen-2021-051721.
Non-linear relationship between basal serum albumin concentration and cardiac arrest in critically ill patients with end-stage renal disease: a cross-sectional study.
Zeng YQ(1), Qin ZA(2), Guo ZW(1), Li B(1), Yu HY(1), Chen RX(1), Tang YQ(1), Hu KJ(1), Guan CJ(1), Yan R(3).
ABSTRACT
OBJECTIVES: The aim of our study was to investigate the association between serum albumin concentration and the risk of cardiac arrest in critically ill patients with end-stage renal disease in the intensive care unit (ICU). DESIGN: This was a secondary analysis. SETTING: The Phillip electronic-ICU collaborative database from 2014 to 2015. PARTICIPANTS: This study included 4990 critically ill patients diagnosed with end-stage renal disease. PRIMARY AND SECONDARY OUTCOME MEASURES: The exposure of interest was serum albumin concentration. The outcome variable was cardiac arrest. RESULTS: A non-linear relationship was observed between serum albumin concentration and risk of cardiac arrest, with an inflection point of 3.26 g/dL after adjusting for potential confounders. The effect sizes and the CIs on the left and right sides of the inflection point were 0.88 (0.65 to 1.19) and 0.32 (0.16 to 0.64), respectively. CONCLUSIONS: Within an albumin range of 3.26-5.6 g/dL, each 1 g/dL increase in serum levels is associated with a 68% decrease of the risk of cardiac arrest in critically ill patients with end-stage renal disease.

3. Heart Rhythm. 2022 Feb 3:S1547-5271(22)00109-6. doi: 10.1016/j.hrthm.2022.01.035. Online ahead of print.
Predictors and outcomes of in-hospital referrals for forensic investigation after young sudden cardiac death.
Paratz ED(1), van Heusden A(2), Zentner D(3), Morgan N(4), Smith K(5), Ball J(6), Thompson T(7), James P(7), Connell V(8), Pflaumer A(9), Semsarian C(10), Ingles J(11), Stub D(12), Parsons S(13), La Gerche A(14).
ABSTRACT
BACKGROUND: Forensic investigations are recommended following sudden cardiac death (SCD) to determine cause of death and identify living relatives at potential risk. Not all young SCD patients are referred to coronial services. OBJECTIVE: To identify referral rates, predictors and outcomes for young SCD patients who die in-hospital following out-of-hospital cardiac arrest (OHCA). METHODS: A prospective two-year analysis of in-hospital deaths following OHCA in Victoria, Australia was conducted using a state-wide registry combining data from ambulance, hospital and forensic resources. RESULTS: OHCA caused 26.3% of all deaths (n=1,301) in Victorians aged 1-50 years old. Rates of pre-hospital and in-hospital referral to coronial services were 95.0% and 59.5% respectively. Factors independently predicting in-hospital coronial referral were age <40 years old, death in Emergency Department and rural status (odds ratios 4.07, 8.91 and 3.43 respectively). Establishing a diagnosis of coronary disease in-hospital substantially reduced odds of coronial referral (odds ratio 0.07). Of 107 SCD patients referred to the coroner from hospitals, 25 (23.3%) had illicit substances identified on toxicological analysis. 81 patients (75.7%) underwent autopsy with cause of death determined in 65 (80.2%) cases. Sixteen (19.8%) deaths remained unascertained after autopsy and ancillary investigations. CONCLUSIONS: Over one-quarter of young Victorian deaths result from OHCA. Approximately half of patients dying in-hospital following OHCA are referred to the coroner. Patients referred are younger, more likely to die in Emergency and reside rurally. Forensic assessment identifies high rates of illicit drug use in young SCDs and provides a definitive cause of death for most patients.

4. Hellenic J Cardiol. 2022 Jan-Feb;63:15-21. doi: 10.1016/j.hjc.2021.06.005. Epub 2021 Jun 17.
Validation of the new American College of Cardiology/American Heart Association Guidelines for the risk stratification of sudden cardiac death in a large Mediterranean cohort with Hypertrophic Cardiomyopathy.
Zegkos T(1), Tziomalos G(2), Parcharidou D(2), Ntelios D(2), Papanastasiou CA(2), Karagiannidis E(2), Gossios T(2), Rouskas P(2), Katranas S(2), Paraskevaidis S(2), Karvounis H(2), Efthimiadis G(2).
ABSTRACT
BACKGROUND: The aim of our study was to assess the performance of the new American College of Cardiology (ACC)/American Heart Association (AHA) Guidelines, with respect to sudden cardiac death (SCD) prevention, in comparison with the established risk score of the European Society of Cardiology (hypertrophic cardiomyopathy [HCM] Risk-SCD), in a large Mediterranean cohort of HCM patients. METHODS: The clinical and imaging characteristics of 784 HCM patients (mean age at first evaluation 52 ± 16 years, 67.2% males) were analyzed retrospectively. The sensitivity, specificity, and negative predictive value for SCD events of the presence of ≥1 risk factor for SCD according to the ACC/AHA Guidelines 2020 and of the HCM Risk-SCD≥6% and HCM Risk-SCD≥4% were estimated during follow-up. RESULTS: During follow-up, 47 (6%) patients suffered an SCD event. The presence of ≥1 major risk factor for SCD according to the new ACC/AHA Guidelines had 96% sensitivity (95% CI 85.5-99.5%) with modest specificity of 59% (95% CI 55-62.2%) and negative predictive value of 99.5% (95% CI 98.2-99.9%). On the contrary, HCM- Risk-SCD≥6% had a relatively low sensitivity (32%, 95% CI 19.1-47.1%) and high specificity of 95% (95% CI 93.1-96.4%), whereas, HCM-Risk-SCD≥4% had sensitivity of 60% (95% CI 44-74%) and specificity of 83.9% (95% CI 80-85.6%). Both the HCM Risk-SCD cut-off values demonstrated lower negative predictive value but higher accuracy than the ACC/AHA algorithm for SCD prediction. CONCLUSION: The novel ACC/AHA proposed algorithm identifies most of the patients with an SCD event with the cost of numerous defibrillator implantations. HCM-Risk-SCD demonstrated higher specificity, whereas its sensitivity and negative predictive value are modest.

5. Eur J Prev Cardiol. 2022 Feb 3;28(17):1875-1882. doi: 10.1093/eurjpc/zwaa118.
QTc-interval prolongation and increased risk of sudden cardiac death associated with hydroxychloroquine.
Ahmadizar F(1), Soroush N(1), Ikram MA(1), Kors JA(2), Kavousi M(1), Stricker BH(1).
ABSTRACT
AIMS: Hydroxychloroquine and chloroquine ([hydroxy]chloroquine) are drugs used to treat malaria and rheumatological disorders and were recently suggested as beneficial for prevention and treatment of patients with coronavirus disease 2019 (COVID-19) due to SARS-CoV-2 infection. However, longitudinal studies to assess the electrocardiographic and cardiotoxic effects of these drugs are limited. In this study, we aimed to investigate the effect of these drugs on QTc-interval and incidence of sudden cardiac death (SCD). METHODS: We designed a longitudinal follow-up study of individuals within the prospective population-based Rotterdam Study. Eligible individuals had available data on medication and repeated ECG measurements. The study period was between 1 January 1991 and 1 January 2014. We studied on current and past use of [hydroxy]chloroquine as a time-varying exposure; high versus low daily dose of [hydroxy] chloroquine. QTc-interval duration, and the occurrence of SCD were the main outcomes. SCD was defined as an unexpected and sudden death due to cardiac arrhythmia within one hour of the onset of acute symptoms, and in patients without cardiac symptoms within 24 hours before death. RESULTS: Among the study population of 14 594 individuals (58.8% women) with an average age of 65 years, 346 patients used [hydroxy] chloroquine at any time during follow-up. The total number of SCD cases was 609. In a multiple

linear mixed model analysis, the current use of [hydroxy]chloroquine was associated with a significantly increased duration of the QTc-interval of 8.1 ms (95% CI: 3.6; 12.6) compared with non-users. The association was stronger among current-high daily dosage [15.3 (95%CI: 7.0; 23.6)] compared with current-low daily dosage [5.5 (95%CI: 0.4; 10.7)] users. In a Cox proportional hazard regression analysis, the risk of SCD was significantly higher in participants who were current users of [hydroxy]chloroquine than in non-users [adjusted hazard ratio; 3.7 (95%CI: 1.1; 12.6)]. CONCLUSIONS: In this longitudinal study, persons who received [hydroxy]chloroquine had an increased QTc-interval duration and the association was dose-dependent. [Hydroxy]chloroquine was associated with a significantly increased risk of SCD. As long as their activity against COVID-19 is controversial, cardiotoxicity is a strong argument against using these drugs to treat COVID-19 infections.

END-TIDAL CO_2

1. Am J Emerg Med. 2022 Jan 30;54:71-75. doi: 10.1016/j.ajem.2022.01.053. Online ahead of print.
Chest compression release velocity: An independent determinant of end-tidal carbon dioxide in out-of-hospital cardiac arrest.
De Roos E(1), Vanwulpen M(2), Hachimi-Idrissi S(3).
ABSTRACT
BACKGROUND: Chest compression (CC) depth, CC rate and ventilatory rate (VR) are known to have an impact on end-tidal carbon dioxide (ETCO2) values. Chest compression release velocity (CCRV) is increasingly acknowledged as a novel metric in cardiopulmonary resuscitation (CPR). The objective of this study was to analyze whether CCRV would have any effect on ETCO2 values. METHODS: In out-of-hospital cardiac arrests (OHCA), effects of CC depth, CC rate, CCRV and VR on ETCO2 were analyzed through linear mixed effect models. A stratification was made on a CCRV of 300, 400 and 500 mm/s. In these categories, mean ETCO2 values were corrected for CC depth and compared through a one-way ANOVA. RESULTS: A 10 mm increase in CC depth was associated with a 1.5 mmHg increase in ETCO2 ($p < 0.001$), a 100 mm/s increase in CCRV with a 0.8 mmHg increase ($p = 0.010$) and a 5 breaths per minute increase in VR with a 2.0 mmHg decrease ($p < 0.001$). CC depth was strongly correlated with CCRV (Pearson's $r = 0.709$, $p < 0.001$). After adjusting for CC depth, ETCO2 was on average 6.5 mmHg higher at a CCRV of 500 than at 400 mm/s ($p = 0.005$) and 5.3 mmHg higher than at 300 mm/s ($p = 0.033$). CONCLUSIONS: In OHCA patients, higher CCRV values resulted in higher ETCO2 values. This effect is independent of CC depth, despite the strong correlation between CCRV and CC depth.

ORGAN DONATION

1. J Thorac Cardiovasc Surg. 2022 Feb;163(2):e187-e197. doi: 10.1016/j.jtcvs.2020.03.042. Epub 2020 Mar 23.
Novel heat shock protein 90 inhibitor improves cardiac recovery in a rodent model of donation after circulatory death.
Aceros H(1), Der Sarkissian S(2), Borie M(1), Pinto Ribeiro RV(3), Maltais S(4), Stevens LM(2), Noiseux N(5).
ABSTRACT
OBJECTIVE: Organ donation after circulatory death (DCD) is a potential solution for the shortage of suitable organs for transplant. Heart transplantation using DCD donors is not frequently performed due to the potential myocardial damage following warm ischemia. Heat shock protein (HSP) 90 has

recently been investigated as a novel target to reduce ischemia/reperfusion injury. The objective of this study is to evaluate an innovative HSP90 inhibitor (HSP90i) as a cardioprotective agent in a model of DCD heart. METHODS: A DCD protocol was initiated in anesthetized Lewis rats by discontinuation of ventilation and confirmation of circulatory death by invasive monitoring. Following 15 minutes of warm ischemia, cardioplegia was perfused for 5 minutes at physiological pressure. DCD hearts were mounted on a Langendorff ex vivo heart perfusion system for reconditioning and functional assessment (60 minutes). HSP90i (0.01 μmol/L) or vehicle was perfused in the cardioplegia and during the first 10 minutes of ex vivo heart perfusion reperfusion. Following assessment, pro-survival pathway signaling was evaluated by western blot or polymerase chain reaction. RESULTS: Treatment with HSP90i preserved left ventricular contractility (maximum + dP/dt, 2385 ± 249 vs 1745 ± 150 mm Hg/s), relaxation (minimum -dP/dt, -1437 ± 97 vs 1125 ± 85 mm Hg/s), and developed pressure (60.7 ± 5.6 vs 43.9 ± 4.0 mm Hg), when compared with control DCD hearts (All P = .001). Treatment abrogates ischemic injury as demonstrated by a significant reduction of infarct size (2,3,5-triphenyl-tetrazolium chloride staining) of 7 ± 3% versus 19 ± 4% (P = .03), troponin T release, and mRNA expression of Bax/Bcl-2 (P < .05). CONCLUSIONS: The cardioprotective effects of HSP90i when used following circulatory death might improve transplant organ availability by expanding the use of DCD hearts.

FEEDBACK

No articles identified.

DRUGS

1. Intensive Care Med. 2022 Feb 7. doi: 10.1007/s00134-021-06608-7. Online ahead of print.
Epinephrine versus norepinephrine in cardiac arrest patients with post-resuscitation shock.
Bougouin W(1)(2)(3), Slimani K(1)(3), Renaudier M(1)(3), Binois Y(1)(3), Paul M(4), Dumas F(1)(3)(5)(6), Lamhaut L(1)(3)(5)(7), Loeb T(8), Ortuno S(1)(3)(5)(9), Deye N(10), Voicu S(10), Beganton F(1)(3), Jost D(1)(3)(11), Mekontso-Dessap A(12)(13)(14), Marijon E(1)(3)(5)(15), Jouven X(1)(3)(5)(15), Aissaoui N(1)(3)(5)(9), Cariou A(16)(17)(18)(19); Sudden Death Expertise Center Investigators.

ABSTRACT

PURPOSE: Whether epinephrine or norepinephrine is preferable as the continuous intravenous vasopressor used to treat post-resuscitation shock is unclear. We assessed outcomes of patients with post-resuscitation shock after out-of-hospital cardiac arrest according to whether the continuous intravenous vasopressor used was epinephrine or norepinephrine. METHODS: We conducted an observational multicenter study of consecutive patients managed in 2011-2018 for post-resuscitation shock. The primary outcome was all-cause hospital mortality, and secondary outcomes were cardiovascular hospital mortality and unfavorable neurological outcome (Cerebral Performance Category 3-5). A multivariate regression analysis and a propensity score analysis were performed, as well as several sensitivity analyses. RESULTS: Of the 766 patients included in five hospitals, 285 (37%) received epinephrine and 481 (63%) norepinephrine. All-cause hospital mortality was significantly higher in the epinephrine group (OR 2.6; 95%CI 1.4-4.7; P = 0.002). Cardiovascular hospital mortality was also higher with epinephrine (aOR 5.5; 95%CI 3.0-10.3; P < 0.001), as was the proportion of patients with CPC of 3-5 at hospital discharge. Sensitivity analyses produced consistent results. The analysis involving adjustment on a propensity score to control for confounders showed similar findings (aOR 2.1; 95%CI 1.1-4.0; P = 0.02). CONCLUSION:

Among patients with post-resuscitation shock after out-of-hospital cardiac arrest, use of epinephrine was associated with higher all-cause and cardiovascular-specific mortality, compared with norepinephrine infusion. Until additional data become available, intensivists may want to choose norepinephrine rather than epinephrine for the treatment of post-resuscitation shock after OHCA.

2. Front Pharmacol. 2022 Jan 20;13:806592. doi: 10.3389/fphar.2022.806592. eCollection 2022.
Accumulated Epinephrine Dose is Associated With Acute Kidney Injury Following Resuscitation in Adult Cardiac Arrest Patients.
Gao Q(1), Mok HP(2), Qiu HL(1), Cen J(1), Chen J(1), Zhuang J(1).

ABSTRACT
The goal of this study was to investigate the association between total epinephrine dosage during resuscitation and acute kidney injury after return of spontaneous circulation in patients with cardiac arrest. We performed a secondary analysis of previously published data on the resuscitation of cardiac arrest patients. Bivariate, multivariate logistic regression, and subgroup analyses were conducted to investigate the association between total epinephrine dosage during resuscitation and acute kidney injury after return of spontaneous circulation. A total of 312 eligible patients were included. The mean age of the patients was 60.8 ± 15.2 years. More than half of the patients were male (73.4%) and had an out-of-hospital cardiac arrest (61.9%). During resuscitation, 125, 81, and 106 patients received ≤2, 3 - 4, and ≥5 mg epinephrine, respectively. After return of spontaneous circulation, there were 165 patients (52.9%) and 147 patients (47.1%) with and without acute kidney injury, respectively. Both bivariate and multivariate analysis showed a statistically significant association between total epinephrine dosage and acute kidney injury. The subgroup analysis showed that the strength of the association between epinephrine dosage and acute kidney injury varied by location of cardiac arrest. Further multivariate regression analysis found that the association between epinephrine dosage and acute kidney injury was only observed in patients with in-hospital cardiac arrest after adjusting for multiple confounding factors. Compared with in-hospital cardiac arrest patients who received ≤2 mg of epinephrine, patients with 3-4 mg of epinephrine or ≥5 mg of epinephrine had adjusted odds ratios of 4.2 (95% confidence interval 1.0-18.4) and 11.3 (95% confidence interval 2.0-63.0), respectively, to develop acute kidney injury. Therefore, we concluded that a higher epinephrine dosage during resuscitation was associated with an increased incidence of acute kidney injury after return of spontaneous circulation in adult patients with in-hospital cardiac arrest.

TRAUMA

No articles identified.

VENTILATION

No articles identified.

CERERBRAL MONITORING

1. Resuscitation. 2022 Feb 9:S0300-9572(22)00037-5. doi: 10.1016/j.resuscitation.2022.02.002. Online ahead of print.
Promising results from a residential rehabilitation intervention focused on fatigue and the secondary psychological and physical consequences of cardiac arrest: The SCARF feasibility study.

Joshi VL(1), Hermann Tang L(2), Joo Kim Y(3), Kirstine Wagner M(4), Feldbæk Nielsen J(5), Tjoernlund M(6), Zwisler AD(7).

ABSTRACT

AIMS: This study investigated the feasibility and potential effect of SCARF (Survivors of Cardiac ARest focused on Fatigue) a multidisciplinary residential rehabilitation intervention focused on fatigue and the secondary psychological and physical consequences of cardiac arrest (CA). METHODS: This was a prospective one-armed feasibility study. Six progression criteria were identified related to the feasibility of the intervention and viability of a future effect study in terms of: participant recruitment (1), participant retention (2,3,4), and completeness of outcomes (5,6). Data on Participant/clinician satisfaction with the intervention was also collected along with self-reported outcomes: fatigue, quality of life, anxiety, depression, function and disability, and physical activity (at baseline, 12 weeks and 6 months) and physical capacity (baseline and 12 weeks). RESULTS: Four progression criteria were met including retention (87.5%) and completion of baseline outcomes (97.5%). Two criteria were not met: recruitment rate was 2.9 participants per month (estimated rate needed 6.1) and completion of final outcomes was 65% (estimated proportion needed 75%). Participant/clinician satisfaction with the intervention was high. Three months after the SCARF intervention small to moderate effect size changes of r=0.18-0.46 were found for self-reported fatigue, quality of life, anxiety, depression and disability and for two of the physical capacity tests (d=0.46-0.52). CONCLUSION: SCARF was found to be a feasible intervention with high participant/ clinician satisfaction, high participant retention and the possible potential to improve self-reported and physical capacity outcomes. Procedures for study recruitment and collection of final outcomes should be modified before a fully powered randomised controlled trial is conducted.

2. Intensive Care Med. 2022 Feb 11. doi: 10.1007/s00134-022-06646-9. Online ahead of print.

Early neurological pupil index to predict outcome after cardiac arrest.

Peluso L(1), Oddo M(2), Sandroni C(3)(4), Citerio G(5)(6), Taccone FS(7).

NO ABSTRACT AVAILABLE

3. Sci Rep. 2022 Feb 9;12(1):2186. doi: 10.1038/s41598-022-06233-4.

Blood-brain barrier disruption as a cause of various serum neuron-specific enolase cut-off values for neurological prognosis in cardiac arrest patients.

Kang C(1), You Y(2), Ahn HJ(1)(3), Park JS(1)(3), Jeong W(1), Min JH(3)(4), In YN(3)(4), Yoo I(1)(3), Cho Y(1), Ryu S(1), Lee J(1), Kim SW(1)(3).

ABSTRACT

We compared the cut-off and prognostic value of serum neuron-specific enolase (NSE) between groups with and without severe blood-brain barrier (BBB) disruption to reveal that a cause of various serum NSE cut-off value for neurological prognosis is severe BBB disruption in out-of-hospital cardiac arrest (OHCA) patients underwent target temperature management (TTM). This was a prospective, single-centre study conducted from January 2019 to June 2021. Severe BBB disruption was indicated using cerebrospinal fluid-serum albumin quotient values > 0.02. The area under the receiver operating characteristic curve of serum NSE obtained on day 3 of hospitalisation to predict poor outcomes was used. In patients with poor neurologic outcomes, serum NSE in those with severe BBB disruption was higher than in those without (P = 0.006). A serum NSE cut-off value of 40.4 μg/L for poor outcomes in patients without severe BBB disruption had a sensitivity of 41.7% and a specificity of 96.0%, whereas a cut-off value of 34.6 μg/L in those with severe BBB disruption had a sensitivity of 86.4% and a specificity of 100.0%. We demonstrated that the cut-off and prognostic value of serum NSE were heterogeneous, depending on severe BBB disruption in OHCA patients treated with TTM.

ULTRASOUND AND CPR

1. Resuscitation. 2022 Feb 4:S0300-9572(22)00032-6. doi: 10.1016/j.resuscitation.2022.01.030. Online ahead of print.

Femoral Artery Doppler Ultrasound is more Accurate than Manual Palpation for Pulse Detection in Cardiac Arrest.

Cohen AL(1), Li T(1), Becker LB(2), Owens C(3), Singh N(4), Gold A(5), Nelson MJ(1), Jafari D(1), Haddad G(6), Nello AV(1), Rolston DM(7), Sisson C(4), Lesser ML(4).

ABSTRACT

OBJECTIVES: Our primary objective was to assess the accuracy of Doppler ultrasound versus manual palpation in detecting any pulse with an arterial line waveform in cardiac arrest. Secondarily, we sought to determine whether peak systolic velocity (PSV) on Doppler ultrasound could detect a pulse with a systolic blood pressure (SBP) ≥60mmHg. METHODS: We conducted a prospective, cross-sectional, diagnostic accuracy study on a convenience sample of adult, Emergency Department (ED) cardiac arrest patients. All patients had a femoral arterial line. During a pulse check, manual pulse detection, PSV and Doppler ultrasound clips, and SBP were recorded. A receiver operator characteristic curve analysis was performed to determine the optimal cut-off of PSV associated with a SBP ≥60mmHg. Accuracy of manual palpation and Doppler ultrasound for detection of any pulse and SBP ≥60mmHg were compared with McNemar's test. RESULTS: 54 patients and 213 pulse checks were analysed. Doppler ultrasound demonstrated higher accuracy than manual palpation (95.3% vs. 54.0%; p <0.001) for detection of any pulse. Correlation between PSV and SBP was strong (Spearman correlation coefficient = 0.89; p<0.001). The optimal cut-off value of PSV associated with a SBP ≥60 mmHg was 20 cm/sec (area under the curve = 0.975). To detect SBP ≥60 mmHg, accuracy of a PSV ≥20 cm/sec was higher than manual palpation (91.4% vs. 66.2%; p <0.001). CONCLUSIONS: Among ED cardiac arrest patients, femoral artery Doppler ultrasound was more accurate than manual palpation for detecting any pulse. When using a PSV ≥20 cm/sec, Doppler ultrasound was also more accurate for detecting a SBP ≥60 mmHg.

ORGANISATION AND TRAINING

1. BMC Emerg Med. 2022 Feb 11;22(1):25. doi: 10.1186/s12873-022-00581-0.

National survey of do not attempt resuscitation decisions on out-of-hospital cardiac arrest in China.

Tian S(1), Niu S(1), Zhang L(1), Lian H(1), Zhou M(1), Zhang X(1), Kang X(1), Zhang J(2).

ABSTRACT

BACKGROUND: To investigate and understand the determinants of decisions not to attempt resuscitation following out-of-hospital cardiac arrest, to contribute to establishing rules that are appropriate to China. METHODS: We recruited participants through directors of emergency medical services across China. A 28-question web survey was available between February 5 and March 6, 2021 that targeted demographic information and views on emergency work and cardiopulmonary resuscitation. Each question was assigned a value between 1 and 7 based on the level of importance from low to high. T-tests, one-way analysis of variance, and Kruskal-Wallis H-tests were used to compare continuous variables. Binary logistic regression analysis was used to identify factors influencing when people considered it suitable to initiate cardiopulmonary resuscitation. RESULTS: The study involved 4289 participants from 31 provinces, autonomous regions and municipalities in mainland China, of whom 52.8% were male. The top three reasons for not attempting cardio-

pulmonary resuscitation were decomposition/hypostasis/rigor mortis (6.39 ± 1.44 points), massive injury (4.57 ± 2.08 points) and family members' preference (4.35 ± 1.98 points). In total, 2761 (64.4%) thought emergency services should not attempt cardiopulmonary resuscitation when cardiac arrest had happened more than 30 min before, and there had been no bystander cardiopulmonary resuscitation. Gender (OR 1.233, p = 0.002), religion (OR 1.147, p = 0.046), level (OR 0.903, p = 0.028) or classification of city (OR 0.920, p = 0.049), years of work experience (OR 0.884, p = 0.004), and major (OR 1.032, p = 0.044) all influenced how long after cardiac arrest was considered suitable for initiating cardiopulmonary resuscitation. CONCLUSIONS: Chinese emergency physicians have different perceptions of when not to attempt resuscitation to those practicing elsewhere. The existing guidelines for resuscitation are not suitable for China, and China-specific guidelines need to be established.

2. Resusc Plus. 2022 Feb 1;9:100208. doi: 10.1016/j.resplu.2022.100208. eCollection 2022 Mar.
Out-of-hospital cardiac arrest: Does rurality decrease chances of survival?
Ringgren KB(1), Kragholm KH(1), Lindgren FL(1), Jacobsen PA(2), Jørgensen AJ(3), Christensen HC(3)(4), Mills EHA(2), Jakobsen LK(3), Yonis H(5), Folke F(3), Lippert F(3), Torp-Pedersen C(1)(5)(6).
ABSTRACT
BACKGROUND: Geographical setting is seldomly taken into account when investigating out-of-hospital cardiac arrest (OHCA). It is a common notion that living in rural areas means a lower chance of fast and effective helpwhen suffering a time-critical event. This retrospective cohort study investigates this hypothesis and compares across healthcare-divided administrative regions. METHODS: We included only witnessed OHCAs to minimize the risk that outcome was predetermined by time to caller arrival and/or recognition. Arrests were divided into public and residential. Residential arrests were categorized according to population density of the area in which they occurred. We investigated incidence, EMS response time and 30-day survival according to area type and subsidiarily by healthcare-divided administrative region. RESULTS: The majority (71%) of 8,579 OHCAs were residential, and 53.2% of all arrests occurred in the most densely populated cell group amongst residential arrests. This group had a median EMS response time of six minutes, whereas the most sparsely populated group had a median of 10 minutes. Public arrests also had a median response time of six minutes. 30-day survival was highest in public arrests (38.5%, [95% CI 36.9;40.1]), and varied only slightly with no statistical significance between OHCAs in densely and sparsely populated areas from 14.8% (95% CI 14.4;15.2) and 13.4% (95% CI 12.2;14.7). CONCLUSION: Our study demonstrates that while EMS response times in Denmark are longer in the rural areas, there is no statistically significant decrease in survival compared to the most densely populated areas.

3. Resuscitation. 2022 Feb 7:S0300-9572(22)00030-2. doi: 10.1016/j.resuscitation.2022.01.028. Online ahead of print.
Emotional Work Stress Reactions of Emergency Medical Technicians Involved in Transporting Out-of-Hospital Cardiac Arrest Patients with "Do Not Attempt Resuscitation" Orders.
Tanabe R(1), Hongo T(1), Mandai Y(2), Inaba M(1), Yorifuji T(3), Nakao A(1), Elmer J(4), Naito H(5).
ABSTRACT
BACKGROUND: Emergency medical technicians (EMTs) may be subjected to emotional stress during patient treatment/transport. In Japan, dispatched EMTs must attempt resuscitation in all cases of out-of-hospital cardiac arrest (OHCA), including patients with "do not attempt resuscitation" (DNAR) orders and patients whose families do not support resuscitation. We described the characteristics, prevalence, and outcomes of OHCA/DNAR patients, and aimed to identify factors associated with EMT stress when treating them. METHODS: We included OHCA patients transported by EMTs in the

city of Okayama from 2015 to 2019. We identified patients with DNAR orders based on emergency medical service (EMS) records, then EMTs completed questionnaires regarding the management of those patients and EMTs' emotions. RESULTS: Among 3,079 eligible OHCA patients, 122 patients (4%) had DNAR orders (DNAR group), and 2,957 (96%) patients had no DNAR orders (no DNAR group). Based on responses from 243 EMT participants involved in OHCA/DNAR transports, we divided EMTs into high stress (73/243, 30%) and low stress (170/243, 70%) groups. EMTs experienced emotional stress from treating patients with family physician orders to transport (AOR: 4.74, 95% CI: 2.35-9.56) and those for whom prehospital defibrillation was performed (AOR: 20.7, 95% CI: 3.10-137.9). CONCLUSIONS: Approximately 30% of EMTs providing resuscitation to OHCA/DNAR patients experienced high levels of stress. Establishment of a prehospital emergency system incorporating physician medical direction and updated guidelines for treating patients with DNAR orders may reduce the psychosocial stress of EMTs.

4. Resuscitation. 2022 Feb 4:S0300-9572(22)00010-7. doi: 10.1016/j.resuscitation.2022.01.009. Online ahead of print.

ERC-ESICM guidelines on temperature control after cardiac arrest in adults.

Nolan JP(1), Sandroni C(2), Andersen LW(3), Böttiger BW(4), Cariou A(5), Cronberg T(6), Friberg H(7), Genbrugge C(8), Lilja G(6), Morley PT(9), Nikolaou N(10), Olasveengen TM(11), Skrifvars MB(12), Taccone FS(13), Soar J(14).

ABSTRACT

The aim of these guidelines is to provide evidence-based guidance for temperature control in adults who are comatose after resuscitation from either in-hospital or out-of-hospital cardiac arrest, regardless of the underlying cardiac rhythm. These guidelines replace the recommendations on temperature management after cardiac arrest included in the 2021 post-resuscitation care guidelines co-issued by the European Resuscitation Council (ERC) and the European Society of Intensive Care Medicine (ESICM). The guideline panel included thirteen international clinical experts who authored the 2021 ERC-ESICM guidelines and two methodologists who participated in the evidence review completed on behalf of the International Liaison Committee on Resuscitation (ILCOR) of whom ERC is a member society. We followed the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach to assess the certainty of evidence and grade recommendations. The panel provided suggestions on guideline implementation and identified priorities for future research. The certainty of evidence ranged from moderate to low. In patients who remain comatose after cardiac arrest, we recommend continuous monitoring of core temperature and actively preventing fever (defined as a temperature > 37.7 °C) for at least 72 hours. There was insufficient evidence to recommend for or against temperature control at 32-36 °C or early cooling after cardiac arrest. We recommend not actively rewarming comatose patients with mild hypothermia after return of spontaneous circulation (ROSC) to achieve normothermia. We recommend not using prehospital cooling with rapid infusion of large volumes of cold intravenous fluids immediately after ROSC.

5. BMJ Open. 2022 Feb 11;12(2):e058827. doi: 10.1136/bmjopen-2021-058827.

Efficacy of virtual reality techniques in cardiopulmonary resuscitation training: protocol for a meta-analysis of randomised controlled trials and trial sequential analysis.

Zheng J(1), Du L(2), Deng X(1), Zhang L(1), Wang J(1), Chen G(3).

ABSTRACT

INTRODUCTION: Cardiopulmonary resuscitation (CPR) is the most critical procedure in the rescue of patients with sudden cardiac death (SCD). The success rate of CPR remains far below expectations, which made CPR education identified as the top priority for SCD. CPR training using the virtual reality

(VR) technique is a feasible training method, with a wider population and lower cost, but its efficacy remains controversial. Thus, we will perform a protocol for a systematic review and meta-analysis to identify the efficacy of the VR technique on CPR quality. METHODS AND ANALYSIS: We will search PubMed, Web of Science, Cochrane Library, Ovid Medline, Embase, China National Knowledge Infrastructure, Chinese BioMedical Literature, Wanfang and VIP databases from inception to November 2021, to identify randomised controlled trials and the first period in randomised cross-over trials assessing the efficacy of VR techniques versus non-VR techniques for adult participants accepting adult CPR training. No language restrictions will be considered. Data synthesis will be performed using RevMan V.5.4 and Stata/MP V.16.0. Outcome measures will be present as relative risk with 95% CIs for dichotomous data and mean difference with 95% CIs for continuous data. The primary outcome will be the CPR quality defined as chest compression rate and depth. Secondary outcomes will be the overall performance of CPR. Heterogeneity will be assessed by the χ2 test and I2 statistic. Data will be synthesised by either fixed-effects or random-effects models according to the I2 value. Trial sequential analysis and modified Jadad Scale will be used to control the risks of random errors and evaluate the evidence quality. Egger's regression test and funnel plots will be used to assess the publication bias. ETHICS AND DISSEMINATION: Ethical approval was not required for this systematic review protocol. The findings will be disseminated through peer-reviewed publications.

6. BMJ Open. 2022 Feb 8;12(2):e054027. doi: 10.1136/bmjopen-2021-054027.
Evaluation of NEWS2 response thresholds in a retrospective observational study from a UK acute hospital.
Pankhurst T(1), Sapey E(2)(3), Gyves H(4), Evison F(4), Gallier S(4)(5), Gkoutos G(6), Ball S(7)(8).
ABSTRACT
OBJECTIVE: Use of National Early Warning Score 2 (NEWS2) has been mandated in adults admitted to acute hospitals in England. Urgent clinical review is recommended at NEWS2 ≥5. This policy is recognised as requiring ongoing evaluation. We assessed NEWS2 acquisition, alerting at key thresholds and patient outcomes, to understand how response recommendations would affect clinical resource allocation. SETTING: Adult acute hospital in England. DESIGN: Retrospective observational cohort study. PARTICIPANTS: 100 362 consecutive admissions between November 2018 and July 2019. OUTCOME: Death or admission to intensive care unit within 24 hours of a score. METHODS: NEWS2 were assembled as single scores from consecutive 24-hour time frames, (the first NEWS2 termed 'Index-NEWS2'), or as all scores from the admission (termed All-NEWS2). Scores were excluded when a patient was in intensive care, in the presence of a decision not to attempt cardiopulmonary resuscitation, or on day 1 of elective admission. RESULTS: A mean of 4.5 NEWS2 were acquired per patient per day. The outcome rate following an Index-NEWS2 was 0.22/100 patient-days. The sensitivity of outcome prediction at Index-NEWS2 ≥5=0.46, and number needed to evaluate (NNE)=52. At this threshold, a mean of 37.6 alerts/100 patient-days would be generated, occurring in 12.3% of patients on any single day. Threshold changes to increase sensitivity by 0.1, would result in a twofold increase in alert rate and 1.5-fold increase in NNE. Overall, NEWS2 classification performance was significantly worse on Index-scores than All-scores (c-statistic=0.78 vs 0.85; p<0.001). CONCLUSIONS: The combination of low event-rate, high alert-rate and low sensitivity, in patients for cardiopulmonary resuscitation, means that at current NEWS2 thresholds, resource demand would be sufficient to meaningfully compete with other pathways to clinical evaluation. In analyses that epitomise in-patient screening, NEWS2 performance suggests a need for re-evaluation of current response recommendations in this population.

7. Ned Tijdschr Geneeskd. 2022 Jan 18;166:D6332.

[Professional caregivers as civilian first responders in prehospital cardiac arrest]. [Article in Dutch]
Bollen J(1)(2), van der Leeuw BMF(3), Thomas O(4).

ABSTRACT

The chance of survival from a prehospital cardiac arrest has increased enormously in recent years thanks to the efforts of civilian first responders. They can start CPR and possibly defibrillate while waiting for the ambulance. These civilian first responders regularly include professional caregivers who can provide advanced life support (ALS) together with ambulance personnel. This article describes the opportunities and challenges, and discusses competence and ability, the use of expertise, and crew resource management (CRM) to ensure that the available knowledge and skills are managed in the right direction. This can further improve the quality of patient care and thus increase the chance of survival.

POST-CARDIAC ARREST TREATMENTS

1. Ann Intensive Care. 2022 Feb 11;12(1):12. doi: 10.1186/s13613-022-00987-w.

The influence of timing of coronary angiography on acute kidney injury in out-of-hospital cardiac arrest patients: a retrospective cohort study.

Janssens GN(1), Daemen J(2), Lemkes JS(1), Spoormans EM(1), Janssen D(1), den Uil CA(2)(3)(4), Jewbali LSD(2), Heestermans TACM(5), Umans VAWM(5), Halfwerk FR(6), Beishuizen A(7), Nas J(8), Bonnes J(9), van de Ven PM(9), van Rossum AC(1), Elbers PWG(10), van Royen N(11)(12).

ABSTRACT

BACKGROUND: Acute kidney injury (AKI) is a frequent complication in cardiac arrest survivors and associated with adverse outcome. It remains unclear whether the incidence of AKI increases after the post-cardiac arrest contrast administration for coronary angiography and whether this depends on timing of angiography. Aim of this study was to investigate whether early angiography is associated with increased development of AKI compared to deferred angiography in out-of-hospital cardiac arrest (OHCA) survivors. METHODS: In this retrospective multicenter cohort study, we investigated whether early angiography (within 2 h) after OHCA was non-inferior to deferred angiography regarding the development of AKI. We used an absolute difference of 5% as the non-inferiority margin. Primary non-inferiority analysis was done by calculating the risk difference with its 90% confidence interval (CI) using a generalized linear model for a binary outcome. As a sensitivity analysis, we repeated the primary analysis using propensity score matching. A multivariable model was built to identify predictors of acute kidney injury. RESULTS: A total of 2375 patients were included from 2009 until 2018, of which 1148 patients were treated with early coronary angiography and 1227 patients with delayed or no angiography. In the early angiography group 18.5% of patients developed AKI after OHCA and 24.1% in the deferred angiography group. Risk difference was - 3.7% with 90% CI ranging from - 6.7 to - 0.7%, indicating non-inferiority of early angiography. The sensitivity analysis using propensity score matching showed accordant results, but no longer non-inferiority of early angiography. The factors time to return of spontaneous circulation (odds ratio [OR] 1.12, 95% CI 1.06-1.19, $p < 0.001$), the (not) use of angiotensin-converting enzyme inhibitor or angiotensin II receptor blocker (OR 0.20, 95% CI 0.04-0.91, $p = 0.04$) and baseline creatinine (OR 1.05, 95% CI 1.03-1.07, $p < 0.001$) were found to be independently associated with the development of AKI. CONCLUSIONS: Although AKI occurred in approximately 20% of OHCA patients, we found that early angiography was not associated with a higher AKI incidence than a deferred angiography strategy. The present results implicate that it is safe to perform early coronary angiography with respect to the risk of developing AKI after OHCA.

2. Resusc Plus. 2022 Jan 31;9:100204. doi: 10.1016/j.resplu.2022.100204. eCollection 2022 Mar.

Elevated prehospital point-of-care glucose is associated with worse neurologic outcome after out-of-hospital cardiac arrest.

Abramson TM(1), Bosson N(2)(3)(4), Whitfield D(2)(3)(4), Gausche-Hill M(2)(3)(4), Niemann JT(3)(4).
ABSTRACT
OBJECTIVES: Hyperglycemia is associated with poor outcomes in critically-ill patients. This has implications for prognostication of patients with out-of-hospital cardiac arrest (OHCA) and for post-resuscitation care. We assessed the association of hyperglycemia, on field point-of-care (POC) testing, with survival and neurologic outcome in patients with return of spontaneous circulation (ROSC) after OHCA. METHODS: This was a retrospective analysis of data in a regional cardiac care system from April 2011 through December 2017 of adult patients with OHCA and ROSC who had a field POC glucose. Patients were excluded if they were hypoglycemic (glucose <60 mg/dl) or received empiric dextrose. We compared hyperglycemic (glucose >250 mg/dL) with euglycemic (glucose 60-250 mg/dL) patients. Primary outcome was survival to hospital discharge (SHD). Secondary outcome was survival with good neurologic outcome (cerebral performance category 1 or 2 at discharge). We determined the adjusted odds ratios (AORs) for SHD and survival with good neurologic outcome. RESULTS: Of 9008 patients with OHCA and ROSC, 6995 patients were included; 1941 (28%) were hyperglycemic and 5054 (72%) were euglycemic. Hyperglycemic patients were more likely to be female, of non-White race, and have an initial non-shockable rhythm compared to euglycemic patients ($p < 0.0001$ for all). Hyperglycemic patients were less likely to have SHD compared to euglycemic survivors, 24.4% vs 32.9%, risk difference (RD) -8.5% (95 %CI -10.8%, -6.2%), $p < 0.0001$. Hyperglycemic survivors were also less likely to have good neurologic outcome compared to euglycemic survivors, 57.0% vs 64.6%, RD -7.6% (95 %CI -12.9%, -2.4%), $p = 0.004$. The AOR for SHD was 0.72 (95 %CI 0.62, 0.85), $p < 0.0001$ and for good neurologic outcome, 0.70 (95 %CI 0.57, 0.86), $p = 0.0005$. CONCLUSION: In patients with OHCA, hyperglycemia on field POC glucose was associated with lower survival and worse neurologic outcome.

3. Resuscitation. 2022 Feb 4:S0300-9572(22)00024-7. doi: 10.1016/j.resuscitation.2022.01.023. Online ahead of print.

Very long-term survivors of in-hospital and out-of-hospital cardiac arrest show considerable impairment of daily life.

Schnaubelt S(1), Mayr FB(2), Losert H(3), Domanovits H(3), Sulzgruber P(4), Holzer M(3), Sterz F(3), Uray T(3).

ABSTRACT
BACKGROUND: Reliable data on long-term outcomes after cardiac arrest (CA) remain scarce. Identifying factors persistently impacting the quality of life after CA is crucial to improve long-term outcomes. METHODS: Adult in- and out-of-hospital CA patients surviving to hospital discharge between 1996 and 2015 were retrospectively included. We classified survivors in stages of survival time and assessed long-term survival and quality of life by contacting patients via a standardized telephone questionnaire including the modified Rankin Scale (mRS). RESULTS: Of 4,234 patients, 1,573 (37.2%) survived to hospital discharge. Among those, 693(44.1%) were alive at the time of the interview. We obtained interviews in 178 patients at a survival time of 7.8 (4.2-12.6) years. Younger age, female gender, and shorter duration of initial hospitalization and coma were associated with long-term survival. Conversely, higher median age at time of CA predicted poor outcome ($mRS \geq 3$) and impaired quality of daily life. Around 25% declared being impaired in mobility, with female gender and higher age being predictors. Impairment in personal care and hygiene was stated in 11.8%, and activities of daily life such as shopping troubled 33.1%. Chronic pain impairing daily life was reported in 47.2% of cases, and lower socioeconomic status was suggestive of unfavourable outcome. CONCLUSION: Very long-term survivors showed considerable impairment of quality of life in terms of reduced mobility, self-care, or chronic pain. Higher age at time of CA and lower socioeconomic status showed worse outcomes. A more personalized screening of survivors for risk factors and long-term support are suggested.

TARGETED TEMPERATURE MANAGEMENT

1. Ann Med Surg (Lond). 2022 Jan 29;74:103327. doi: 10.1016/j.amsu.2022.103327. eCollection 2022 Feb.

Hypothermia versus normothermia after out-of-hospital cardiac arrest: A systematic review and meta-analysis of randomized controlled trials.

Shrestha DB(1), Sedhai YR(2), Budhathoki P(3), Gaire S(4), Adhikari A(5), Poudel A(6), Aryal BB(7), Yadullahi Mir WA(1), Dahal K(8), Kashiouris MG(9).

ABSTRACT

BACKGROUND: The current guidelines recommend targeted temperature management (TTM) as part of the post-resuscitation care for comatose patients following out-of-hospital cardiac arrest. These recommendations are based on the weak evidence of benefit seen in the early clinical trials. Recent large multicentered trials have failed to show a meaningful clinical benefit of hypothermia, unlike the earlier studies. Thus, to fully appraise the available data, we sought to perform this systematic review and meta-analysis of randomized controlled trials. METHODS: We searched four databases for randomized controlled trials comparing therapeutic hypothermia (32-34 °C) with normothermia (≥36 °C with control of fever) in adult patients resuscitated after out-of-hospital cardiac arrest. Independent reviewers did the title and abstract screening, full-text screening, and extraction. The primary outcome was mortality six months after cardiac arrest, and secondary outcomes were neurological outcomes and adverse effects. RELEVANCE FOR PATIENTS: Six randomized controlled trials were included in this review. There was no significant difference between the hypothermia and normothermia groups in mortality till 6 months follow up after out-of-hospital cardiac arrest (OR 0.88, 95% CI 0.67-1.16; n = 3243; I2 = 51%), or favorable neurological outcome (OR 1.31, 95% CI 0.93-1.84; n = 3091; I2 = 68%). Rates of arrhythmias were notably higher in the hypothermia group than the normothermia group (OR 1.43, 95% CI 1.20-1.71; n = 3029; I2 = 4%). However, odds for development of pneumonia showed no significant differences across two groups (OR 1.13, 95% CI 0.98-1.31; n = 3056; I2 = 22%). Therefore, targeted hypothermia with a target temperature of 32-34 °C does not provide mortality benefit or better neurological outcome in patients resuscitated after the out-of-hospital cardiac arrest when compared with normothermia.

2. Ann Palliat Med. 2022 Jan;11(1):68-76. doi: 10.21037/apm-21-3403.

Survival to hospital discharge and neurological outcomes with targeted temperature management after in-hospital cardiac arrest: a systematic review and meta-analysis.

Yin L(1), Xie D(2), He D(1), Chen Z(1), Guan Y(1), Wang J(1), Lin Z(1).

ABSTRACT

BACKGROUND: Multiple randomized controlled trials have shown that targeted temperature management (TTM) has favorable effects in out-of-hospital cardiac arrest. However, the benefit of TTM in patients with in-hospital cardiac arrest (IHCA) remains to be verified. METHODS: The PubMed, Cochrane Library, and EMBASE databases were searched for clinical studies with the primary outcomes of survival to hospital discharge and neurological outcomes. Neurological outcomes were evaluated by the categorical scale of cerebral function (CPC); a score of 1-2 points was considered neurologically good, and a score of 3-5 points was considered a poor outcome. Revman 5.3 and Stata 14 software with the random effects model were used for analysis. P<0.05 was considered statistically significant. RESULTS: Six retrospective controlled studies with a total of 14,607 patients (TTM group: 1,845, control group: 12,762) were included and analyzed. There were no statistically significant differences between the two groups in survival to hospital discharge [odds ratio (OR) =1.02, 95% CI: 0.77-1.35, P=0.89, I2=47%] or favorable neurological outcomes (OR =1.06, 95% CI: 0.56-2.02, P=0.85, I2=79%). After excluding patients with non-shockable initial rhythms, TTM

did not show any significant improvement in survival to hospital discharge. Subgroup analysis was performed according to the sample size. No significant improvement was observed between the two groups in terms of survival to hospital discharge or neurological outcome. DISCUSSION: In this meta-analysis, the effects of TTM on discharge survival and neurological prognosis were evaluated by studying the results of IHCA in 14,607 patients. We found that the TTM did not improve survival and neurological function in discharged patients. Our results showed that the sample size discrepancy had a large effect on the heterogeneity; to address this, subgroup analyses were performed according to the different sample sizes. However, TTM treatment in different sample size subgroups showed no significant effect on survival to hospital discharge. Moreover, in the large sample size subgroup, therapeutic hypothermia was associated with increased unfavorable neurological outcome compared with no hypothermia.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

No articles identified.

PEDIATRICS AND CHILDREN

1. Pediatr Cardiol. 2022 Feb 9. doi: 10.1007/s00246-022-02838-8. Online ahead of print.
Delayed, Unprovoked, Hemodynamic Collapse with Following Asystole in a Pediatric Patient Following a High-Voltage Injury: A Case Report and Literature Review.
Ghazal Asswad A(1), Holm S(2), Engström O(2), Huss F(2)(3), Lipcsey M(4), Rudolph A(5)(6).
ABSTRACT
Electrical incidents are common and mostly uneventful, though can be severe and sometimes lethal. Aside from skin, muscle and soft tissue damage, electrical injuries can cause cardiac arrhythmias, the most common cardiac complication. The case of a 14-year-old girl who sustained 48.5% TBSA burns following a high-voltage electrical injury is described. She suffered five episodes of asystole 78 h following the injury, requiring extracorporeal membrane oxygenation. The cause of the delayed asystole was investigated and a PubMed literature search was conducted to explore late presenting cardiac sequelae following electrical injuries. This yielded fifteen studies, identified as relevant, of high quality and in the English language. These studies included a total of 1411 patients of whom only 3 were found to have had late potentially lethal arrhythmias, all manifesting within the first 24 h after the injury. Of these patients, 32 suffered cardiac arrests shortly after the electrical injury, 11 of which were documented as asystolic arrests though these were all from a single study with the rural locale and prolonged delay in arrival to the hospital setting contributing to this finding. To our knowledge, this is the only pediatric cardiac arrest developing in a stable patient over 72 h following the initial electrical injury. No other patient has suffered any significant cardiac complications first presenting outside the initial 24-h period following the electrical injury. Guidelines and recommendations on post electrical injury observation of patient vary and further research into this field is required to allow for guidance unification.

2. S Afr Fam Pract (2004). 2022 Jan 26;64(1):e1-e8. doi: 10.4102/safp.v64i1.5323.
Preparedness for paediatric cardiopulmonary resuscitation amongst medical doctors working in primary health care facilities in Cape Town, South Africa.
Amien N(1), Bresick G, Evans K.
ABSTRACT

BACKGROUND: Cardiopulmonary resuscitation (CPR) is the principal medical intervention used to reduce the high mortality associated with the cardiorespiratory arrest. There is a paucity of literature on the preparedness for paediatric cardiopulmonary resuscitation (pCPR) amongst doctors in Cape Town. This study aimed to assess the preparedness for pCPR of doctors working in Western Cape Provincial Government primary health care facilities (PHCFs) in Cape Town with regard to knowledge, confidence and doctors' knowledge of equipment availability. METHODS: A cross-sectional study using a questionnaire to collect quantitative data from a sample of 206 doctors working in Cape Town PHCFs. RESULTS: The questionnaire was completed by 173 doctors (84% response rate). The majority (81.8%) had not undergone pCPR training (Paediatric Advanced Life Support or Advanced Paediatric Life Support). Basic life support was done by 88.3%: 28% greater than two years ago. The average pCPR knowledge score was 61% (standard deviation [s.d.]: 20.3, range: 8.3% - 100%). Doctors in their community service and internship years had significantly higher knowledge scores compared to grade 3 Medical officers ($p = 0.001$ and $p = 0.010$, respectively). Eleven per cent had performed pCPR 10 times in the past year; 20% had never performed pCPR and 35% did not feel confident performing pCPR. More than 35% of doctors were uncertain about the availability of equipment in their facility. CONCLUSION: Doctors working in Cape Town PHCFs have poor knowledge, have low confidence levels and are poorly prepared to perform pCPR. Urgent attention needs to be given to ensuring formal pCPR training and acquaintance with equipment availability and location in Cape Town PHCFs.

3. J Pediatr (Rio J). 2022 Feb 6:S0021-7557(22)00002-X. doi: 10.1016/j.jped.2021.12.008. Online ahead of print.

Analysis of death in children not submitted to cardiopulmonary resuscitation.

Leite MM(1), Bello FPS(2), Sakano TMS(2), Schvartsman C(2), da Costa Reis AGA(2).

ABSTRACT

OBJECTIVE: Describe the epidemiology of deaths in children not submitted to CPR, compare to a CPR group and evaluate patients' medical records of those not submitted to CPR. METHODS: Observational cross-sectional study assessing deaths between 2015 and 2018 in a pediatric tertiary hospital, divided into two groups: CPR and no- CPR. The source of data included the cardiorespiratory arrest register, based on Utstein style. Children's medical records in no-CPR group were researched by hand. RESULTS: 241 deaths were included, 162 in CPR group and 79 in the no-CPR group. Preexisting diseases were observed in 98.3% of patients and prior advanced intervention in 78%. Of the 241 deaths, 212 (88%) occurred in the PICU, being 138/162 (85.2%) in CPR group and 74/79 (93.7%) in no-CPR group ($p = 0.018$). Bradycardia as the initial rhythm was five times more frequent in the CPR group (OR 5.06, 95% CI 1.94-13,19). There was no statistically significant difference regarding age, gender, preexisting diseases, and period of the day of the occurrence of death. Medical records revealed factors related to the family decision-making process or the suitability of therapeutic effort. Discrepancies between the practice of CPR and medical records were identified in 9/79 (11,4%) records allocated to the no-CPR group. CONCLUSION: Most deaths with CPR and with the no-CPR occurred in the PICU. Bradycardia as the initial rhythm was five times more frequent in the CPR group. Medical records reflected the complexity of the decision not to perform CPR. Discrepancies were identified between practice and medical records in the no-CPR group.

4. Am J Emerg Med. 2022 Jan 30;54:65-70. doi: 10.1016/j.ajem.2022.01.051. Online ahead of print.

Effects of resuscitation guideline terminology on pediatric cardiopulmonary resuscitation.

Noh H(1), Lee W(1), Yang D(1), Oh JH(2).

ABSTRACT
OBJECTIVE: This study aimed to investigate the effect of resuscitation guideline terminology on pediatric cardiopulmonary resuscitation (CPR) performance. METHODS: This was a prospective randomised crossover simulation trial. A total of 32 medical doctors conducted 2-min single-rescuer CPR using the one-handed chest compression technique (OHCC) or two-handed chest compression technique (THCC) on a pediatric manikin. The participants conducted chest compressions according to the chest compression depth (CCD) target of '5 cm (Test 1)' or 'at least one third of the anterior-posterior dimension of the chest (Test 2)' in a random order. RESULTS: In both techniques (OHCC or THCC), the average CCD of Test 1 were significantly lower than those of Test 2 (OHCC: 50.0 mm [46.0-52.0 mm] in Test 1 vs. 52.0 mm [50.3-55.0 mm] in Test 2, P = 0.001; THCC: 52.0 mm [50.3-55.0 mm] in Test 1 vs. 58.0 mm [54.0-62.0 mm] in Test 2, P < 0.001). The adequacy of the chest compressions was also superior in Test 2 (OHCC: 63.0% [7.5-95.8%] in Test 1 vs. 96.5% [78.8-99.9%] in Test 2, P < 0.001; THCC: 96.5% [78.8-99.9%] in Test 1 vs. 100.0% [100.0-100.0%] in Test 2, P < 0.001). Ventilation parameters were not significantly different between Tests 1 and 2. CONCLUSIONS: Average CCD during simulated pediatric CPR according to the CCD target of '5 cm' was significantly lower than those according to the CCD target of 'at least one third of the anterior-posterior dimension of the chest'.

EXTRACORPOREAL LIFE SUPPORT

1. Resuscitation. 2022 Feb 7:S0300-9572(22)00036-3. doi: 10.1016/j.resuscitation.2022.02.001. Online ahead of print.
Cytokine adsorption in patients with post-cardiac arrest syndrome after extracorporeal cardiopulmonary resuscitation (CYTER) - a single-centre, open-label, randomised, controlled trial.
Supady A(1), Zahn T(2), Kuhl M(2), Maier S(3), Benk C(3), Kaier K(4), Böttiger BW(5), Bode C(2), Lother A(2), Staudacher DL(2), Wengenmayer T(2), Duerschmied D(2).
ABSTRACT
AIM: To investigate the effect of cytokine adsorption in patients receiving extracorporeal cardiopulmonary resuscitation (ECPR) after cardiac arrest. METHODS: CYTER was a single-centre, open-label, randomised, controlled trial. Patients selected for ECPR at the University Medical Center Freiburg (Freiburg, Germany) were assigned to extracorporeal membrane oxygenation (ECMO) support with or without cytokine adsorption (1:1) using the CytoSorb adsorber, incorporated into the ECMO, replaced every 24 hours, and removed after 72 hours. The primary endpoint was serum interleukin (IL)-6 concentration at 72 hours (intention-to-treat analysis). Secondary endpoints included 30-day survival, vasopressor support and biomarkers of end-organ injury. RESULTS: Of 50 patients enrolled in the trial, 26 (52%) were treated with cytokine adsorption and 24 (48%) without. Nine patients were excluded (informed consent could not be obtained); 41 patients were therefore included in the primary analysis. Median IL-6 levels (IQR) decreased from 408.0(93.4-906.5) to 324.0 (134.3-4617.3) pg/mL and increased from 133.0 (56.2-528.5) to 241.0 (132.8-718.0) pg/mL in the cytokine adsorption and control group, respectively (linear regression for treatment [cytokine adsorption vs control]: p = 0.48). Three (14%) of 22 patients treated with cytokine adsorption and 8 (42%) of 19 patients treated without cytokine adsorption survived to day 30 (HR = 1.85, 95% CI 0.86-4.01; p = 0.10). Vasopressor support and NSE, S100b, troponin T, CRP and PCT levels were similar between groups. CONCLUSION: Cytokine adsorption in patients receiving ECPR did not reduce serum IL-6 and had no significant effect on survival, vasopressor support, or biomarkers of injury.

2. Eur Heart J Acute Cardiovasc Care. 2022 Feb 10:zuac010. doi: 10.1093/ehjacc/zuac010. Online ahead of print.
The association between time to extracorporeal cardiopulmonary resuscitation and outcome in patients with out-of-hospital cardiac arrest.

Kawakami S(1)(2), Tahara Y(2), Koga H(3), Noguchi T(2), Inoue S(1), Yasuda S(2)(4).
ABSTRACT
AIMS: Extracorporeal cardiopulmonary resuscitation (ECPR) is considered for potentially reversible out-of-hospital cardiac arrest (OHCA). However, the association between time to ECPR and outcome has not been well established. METHODS AND RESULTS: Between June 2014 and December 2017, we enrolled 34 754 OHCA patients in a multicentre, prospective fashion [Japanese Association for Acute Medicine (JAAM)-OHCA registry]. After the application of exclusion criteria, 695 OHCA patients who underwent ECPR for cardiac causes were eligible for this study. We investigated the association between the call-to-ECPR interval and favourable neurological outcome (cerebral performance category 1 or 2) at 30 days. Seventy-seven patients (11%) had a favourable neurological outcome at 30 days. The call-to-ECPR intervals in these patients were significantly shorter than in those with an unfavourable neurological outcome [49 (41-58) vs. 58 (48-68) min, respectively, P < 0.001]. A longer call-to-ECPR interval was associated with a smaller proportion of patients undergoing percutaneous coronary intervention (PCI) (P = 0.034) or target temperature management (TTM) (P < 0.001). Stepwise multivariable logistic regression analysis revealed that the call-to-ECPR interval was an independent predictor of favourable neurological outcome [odds ratio (OR) 0.96, 95% confidence interval (CI) 0.94-0.99, P = 0.001], as were age, male gender, initial shockable rhythm, transient return of spontaneous circulation in the prehospital setting, arterial pH at hospital arrival, PCI (OR 2.30, 95% CI 1.14-4.66, P = 0.019), and TTM (OR 2.28, 95% CI 1.13-4.62, P = 0.019). CONCLUSION: A shorter call-to-ECPR interval and implementation of PCI and TTM predicted a favourable neurological outcome at 30 days in OHCA patients who underwent ECPR for cardiac causes.

3. J Card Surg. 2022 Feb 13. doi: 10.1111/jocs.16307. Online ahead of print.
Contemporary national utilization of extracorporeal cardiopulmonary resuscitation (ECPR) for out-of-hospital cardiac arrest.
Catalano MA(1), Pupovac S(2), Manetta F(2), Kennedy KF(3), Hartman A(2), Yu PJ(2).
ABSTRACT
OBJECTIVE: The utilization of extracorporeal membrane oxygenation (ECMO) during cardio-pulmonary resuscitation (ECPR) has demonstrated promising evidence for the management of out-of-hospital cardiac arrest (OHCA). We aim to describe contemporary utilization and predictors of survival of patients receiving ECPR for OHCA. METHODS: The National Inpatient Sample (NIS) was queried to identify hospital discharge records of patients aged ≥18 years who underwent ECPR from 2012 to 2017. Patients with an International Classification of Diseases, Tenth Revision, Clinical Modification diagnosis of cardiac arrest, admitted urgently and placed on ECMO on Day 0 of hospitalization, were selected. Patients with a primary diagnosis indicative of veno-venous ECMO were excluded. Predictors of mortality were assessed using multivariable analyses. RESULTS: There were 1675 cases of ECPR, increasing from 185 cases in 2012 to 400 in 2017 (p < .001). Overall mortality was 63.3%, which remained stable over time (p = .441). Common diagnoses included ST-elevation myocardial infarction (39.1%), non-ST-elevation myocardial infarction (9.3%), and pulmonary embolism (13.7%). Percutaneous coronary intervention was performed in 495 patients (29.6%); coronary artery bypass grafting was performed in 125 patients (7.5%). In multivariable analysis, decreased age, female gender, and left ventricular (LV) decompression were associated with reduced mortality. CONCLUSION: Utilization of ECPR is increasing nationally with stable mortality rates. Younger age, female gender, and utilization of LV decompression were associated with increased survival.

EXPERIMENTAL RESEARCH

1. Neuromodulation. 2022 Feb 4:S1094-7159(21)07009-4. doi: 10.1016/j.neurom.2021.12.014. Online ahead of print.

Cervical Vagus Nerve Stimulation Improves Neurologic Outcome After Cardiac Arrest in Mice by Attenuating Oxidative Stress and Excessive Autophagy.

Duan W(1), Sun Q(2), Wu X(2), Xia Z(2), Warner DS(3), Ulloa L(3), Yang W(3), Sheng H(4).

ABSTRACT

BACKGROUND: Cerebral ischemia and reperfusion (I/R) induces oxidative stress and activates autophagy, leading to brain injury and neurologic deficits. Cervical vagus nerve stimulation (VNS) increases cerebral blood flow (CBF). In this study, we investigate the effect of VNS-induced CBF increase on neurologic outcomes after cardiac arrest (CA). MATERIALS AND METHODS: A total of 40 male C57Bl/6 mice were subjected to ten minutes of asphyxia CA and randomized to vagus nerve isolation (VNI) or VNS treatment group. Eight mice received sham surgery and VNI. Immediately after resuscitation, 20 minutes of electrical stimulation (1 mA, 1 ms, and 10 Hz) was started in the VNS group. Electrocardiogram, blood pressure, and CBF were monitored. Neurologic and histologic outcomes were evaluated at 72 hours. Oxidative stress and autophagy were assessed at 3 hours and 24 hours after CA. RESULTS: Baseline characteristics were not different among groups. VNS mice had better behavioral performance (ie, open field, rotarod, and neurologic score) and less neuronal death ($p < 0.05$, vs VNI) in the hippocampus. CBF was significantly increased in VNS-treated mice at 20 minutes after return of spontaneous circulation (ROSC) ($p < 0.05$). Furthermore, levels of 8-hydroxy-2'-deoxyguanosine in the blood and autophagy-related proteins (ie, LC-3 Ⅱ/Ⅰ, Beclin-1, and p62) in the brain were significantly decreased in VNS mice. Aconitase activity was also reduced, and the p-mTOR/mTOR ratio was increased in VNS mice. CONCLUSIONS: Oxidative stress induced by global brain I/R following CA/ROSC leads to early excessive autophagy and impaired autophagic flux. VNS promoted CBF recovery, ameliorating these changes. Neurologic and histologic outcomes were also improved.

2. Resusc Plus. 2022 Feb 1;9:100203. doi: 10.1016/j.resplu.2022.100203. eCollection 2022 Mar.

Pediatric defibrillation shocks alone do not cause heart damage in a porcine model.

McCartney B(1)(2), Harvey A(2), Kernaghan A(2), Morais S(2), McAlister O(2)(1), Crawford P(3), Biglarbeigi P(1), Bond R(1), Finlay D(1), McEneaney D(4).

ABSTRACT

AIM: Automated external defibrillators (AEDs) use various shock protocols with different characteristics when deployed in pediatric mode. The aim of this study is to assess and compare the safety and efficacy of different AED pediatric protocols using novel experimental approaches. METHODS: Two defibrillation protocols (A and B) were assessed across two studies: Protocol A: escalating (50-75-90 J) defibrillation waveform with higher voltage, shorter duration and equal phase durations. Protocol B; non-escalating (50-50-50 J) defibrillation waveform with lower voltage, longer duration and unequal phase durations.Experiment 1: Isolated shock damage was assessed following shocks to 12 anesthetized pigs. Animals were randomized into two groups, receiving three shocks from Protocol A (50-75-90 J) or B (50-50-50 J). Cardiac function, cardiac troponin I (cTnI), creatine phosphokinase (CPK) and histopathology were analyzed. Experiment 2: Defibrillation safety and efficacy were assessed through shock success, ROSC, ST-segment deviation and contractility following 16 randomized shocks from protocol A or B delivered to 10 anesthetized pigs in VF. RESULTS: Experiment 1: No clinically meaningful difference in cTnI, CPK, ST-segment deviation, ejection fraction or histopathological damage was observed following defibrillation with either protocol. No difference was observed between protocols at any timepoint. Experiment 2: all defibrillation types demonstrated shock success and ROSC ≥ 97.5%. Post-ROSC contractility was

similar between protocols. CONCLUSIONS: There is no evidence that administration of clinically relevant shock sequences, without experimental confounders, result in significant myocardial damage in this model of pediatric resuscitation. Typical variations in AED pediatric mode settings do not affect defibrillation safety and efficacy.

3. Arch Dis Child Fetal Neonatal Ed. 2022 Feb 8:fetalneonatal-2021-323271. doi: 10.1136/archdischild-2021-323271. Online ahead of print.

Haemodynamic changes with varying chest compression rates in asphyxiated piglets.

Bruckner M(1)(2), Neset M(2)(3), O'Reilly M(2)(4), Lee TF(2), Cheung PY(2)(4), Schmölzer GM(5)(4).

ABSTRACT

BACKGROUND: Current neonatal resuscitation guidelines recommend that chest compressions (CCs) be delivered at a rate of 90/min. The aim of the study was to investigate the haemodynamic effects of different CC rates in a neonatal piglet model. METHODS: Six asphyxiated piglets were randomised to CC with rates of 60/min, 90/min, 120/min, 150/min and 180/min for 1 min at each rate. CCs superimposed with sustained inflations were performed with an automated CC machine. RESULTS: Six newborn piglets (age 0-3 days, weight 2.0-2.3 kg) were included in the study. Overall, there was a gradual increase in stroke volume, minimum and maximum rate of left ventricle pressure change (dp/dtmin and dp/dtmax), and carotid blood flow until CC rate of 150/min, with a level-off effect at a CC rate of 180/min. However, cardiac output continued to increase with the highest being at a CC rate of 180/min. CONCLUSION: Rate of CC was associated with changes in haemodynamic parameters during cardiopulmonary resuscitation. CC rate of 150-180/min during CC resulted in the highest cardiac output and arterial blood pressure.

CASE REPORTS

1. Clin Case Rep. 2022 Feb 2;10(2):e05345. doi: 10.1002/ccr3.5345. eCollection 2022 Feb.

Clinical impact and benefits of a simultaneous cardio-pulmonary rehabilitation in a COVID-19-infected patient following cardiac arrest: A case report.

Lee M(1), Lee JJ(2)(3), Ko JY(1), Kim YK(1), Lee S(1)(4).

ABSTRACT

Since the advent of the pandemic, cardio-pulmonary rehabilitation (CR) has been shown to be an effective treatment. However, there are no studies showing data to substantiate its simultaneous application. A 62-year-old man was resuscitated for asystole during the work-up after presenting with a 2-day history of difficulty breathing. PCR test was positive for COVID-19. He was intubated and admitted to a negative pressure zone. Symptoms improved in response to acute treatment. Following extubation, respiratory distress persisted, and CR was implemented. Clinical indicators of cardiopulmonary function improved resulting in a successful return to community participation. The decline in cardiopulmonary function has been on the rise among COVID-19 survivors. The simultaneous application of CR treatment in our patient resulted in improved clinical indicators of cardiopulmonary function. The patient regained full function for independent community participation.