This week's PubMed 6th – 12th March 2022: articles of interest n = 48

CPR AND COVID-19

Temporal trends of suicide-related non-traumatic out-of-hospital cardiac arrest characteristics and outcomes with the COVID-19 pandemic.
Yap J(1)(2), Scheuermeyer FX(1)(3)(4), van Diepen S(1)(5), Barbic D(3)(4), Straight R(1)(6), Wall N(1)(6), Asamoah-Boaheng M(1)(3), Christenson J(1)(3)(4), Grunau B(1)(3)(4)(6).
ABSTRACT
BACKGROUND: Jurisdictions have reported COVID-19-related increases in the incidence and mortality of non-traumatic out-of-hospital cardiac arrest (OHCA). We hypothesized that changes in suicide incidence during the COVID-19 pandemic may have contributed to these changes. We investigated whether the COVID-19 pandemic was associated with changes in the: (1) incidence of suicide-related OHCA, and (2) characteristics and outcomes of such cases. METHODS: We used the provincial British Columbia Cardiac Arrest Registry, including non-traumatic emergency medical system (EMS)-assessed OHCA, to compare suicide-related OHCA (defined as clear self-harm or a priori communication of intent) one-year prior to, and one year after, the start of the COVID-19 pandemic (March 15, 2020). We calculated differences in incidence (with 95% CI), overall and within subgroups of mechanism (hanging, suffocation, poisoning, or unclear mechanism), and in case characteristics and hospital-discharge favourable neurological outcomes (CPC 1-2). RESULTS: Of 13,785 EMS-assessed OHCA, we included 274/6430 (4.3%) pre-pandemic and 221/7355 (3.0%) pandemic-period suicide-related cases. The median age was 43 years (IQR 30-57), 157 (32%) were female, and 7 (1.4%) survived with favourable neurological status. Suicide-related OHCA incidence decreased from 5.4 pre-pandemic to 4.3 per 100 000 person-years (-1.1, 95% CI -2.0 to -0.28). Hanging-related OHCA incidence also decreased. Patient characteristics and hospital discharge outcomes between periods were similar. CONCLUSION: Suicide-related OHCA incidence decreased with the COVID-19 pandemic and we did not detect changes in patient characteristics or outcomes, suggesting that suicide is not a contributor to increases in COVID-related OHCA incidence or mortality. Overall outcomes in both time periods were poor.

Activation of Citizen Responders to Out-of-Hospital Cardiac Arrest During the COVID-19 Outbreak in Denmark 2020.
Gregers MCT(1)(2), Andelius L(1), Malta Hansen C(1)(2)(3), Kragh AR(1)(2), Torp-Pedersen C(4)(5)(6), Christensen HC(1)(2), Kjoelbye JS(1)(2), Væggemose U(7)(8), Frischknecht Christensen E(9)(10)(11), Folke F(1)(2)(3).
ABSTRACT
Background Little is known about how COVID-19 influenced engagement of citizen responders dispatched to out-of-hospital cardiac arrest (OHCA) by a smartphone application. The objective was to describe and analyze the Danish Citizen Responder Program and bystander interventions (both citizen responders and nondispatched bystanders) during the first COVID-19 lockdown in 2020. Methods and Results All OHCAs from January 1, 2020, to June 30, 2020, with citizen responder activation in 2 regions of Denmark were included. We compared citizen responder engagement for OHCA in the nonlockdown period (January 1, 2020, to March 10, 2020, and April 21, 2020, to June 30, 2020) with the lockdown period (March 11, 2020, to April 20, 2020). Data are displayed in the order lockdown versus nonlockdown period. Bystander cardiopulmonary resuscitation rates did not

differ in the 2 periods (99% versus 92%; P=0.07). Bystander defibrillation (9% versus 14%; P=0.4) or return-of-spontaneous circulation (23% versus 23%; P=1.0) also did not differ. A similar amount of citizen responders accepted alarms during the lockdown (6 per alarm; interquartile range, 6) compared with the nonlockdown period (5 per alarm; interquartile range, 5) (P=0.05). More citizen responders reported performing chest-compression-only cardiopulmonary resuscitation during lockdown compared with nonlockdown (79% versus 59%; P=0.0029), whereas fewer performed standardized cardiopulmonary resuscitation, including ventilations (19% versus 38%; P=0.0061). Finally, during lockdown, more citizen responders reported being not psychologically affected by attending an OHCA compared with nonlockdown period (68% versus 56%; P<0.0001). Likewise, fewer reported being mildly affected during lockdown (26%) compared with nonlockdown (35%) (P=0.003). Conclusions The COVID-19 lockdown in Denmark was not associated with decreased bystander-initiated resuscitation in OHCAs attended by citizen responders.

CPR/MECHANICAL CHEST COMPRESSION

Can Cerebral Regional Oxygen Saturation (rSO(2)) Be Used as an Indicator of the Quality of Chest Compressions in Patients With Cardiopulmonary Arrest? A Study Evaluating the Association Between rSO(2) and Mean Arterial Pressure: The PRESS Study.
Kishihara Y(1), Yasuda H(1)(2), Kashiura M(1), Harada N(3), Moriya T(1).
ABSTRACT
INTRODUCTION: Sudden cardiac arrest causes numerous deaths worldwide. High-quality chest compressions are important for good neurological recovery. Arterial pressure is considered useful to monitor the quality of chest compressions by the American Heart Association. However, arterial pressure catheter might be inconvenient during resuscitation. Conversely, cerebral regional oxygen saturation (rSO2) during resuscitation may be associated with a good neurological prognosis. Therefore, we aimed to evaluate the correlation between mean arterial pressure and rSO2 during resuscitation to evaluate rSO2 as an indicator of the quality of chest compressions. MATERIALS AND METHODS: This study was a single-center, prospective, observational study. Patients with out-of-hospital cardiac arrest who were transported to a tertiary care emergency center in Japan between October 2014 and March 2015 were included. The primary outcome was the regression coefficient between mean arterial pressure (MAP) and rSO2. MAP and rSO2 were measured during resuscitation (at hospital arrival [0 min], 3, 6, 9, 12, and 15 min), and MAP was measured by using an arterial catheter inserted into the femoral artery. For analysis, we used the higher value of rSO2 obtained from the left and right forehead of the patient measured using a near-infrared spectrometer. Regression coefficients were calculated using the generalized estimating equation with MAP and systolic arterial pressure as response variables and rSO2 as an explanatory variable since MAP and rSO2 were repeatedly measured in the same patient. Since the confounding factors between MAP or systolic arterial pressure and rSO2 were not clear clinically or from previous studies, the generalized estimating equation was analyzed using a univariate analysis. RESULTS: In this study, 37 patients were analyzed. The rSO2 and MAP during resuscitation from hospital arrival to 15 min later were expressed as follows: (median [interquartile range, IQR]): rSO2, 29.5 (24.3-38.8)%, and MAP, 36.5 (26-46) mmHg. The regression coefficient (95% CI) of log-rSO2 and log-MAP was 0.42 (0.03-0.81) (p = 0.035). CONCLUSION: The values of rSO2 and MAP showed a mild but statistically significant association. rSO2 could be used to assess the quality of chest compressions during resuscitation as a non-invasive and simple method.

Efficacy of AutoPulse for Mechanical Chest Compression in Patients with Shock-Resistant Ventricular Fibrillation.

Gorący J(1), Stachowiak P(2), Krejczy A(3)(4)(5), Piątek P(6)(7), Gorący I(8).

ABSTRACT
INTRODUCTION: Sudden cardiac arrest is one of the most common causes of death. In cases of shock-resistant ventricular fibrillation, immediate transport of patients to the hospital is essential and made possible with use of devices for mechanical chest compression. OBJECTIVES: The efficacy of AutoPulse in patients with shock-resistant ventricular fibrillation was studied. METHODS: This is a multicentre observational study on a population of 480,000, with 192 reported cases of out-of-hospital cardiac arrest. The study included patients with shock-resistant ventricular fibrillation defined as cardiac arrest secondary to ventricular fibrillation requiring ≥3 consecutive shocks. Eventually, 18 patients met the study criteria. RESULTS: The mean duration of resuscitation was 48.4±43 min, 55% of patients were handed over to the laboratory while still in cardiac arrest, 83.3% of them underwent angiography and, in 93.3% of them, infarction was confirmed. Coronary intervention was continued during mechanical resuscitation in 50.0% of patients, 60% of patients survived the procedure, and 27.8% of the patients survived. CONCLUSIONS: Resistant ventricular fibrillation suggests high likelihood of a coronary component to the cardiac arrest. AutoPulse is helpful in conducting resuscitation, allowing the time to arrival at hospital to be reduced.

Comparison between Prehospital Mechanical Cardiopulmonary Resuscitation (CPR) Devices and Manual CPR for Out-of-Hospital Cardiac Arrest: A Systematic Review, Meta-Analysis, and Trial Sequential Analysis.

Chiang CY(1), Lim KC(1), Lai PC(2), Tsai TY(3)(4), Huang YT(5), Tsai MJ(1).

ABSTRACT
In pre-hospital settings, efficient cardiopulmonary resuscitation (CPR) is challenging; therefore, the application of mechanical CPR devices continues to increase. However, the evidence of the benefits of using mechanical CPR devices in pre-hospital settings for adult out-of-hospital cardiac arrest (OHCA) is controversial. This meta-analysis compared the effects of mechanical and manual CPR applied in the pre-hospital stage on clinical outcomes after OHCA. Cochrane Library, PubMed, Embase, and ClinicalTrials.gov were searched from inception until October 2021. Studies comparing mechanical and manual CPR applied in the pre-hospital stage for survival outcomes of adult OHCA were eligible. Data abstraction, quality assessment, meta-analysis, trial sequential analysis (TSA), and grading of recommendations, assessment, development, and evaluation were conducted. Seven randomized controlled and 15 observational studies were included. Compared to manual CPR, pre-hospital use of mechanical CPR showed a positive effect in achieving return of spontaneous circulation (ROSC) and survival to admission. No difference was found in survival to discharge and discharge with favorable neurological status, with inconclusive results in TSA. In conclusion, pre-hospital use of mechanical CPR devices may benefit adult OHCA in achieving ROSC and survival to admission. With low certainty of evidence, more well-designed large-scale randomized controlled trials are needed to validate these findings.

REGISTRIES, REVIEWS AND EDITORIALS

Percutaneous Coronary Revascularization after Out-of-Hospital Cardiac Arrest: A Review of the Literature and a Case Series.

Scavelli F(1), Cartella I(1)(2), Montalto C(1), Oreglia JA(1), Villanova L(1), Garatti L(1), Colombo C(1), Sacco A(1), Morici N(1).

ABSTRACT

Out-of-hospital cardiac arrest (OHCA) is still associated with high mortality and severe complications, despite major treatment advances in this field. Ischemic heart disease is a common cause of OHCA, and current guidelines clearly recommend performing immediate coronary angiography (CAG) in patients whose post-resuscitation electrocardiogram shows ST-segment elevation (STE). Contrarily, the optimal approach and the advantage of early revascularization in cases of no STE is less clear, and decisions are often based on the individual experience of the center. Numerous studies have been conducted on this topic and have provided contradictory evidence; however, more recently, results from several randomized clinical trials have suggested that performing early CAG has no impact on overall survival in patients without STE.

The Use of Neuromuscular Blockers to Prevent Shivering in the Setting of Postcardiac Arrest Targeted Temperature Management: A Narrative Review of an Off-Label Indication.
Comstock B(1), Lopane CM(1), Fellows S(1), Gandhi MA(1).

ABSTRACT

Targeted temperature management (TTM) has become a standard of care over the past two decades for the improvement in neurologic function and mortality in postcardiac arrest patients. There are various mechanisms by which hypothermia helps to improve these outcomes, one of which is by reducing oxygen requirements. Less established is the use of nondepolarizing neuromuscular blockers (NMBs) to prevent shivering during TTM. Shivering can be disadvantageous in this setting as it increases oxygen requirements, which TTM is actively trying to decrease, in an already oxygen-deprived system as well as generates heat making it difficult to maintain hypothermia. Whether NMBs can improve these outcomes is conflicting in the currently available literature and there lacks a consensus on their role in shivering management. The pharmacokinetic and pharmacodynamic responses of these agents may be altered in hypothermic patients, therefore, their standard of monitoring may be unreliable. The accurate dosing and administration of these agents also remain unclear, further complicated by the lack of a standard use protocol. Various studies have been conducted regarding the use of NMBs to prevent shivering in postcardiac arrest patients undergoing TTM; however, it remains an off-label indication requiring further investigation.

IN-HOSPITAL CARDIAC ARREST

Etiologies of In-hospital cardiac arrest: a systematic review and meta-analysis.
Allencherril J(1), Yong Kyu Lee P(2), Khan K(3), Loya A(3), Pally A(4).

ABSTRACT

BACKGROUND: Etiologies of in-hospital cardiac arrest (IHCA) in general wards may differ from etiologies of out-of-hospital cardiac arrest (OHCA) given the different clinical characteristics of these patient populations. An appreciation for the causes of IHCA may allow the clinician to appropriately target root causes of arrest. METHODS: MEDLINE/PubMed, EMBASE, and Google Scholar were queried from inception until May 31, 2021. Studies reporting etiologies of IHCA were included. A random effects meta-analysis of extracted data was performed using Review Manager 5.4. RESULTS: Of 12,451 citations retrieved from the initial literature search, 9 were included in the meta-analysis.

The most frequent etiologies of cardiac arrest were hypoxia (26.46%, 95% confidence interval [CI] 14.19% to 38.74%), acute coronary syndrome (ACS) (18.23%, 95% CI 13.91% to 22.55%), arrhythmias (14.95%, 95% CI 0% to 34.92%), hypovolemia (14.81%, 95% CI 6.98% to 22.65%), infection (14.36%, 95% CI 9.46% to 19.25%), and heart failure (12.64%, 95% CI 6.47% to 18.80%). Cardiac tamponade, electrolyte disturbances, pulmonary embolism, neurological causes, toxins, and pneumothorax were less frequent causes of IHCA. Initial rhythm was unshockable (pulseless electrical activity or asystole) in 69.83% of cases and shockable (ventricular tachycardia or ventricular fibrillation) in 21.75%. CONCLUSION: The most prevalent causes of IHCA among the general wards population are hypoxia, ACS, hypovolemia, arrythmias, infection, heart failure, three of which (arrhythmia, infection, heart failure) are not part of the traditional "H's and T's" of cardiac arrest. Other causes noted in the "H's and T's" of advanced cardiac life support do not appear to be important causes of IHCA.

INJURIES AND CPR

No article identified.

CAUSE OF THE ARREST

1. J Am Heart Assoc. 2022 Mar 8:e024260. doi: 10.1161/JAHA.121.024260. Online ahead of print.
Prognostic Significance of Ventricular Arrhythmias in 13 444 Patients With Acute Coronary Syndrome: A Retrospective Cohort Study Based on Routine Clinical Data (NIHR Health Informatics Collaborative VA-ACS Study).

Sau A(1)(2), Kaura A(1)(2), Ahmed A(1), Patel KHK(1), Li X(1), Mulla A(2), Glampson B(2), Panoulas V(1), Davies J(3), Woods K(3), Gautama S(2), Shah AD(4), Elliott P(2)(5), Hemingway H(4)(5), Williams B(4), Asselbergs FW(4), Melikian N(6), Peters NS(1), Shah AM(6), Perera D(7), Kharbanda R(3), Patel RS(4), Channon KM(3), Mayet J(1)(2), Ng FS(1)(2).

ABSTRACT
Background A minority of acute coronary syndrome (ACS) cases are associated with ventricular arrhythmias (VA) and/or cardiac arrest (CA). We investigated the effect of VA/CA at the time of ACS on long-term outcomes. Methods and Results We analyzed routine clinical data from 5 National Health Service trusts in the United Kingdom, collected between 2010 and 2017 by the National Institute for Health Research Health Informatics Collaborative. A total of 13 444 patients with ACS, 376 (2.8%) of whom had concurrent VA, survived to hospital discharge and were followed up for a median of 3.42 years. Patients with VA or CA at index presentation had significantly increased risks of subsequent VA during follow-up (VA group: adjusted hazard ratio [HR], 4.15 [95% CI, 2.42-7.09]; CA group: adjusted HR, 2.60 [95% CI, 1.23-5.48]). Patients who suffered a CA in the context of ACS and survived to discharge also had a 36% increase in long-term mortality (adjusted HR, 1.36 [95% CI, 1.04-1.78]), although the concurrent diagnosis of VA alone during ACS did not affect all-cause mortality (adjusted HR, 1.03 [95% CI, 0.80-1.33]). Conclusions Patients who develop VA or CA during ACS who survive to discharge have increased risks of subsequent VA, whereas those who have CA during ACS also have an increase in long-term mortality. These individuals may represent a subgroup at greater risk of subsequent arrhythmic events as a result of intrinsically lower thresholds for developing VA.

END-TIDAL CO$_2$

No article identified.

ORGAN DONATION

No article identified.

FEEDBACK

Cardiac Arrest Quality Improvement: A Single-Center Evaluation of Resuscitations Using Defibrillator, Feedback Device, and Survey Data.
Picard C, Drew R, Norris CM, O'Dochartaigh D, Burnett C, Keddie C, Douma MJ.
ABSTRACT
BACKGROUND: High-quality cardiopulmonary resuscitation is foundational to cardiac arrest care. Visual feedback devices can improve chest compression quality, but are infrequently used. Quality improvement data were examined to determine whether handheld visual feedback and backboard use improved chest compression quality, whether resuscitation team size affected resuscitation indicators, and whether feedback sources are comparable. METHODS: From August 2019 to December 2020, data from 50 resuscitations were collected using a handheld device (n = 35), defibrillator (n = 23), and surveys (n = 35) and shared with providers. Aggregated and individual case data, along with education and research, were distributed to staff as quality improvement measures. RESULTS: The mean duration of resuscitation was 1080 compressions (SD = 858); there were no differences in the durations of resuscitations that did or did not use handheld feedback; 50% of resuscitations used handheld feedback and had more compressions at target rate (74.68% vs 42.18%, t(21) = 2.99, P = .007). Moreover, 25% of resuscitations used backboards; these had more chest compressions at target depth (72.92% vs 48.73%, t(25) = 2.08, P = .048). Team size was not associated with duration of resuscitation or chest compressions quality. There was no improvement in other quality indicators (leadership, family presence, or debriefing) during the data collection period. Feedback sources (defibrillator and feedback device) had good agreement and correlation (r = 0.77, P = .01). CONCLUSIONS: Incorporating handheld feedback and backboards improved chest compressions quality. Further work to improve the frequency of device use and to examine their relationship to patient-specific outcomes is needed. Study is needed to find interventions that improve other teamwork metrics, inclusion of family during the resuscitation, referral for tissue donation, and rates of postevent debriefing.

DRUGS

Time to Antiarrhythmic and Association with Return of Spontaneous Circulation in the United States.
Huebinger R(1)(2), Chan HK(1)(3), Bobrow B(1)(2), Chavez S(1)(2), Schulz K(1)(2)(4), Gordon R(1)(2), Jarvis J(2)(5).
ABSTRACT
INTRODUCTION: Recent clinical trials have failed to identify a benefit of antiarrhythmic administration during cardiac arrest. However, little is known regarding the time to administration of antiarrhythmic drugs in clinical practice or its impact on return of spontaneous circulation (ROSC). We utilized a national EMS registry to evaluate the time of drug administration and association with

ROSC. METHODS: We utilized the 2018 and 2019 NEMSIS datasets, including all non-traumatic, adult 9-1-1 EMS activations for cardiac arrests with initial shockable rhythm and that received an antiarrhythmic. We calculated the time from 9-1-1 call to administration of antiarrhythmic. We excluded cases with erroneous time stamps. Stratified by initial antiarrhythmic (amiodarone and lidocaine), we created a mixed-effect logistic regression model evaluating the association between every 5 minute increase in time to antiarrhythmic and ROSC. We modeled EMS agency as a random intercept and adjusted for confounders. RESULTS: There were 449,630 adult, non-traumatic cardiac arrests identified with 11,939 meeting inclusion criteria. 9,236 received amiodarone and 1,327 received lidocaine initially. The median time in minutes to initial dose for amiodarone was 19.9 minutes (IQR 15.8-25.6) and for lidocaine was 19.5 minutes (IQR 15.2-25.4). Increasing time to initial antiarrhythmic was associated with decreased odds of ROSC for both amiodarone (aOR 0.9; 95% CI 0.9-0.94) and lidocaine (aOR 0.9; 95% CI 0.8-0.97). CONCLUSION: Time to administration of anti-arrhythmic medication varied, but most patients received the first dose of anti-arrhythmic drug more than 19 minutes after the initial 9-1-1 call. Longer time to administration of an antiarrhythmic in patients with an initial shockable rhythm was associated with decreased ROSC rates.

TRAUMA

1. J Trauma Acute Care Surg. 2022 Mar 1;92(3):553-560. doi: 10.1097/TA.0000000000003474.
Prehospital predictors for return of spontaneous circulation in traumatic cardiac arrest.

Benhamed A(1), Canon V, Mercier E, Heidet M, Gossiome A, Savary D, El Khoury C, Gueugniaud PY, Hubert H, Tazarourte K.

ABSTRACT

BACKGROUND: Traumatic cardiac arrests (TCAs) are associated with high mortality and the majority of deaths occur at the prehospital scene. The aim of the present study was to assess, in a prehospital physician-led emergency medical system, the factors associated with sustained return of spontaneous circulation (ROSC) in TCA, including advanced life procedures. The secondary objectives were to assess factors associated with 30-day survival in TCA, evaluate neurological recovery in survivors, and describe the frequency of organ donation among patients experiencing a TCA. METHODS: We conducted a retrospective study of all TCA patients included in the French nationwide cardiac arrest registry from July 2011 to November 2020. Multivariable logistic regression analysis was used to identify factors independently associated with ROSC. RESULTS: A total of 120,045 out-of-hospital cardiac arrests were included in the registry, among which 4,922 TCA were eligible for analysis. Return of spontaneous circulation was sustained on-scene in 21.1% (n = 1,037) patients. Factors significantly associated with sustained ROSC were not-asystolic initial rhythms (pulseless electric activity (odds ratio [OR], 1.81; 95% confidence interval [CI], 1.40-2.35; p < 0.001), shockable rhythm (OR, 1.83; 95% CI, 1.12-2.98; p = 0.016), spontaneous activity (OR, 3.66; 95% CI, 2.70-4.96; p < 0.001), and gasping at the mobile medical team (MMT) arrival (OR, 1.40; 95% CI, 1.02-1.94; p = 0.042). The MMT interventions significantly associated with ROSC were as follows: intravenous fluid resuscitation (OR, 3.19; 95% CI, 2.69-3.78; p < 0.001), packed red cells transfusion (OR, 2.54; 95% CI, 1.84-3.51; p < 0.001), and external hemorrhage control (OR, 1.74; 95% CI, 1.31-2.30; p < 0.001). Among patients who survived (n = 67), neurological outcome at Day 30 was favorable (cerebral performance categories 1-2) in 72.2% cases (n = 39/54) and 1.4% (n = 67/4,855) of deceased patients donated one or more organ. CONCLUSION: Sustained ROSC was frequently achieved in patients not in asystole at MMT arrival, and higher ROSC rates were achieved in patients benefiting from specific advanced life support interventions. Organ donation was somewhat possible in TCA patients undergoing on-scene resuscitation. LEVEL OF EVIDENCE: Prognostic and epidemiologic, Level III.

VENTILATION

Impact of different medical direction policies on prehospital advanced airway management for out-of hospital cardiac arrest patients: A retrospective cohort study.
Hongo T(1), Yumoto T(1), Naito H(1), Mikane T(2), Nakao A(1).
ABSTRACT
BACKGROUND: Although optimal prehospital airway management after out-of-hospital cardiac arrest (OHCA) remains undetermined, no studies have compared different advanced airway management (AAM) policies adopted by two hospitals in charge of online medical direction by emergency physicians. We examined the impact of two different AAM policies on OHCA patient survival. METHODS: This observational cohort study included adult OHCA patients treated in Okayama City from 2013 to 2016. Patients were divided into two groups: the O group - those treated on odd days when a hospital with a policy favoring laryngeal tube ventilation (LT) supervised, and the E group - those treated on even days when the other hospital with a policy favoring endotracheal intubation (ETI) supervised. Multiple logistic regression analysis was performed to assess airway device effects. The primary outcome measure was seven-day survival. RESULTS: Of 2,406 eligible patients, 50.1% were in the O group and 49.9% were in the E group. O group patients received less ETI (1.0% vs. 12.0%) and more LT (53.3% vs. 43.0%) compared with E group patients. In univariate analysis, no differences were observed in seven-day survival (9.4% vs 10.1%). Multiple regression analysis revealed neither LT nor ETI had a significant independent effect on seven-day survival, considering bag-valve mask ventilation as a reference (OR, 0.78; 95% CI, 0.54 to 1.13, OR, 0.79; 95% CI, 0.36 to 1.72, respectively). CONCLUSION: Despite different advanced airway medical direction policies in a single city, there were no substantial impact on outcomes for OHCA patients.

Prehospital Cardiac Arrest Airway Management: An NAEMSP Position Statement and Resource Document.
Carlson JN, Colella MR, Daya MR, J De Maio V, Nawrocki P, Nikolla DA, Bosson N.
ABSTRACT
Airway management is a critical component of out-of-hospital cardiac arrest (OHCA) resuscitation. Multiple cardiac arrest airway management techniques are available to EMS clinicians including bag-valve-mask (BVM) ventilation, supraglottic airways (SGAs), and endotracheal intubation (ETI). Important goals include achieving optimal oxygenation and ventilation while minimizing negative effects on physiology and interference with other resuscitation interventions. NAEMSP recommends: Based on the skill of the clinician and available resources, BVM, SGA, or ETI may be considered as airway management strategies in OHCA. Airway management should not interfere with other key resuscitation interventions such as high-quality chest compressions, rapid defibrillation, and treatment of reversible causes of the cardiac arrest. EMS clinicians should take measures to avoid hyperventilation during cardiac arrest resuscitation. Where available for clinician use, capnography should be used to guide ventilation and chest compressions, confirm and monitor advanced airway placement, identify return of spontaneous circulation (ROSC), and assist in the decision to terminate resuscitation.

CERERBRAL MONITORING

Early quantitative infrared pupillometry for prediction of neurological outcome in patients admitted to intensive care after out-of-hospital cardiac arrest.

Warren A(1), McCarthy C(2), Andiapen M(3), Crouch M(2), Finney S(3), Hamilton S(2), Jain A(3), Jones D(3), Proudfoot A(4).

ABSTRACT

BACKGROUND: Quantitative pupillometry is recommended for neuroprognostication after out-of-hospital cardiac arrest 72 h or more after ICU admission, but the feasibility and utility of earlier assessment is unknown. METHODS: This was a study of the utility of an early quantitative pupillometry index in predicting neurological outcome in patients with reduced consciousness after out-of-hospital cardiac arrest. Quantitative infrared pupillometry index was measured at 0, 6, 24, 48, and 72 h from admission. Acceptable predictive utility was defined as a positive predictive value of >95% and false positive rate of zero, with a narrow 95% confidence interval (95% CI). RESULTS: At least one quantitative pupillometry index measurement was available from within the first 6 h for all 77 patients who met inclusion criteria. A quantitative pupillometry index ≤2.4 at baseline and ≤2.3 within the first 6 h met the criteria for utility. The positive predictive value of the baseline cut-off (≤2.4) for poor neurological outcome was 1.00 (95% CI, 0.54-1.00) with an estimated false positive rate of 0% (95% CI, 0-9%). The positive predictive value of the 6 h cut-off (≤2.3) for poor neurological outcome was 1.00 (95% CI, 0.59-1.00) with an estimated false positive rate of 0% (95% CI, 0-8%). Sensitivities of these cut-offs for ruling out poor neurological outcomes at 0 and 6 h were 19% and 22%, respectively. Of seven patients with a quantitative pupillometry index ≤2.3 within 6 h of ICU admission, none survived. Analyses that used quantitative pupillometry index measurements from 24 to 72 h, but excluded baseline and 6 h values, were not predictive by the utility criteria. CONCLUSIONS: Quantitative pupillometry within 6 h of ICU admission after out-of-hospital cardiac arrest may identify patients with a very low chance of neurologically intact survival. Further studies of early quantitative pupillometry in this population are warranted.

Serum neurofilament light levels are correlated to long-term neurocognitive outcome measures after cardiac arrest.

Blennow Nordström E(1), Lilja G(1), Ullén S(2), Blennow K(3)(4), Friberg H(5), Hassager C(6), Kjærgaard J(7), Mattsson-Carlgren N(8)(9)(10), Moseby-Knappe M(1), Nielsen N(11), Vestberg S(12), Zetterberg H(3)(4)(13)(14), Cronberg T(1).

ABSTRACT

OBJECTIVE: To explore associations between four methods assessing long-term neurocognitive outcome after out-of-hospital cardiac arrest and early hypoxic-ischemic neuronal brain injury assessed by the biomarker serum neurofilament light (NFL), and to compare the agreement for the outcome methods. METHODS: An explorative post-hoc study was conducted on survivor data from the international Target Temperature Management after Out-of-hospital Cardiac Arrest trial, investigating serum NFL sampled 48/72-hours post-arrest and neurocognitive outcome 6 months post-arrest. RESULTS: Among the long-term surviving participants (N = 457), serum NFL (n = 384) was associated to all outcome instruments, also when controlling for demographic and cardiovascular risk factors. Associations between NFL and the patient-reported Two Simple Questions (TSQ) were however attenuated when adjusting for vitality and mental health. NFL predicted results on the outcome instruments to varying degrees, with an excellent area under the curve for the clinician-report Cerebral Performance Category (CPC 1-2: 0.90). Most participants were classified as CPC 1 (79%). Outcome instrument correlations ranged from small (Mini-Mental State Examination [MMSE]-TSQ) to strong (CPC-MMSE). CONCLUSIONS: The clinician-reported CPC was mostly related

to hypoxic-ischemic brain injury, but with a ceiling effect. These results may be useful when selecting methods and instruments for clinical follow-up models.

3. Resuscitation. 2022 Mar 3;173:69-70. doi: 10.1016/j.resuscitation.2022.02.008. Online ahead of print.

Corrigendum to "Development and validation of early prediction for neurological outcome at 90 days after return of spontaneous circulation in out-of-hospital cardiac arrest" [Resuscitation 168 (2021) 142-150].

Nishioka N(1), Kobayashi D(2), Kiguchi T(3), Irisawa T(4), Yamada T(5), Yoshiya K(6), Park C(7), Nishimura T(8), Ishibe T(9), Yagi Y(10), Kishimoto M(11), Kim SH(12), Hayashi Y(13), Sogabe T(14), Morooka T(15), Sakamoto H(16), Suzuki K(17), Nakamura F(18), Matsuyama T(19), Okada Y(1), Matsui S(20), Yoshimura S(1), Kimata S(1), Kawai S(1), Makino Y(1), Kitamura T(20), Iwami T(21); CRITICAL Study Group Investigators.
NO ABSTRACT AVAILABLE

ULTRASOUND AND CPR

No article identified.

ORGANISATION AND TRAINING

1. Crit Care Explor. 2022 Mar 4;4(3):e0648. doi: 10.1097/CCE.0000000000000648. eCollection 2022 Mar.

The Experiences and Needs of Families of Comatose Patients After Cardiac Arrest and Severe Neurotrauma: The Perspectives of National Key Stakeholders During a National Institutes of Health-Funded Workshop.

Muehlschlegel S(1), Perman SM(2), Elmer J(3), Haggins A(4), Teixeira Bailey ND(5), Huang J(5), Jansky L(5), Kirchner J(5), Kasperek-Wynn R(4), Lipman PD(5), Yeatts SD(6), Fetters MD(7), Dickert NW(8), Silbergleit R(4).
ABSTRACT

OBJECTIVES: Severe acute brain injury (SABI) from cardiac arrest and traumatic brain injury happens suddenly and unexpectedly, carrying high potential for lifelong disability with substantial prognostic uncertainty. Comprehensive assessments of family experiences and support needs after SABI are lacking. Our objective is to elicit "on-the-ground" perspectives about the experiences and needs of families of patients with SABI. DESIGN: Two-phase qualitative study of families and multidisciplinary U.S. healthcare professionals (mHCPs) with expertise in SABI: Phase 1 included semistructured interviews to generate formative findings; phase 2 entailed facilitated discussions to confirm and expand initial findings. SETTING: Phase 1: academic medical center; phase 2: virtual workshop. SUBJECTS: Phase 1 included seven family members and 12 mHCPs. Phase 2 included nationally recruited stakeholders (17 family members and 12 mHCPs). INTERVENTION: None. MEASUREMENTS AND RESULTS: We explored: 1) what are families' needs in the first 48 hours? 2) How are these needs addressed? and 3) How can hospitals better meet these needs? Qualitative analysis included inductive and deductive approaches guided by a conceptual ecological model. Four major needs were identified: 1) challenges in coping with uncertainty in early prognostication, 2) inattention to physical needs of family, 3) deficits in compassionate and consistent communication, and 4) need for engagement with families as stakeholders in improving future practices. Participants' recommendations included: 1) ways to communicate more clearly and consistently, 2) better

assistance with navigating resources and access to places for families to care for themselves, and 3) opportunities for families to remain connected with their loved ones, social support networks, and the clinical team. CONCLUSIONS: Stakeholders identified novel insights regarding families' experiences during the hospitalization of comatose SABI patients and factors that can contribute to improved decision-making and physical/emotional outcomes. Interventions to address these unmet needs are promising targets to improve outcomes.

Basic life support knowledge among Swiss conscripts: a national multicentre survey.

Durr D(1), Carron PN(1)(2), Ageron FX(2), Stanga Z(3), Schneider A(1)(4), Maudet L(2)(5), Beysard N(2).

ABSTRACT

BACKGROUND: Basic life support (BLS) is the first link in the chain of survival and should be performed by every lay rescuer. Although international studies have suggested that BLS knowledge was poor among the overall population, Swiss data are scarce. Our objective in this study was to evaluate BLS knowledge among Swiss conscripts, a semi-representative sample of Swiss young adults, during the recruitment process and to identify potential characteristics related to performance. METHODS: A short online voluntary anonymous survey was proposed to Swiss conscripts called to duty in the six national recruiting centres of the Swiss Armed Forces during an 8-month period (2 February 2019 to 27 September 2019). The survey was available in three official languages (French, German, and Italian). Considered outcome was BLS knowledge evaluated on a Likert scale from 1 (very bad) to 6 (excellent). Univariate and multivariate ordinal logistic regression analyses were performed to assess the relationship between BLS knowledge and participants' characteristics. RESULTS: Among the 19,247 conscripts called to service during the study period, 737 replied to the survey. Among them, 735 were included in the analyses (mean age 19.8 years [± 2.1]). Of these, 144 (20%) had never received any BLS training. The BLS knowledge survey was completely answered by 670 participants (91%). 157 participants (23%) reached a BLS knowledge score ≥5. Out of 695 answers, 142 (20%) did not know the Swiss emergency phone number. Out of 670 answers, 364 (54%) believed that CPR could worsen the health status of a person in cardiac arrest, whereas 413 (62%) agreed that BLS training should be mandatory in secondary school. German as native language (odds ratio [OR] 1.3, 95% confidence interval [CI] 1.0-.8)], receipt of BLS training (OR 3.1, 95% CI 2.0-4.8), and female gender were associated with a higher BLS knowledge score. Time since the last BLS training of ≥3 years (OR 0.5, 95% CI 0.4-0.7) and unemployment (OR 0.3, 95% CI 0.1-0.9) were associated with a lower BLS knowledge score. We found substantial agreement between conscripts' scores and their self-assessments (weighted kappa with 74% agreement). DISCUSSION AND CONCLUSION: Knowledge of the emergency phone number and BLS principles was poor among Swiss conscripts participating in the study. However, their awareness and motivation is high. The effect of training during boot camp should be evaluated in further studies. Focusing on BLS training is essential and should be promoted in educational and professional contexts.

Effect of Physiologic Point-of-Care Cardiopulmonary Resuscitation Training on Survival With Favorable Neurologic Outcome in Cardiac Arrest in Pediatric ICUs: A Randomized Clinical Trial.

ICU-RESUS and Eunice Kennedy Shriver National Institute of Child Health; Human Development Collaborative Pediatric Critical Care Research Network Investigator Groups, Sutton RM(1), Wolfe HA(1), Reeder RW(2), Ahmed T(3), Bishop R(4), Bochkoris M(5), Burns C(6), Diddle JW(7), Federman M(8), Fernandez R(9), Franzon D(10), Frazier AH(11), Friess SH(6), Graham K(1), Hehir D(1)(11),

Horvat CM(5), Huard LL(8), Landis WP(1), Maa T(9), Manga A(6), Morgan RW(1), Nadkarni VM(1), Naim MY(1), Palmer CA(2), Schneiter C(4), Sharron MP(7), Siems A(7), Srivastava N(8), Tabbutt S(10), Tilford B(3), Viteri S(11), Berg RA(1), Bell MJ(5)(7), Carcillo JA(5), Carpenter TC(4), Dean JM(2), Fink EL(5), Hall M(9), McQuillen PS(10), Meert KL(3), Mourani PM(4), Notterman D(12), Pollack MM(7), Sapru A(8), Wessel D(7), Yates AR(9), Zuppa AF(1).

ABSTRACT

IMPORTANCE: Approximately 40% of children who experience an in-hospital cardiac arrest survive to hospital discharge. Achieving threshold intra-arrest diastolic blood pressure (BP) targets during cardiopulmonary resuscitation (CPR) and systolic BP targets after the return of circulation may be associated with improved outcomes. OBJECTIVE: To evaluate the effectiveness of a bundled intervention comprising physiologically focused CPR training at the point of care and structured clinical event debriefings. DESIGN, SETTING, AND PARTICIPANTS: A parallel, hybrid stepped-wedge, cluster randomized trial (Improving Outcomes from Pediatric Cardiac Arrest-the ICU-Resuscitation Project [ICU-RESUS]) involving 18 pediatric intensive care units (ICUs) from 10 clinical sites in the US. In this hybrid trial, 2 clinical sites were randomized to remain in the intervention group and 2 in the control group for the duration of the study, and 6 were randomized to transition from the control condition to the intervention in a stepped-wedge fashion. The index (first) CPR events of 1129 pediatric ICU patients were included between October 1, 2016, and March 31, 2021, and were followed up to hospital discharge (final follow-up was April 30, 2021). INTERVENTION: During the intervention period (n = 526 patients), a 2-part ICU resuscitation quality improvement bundle was implemented, consisting of CPR training at the point of care on a manikin (48 trainings/unit per month) and structured physiologically focused debriefings of cardiac arrest events (1 debriefing/unit per month). The control period (n = 548 patients) consisted of usual pediatric ICU management of cardiac arrest. MAIN OUTCOMES AND MEASURES: The primary outcome was survival to hospital discharge with a favorable neurologic outcome defined as a Pediatric Cerebral Performance Category score of 1 to 3 or no change from baseline (score range, 1 [normal] to 6 [brain death or death]). The secondary outcome was survival to hospital discharge. RESULTS: Among 1389 cardiac arrests experienced by 1276 patients, 1129 index CPR events (median patient age, 0.6 [IQR, 0.2-3.8] years; 499 girls [44%]) were included and 1074 were analyzed in the primary analysis. There was no significant difference in the primary outcome of survival to hospital discharge with favorable neurologic outcomes in the intervention group (53.8%) vs control (52.4%); risk difference (RD), 3.2% (95% CI, -4.6% to 11.4%); adjusted OR, 1.08 (95% CI, 0.76 to 1.53). There was also no significant difference in survival to hospital discharge in the intervention group (58.0%) vs control group (56.8%); RD, 1.6% (95% CI, -6.2% to 9.7%); adjusted OR, 1.03 (95% CI, 0.73 to 1.47). CONCLUSIONS AND RELEVANCE: In this randomized clinical trial conducted in 18 pediatric intensive care units, a bundled intervention of cardiopulmonary resuscitation training at the point of care and physiologically focused structured debriefing, compared with usual care, did not significantly improve patient survival to hospital discharge with favorable neurologic outcome among pediatric patients who experienced cardiac arrest in the ICU.

The Association of Fire or Police First Responder Initiated Interventions with Out of Hospital Cardiac Arrest Survival.

Salhi RA(1), Hammond S(2), Lehrich JL(3), O'leary M(4), Kamdar N(4), Brent C(5), Mendes de Leon CF(2), Mendel P(6), Nelson C(6), Forbush B(7), Neumar R(5), Nallamothu BK(8), Abir M(9).

ABSTRACT

OBJECTIVE: Fire and police first responders are often the first to arrive in medical emergencies and provide basic life support services until specialized personnel arrive. This study aims to evaluate rates of fire or police first responder-initiated cardiopulmonary resuscitation (CPR) and automated external defibrillator (AED) use, as well as their associated impact on out-of-hospital cardiac arrest (OHCA) outcomes. METHODS: We completed a secondary data analysis of the MI-CARES registry from 2014-2019. We reported rates of CPR initiation and AED use by fire or police first responders. Multilevel modeling was utilized to evaluate the relationship between fire/police first responder-initiated interventions and outcomes of interest: ROSC upon emergency department arrival, survival to hospital discharge, and good neurologic outcome. RESULTS: Our cohort included 25,067 OHCA incidents. We found fire or police first responders initiated CPR in 31.8% of OHCA events and AED use in 6.1% of OHCA events. Likelihood of sustained ROSC on ED arrival after CPR initiated by a fire/police first responder was not statistically different as compared to EMS initiated CPR (aOR 1.01, CI 0.93-1.11). However, fire/police first responder interventions were associated with significantly higher odds of survival to hospital discharge and survival with good neurologic outcome (aOR 1.25, 95% CI 1.08-1.45 and aOR 1.40, 95% CI 1.18-1.65, respectively). Similar associations were see when examining fire or police initiated AED use. CONCLUSIONS: Fire or police first responders may be an underutilized, potentially powerful mechanism for improving OHCA survival. Future studies should investigate barriers and opportunities for increasing first responder interventions by these groups in OHCA.

5. Acta Anaesthesiol Scand. 2022 Mar;66(3):401-407. doi: 10.1111/aas.14017. Epub 2021 Dec 27.
Rapid response teams-how and who? A protocol for a randomised clinical trial evaluating the composition of the efferent limb of the rapid response system.
Føns-Sønderskov MB(1), Subbe C(2), Kodal AM(1), Bunkenborg G(3), Bestle MH(1)(4).
ABSTRACT
BACKGROUND: Many patients experiencing deterioration have documented deviation of vital signs prior to the deterioration event. Increasing focus on these patients led to the rapid response systems and their configuration with afferent and efferent limbs. The two most prevalent team constellations in the efferent limb are the medical emergency team (MET), usually led by a doctor, and the critical care outreach team (CCOT), usually led by a nurse. The two constellations have not previously been examined in a comparative clinical trial. METHODS: This is a single centre non-inferiority randomised controlled trial of MET vs CCOT. All patients will be randomised at the time of the call. The intervention group will be the critical care outreach team. The primary outcome is mortality at 30 days and the occurrence of serious adverse events. All patients will be followed for 90 days. We aim to detect or reject a change of 7% in mortality whilst accepting a type I error of 5 and type II error of 20, using a sample size of maximum of 2000 individual patients. DISCUSSION: There is evidence supporting a benefit for the patient when using rapid response systems; however, earlier randomised studies are marked by cross-contamination and selection bias. Previous studies have primarily examined the effect of RRS on hospital cardiac arrests (IHCA) and mortality. Our study will be examining the effect on intensive care unit admissions as well as the ICHA and mortality. CONCLUSION: This study may highlight potential benefits of specific configurations of rapid response systems and their impact on safety outcomes.

6. Afr J Emerg Med. 2022 Jun;12(2):106-111. doi: 10.1016/j.afjem.2022.02.001. Epub 2022 Feb 27.
A comparison of the effectiveness of QCPR and conventional CPR training in final-year medical students at a South African university.
Labuschagne MJ(1), Arbee A(1), de Klerk C(1), de Vries E(1), de Waal T(1), Jhetam T(1), Piest B(1), Prins J(1), Uys S(1), van Wyk R(1), van Rooyen C(2).

ABSTRACT

INTRODUCTION: High-quality cardiopulmonary resuscitation (CPR) saves lives. Training on basic first aid manikins allows students to practice manoeuvres and provides realistic resistance to chest compressions. Conventional CPR has no real-time feedback to observe the quality of CPR. Quality cardiopulmonary resuscitation (QCPR) is technology using wireless sensors embedded in the manikin to measure the effectiveness of core CPR components. This study compared the effectiveness of CPR training of final-year undergraduate medical students using electronic-feedback QCPR adult manikins and conventional adult manikins. The effectiveness of compressions was compared and return on investment was investigated. METHODS: In an experimental study, 53 students were divided into two groups using simple random sampling. The QCPR group practised CPR on the QCPR manikins. The CPR group practised on conventional CPR manikins. Both groups were allowed to practice for approximately 10 minutes. After the training session, both groups were tested using the QCPR manikin. Only chest compression performance in adult-sized manikins were measured, recorded and compared. RESULTS: The median flow fraction for the QCPR group was 78.0% (interquartile range (IQR) 63-89%) and for the CPR group 80.0% (IQR 74-85%). The median number of compressions for the QCPR group was 104 (IQR 101-109) and for the CPR group 107 (IQR 79-124). Both groups achieved a 100% compression rate with adequate depth. The maximum total effectiveness of both groups was 99%. No statistically significant difference was seen for the overall percentage of compression effectiveness between the groups. CONCLUSION: Participants achieved acceptable scores on most CPR compression metrics and complied with CPR guidelines in most cases. Efficacy of CPR training on conventional and QCPR manikins was comparable. CPR training in low resource settings can be just as effective on conventional manikins. Immediate feedback technology adds value to the training experience, allowing for individuals to adjust for deviations to set standards.

Perceptions of care following initiation of do-not-resuscitate orders.
Driggers KE(1), Dishman SE(2), Chung KK(3), Olsen CH(3), Ryan AB(4), McLawhorn MM(5), Johnson LS(6).
ABSTRACT

PURPOSE: Documenting do-not-resuscitate (DNR) status in the surgical intensive care unit (ICU) can be controversial; some providers believe that DNR orders change care. This survey evaluates current perceptions. MATERIALS AND METHODS: IRB approved survey consisting of 31 validated questions divided into 3 factors (1. palliation, 2. active treatment, and 3. trust/communication). Individual questions were compared using Fisher's exact-tests and factors were compared via t-tests. RESULTS: Both surgical and ICU staff believe care decreases after DNR order initiation (43%). More surgical staff report decreased care aggressiveness versus ICU staff (63% vs 25%, p < 0.005 and Factor 2, 25.8 versus 29.8, p < 0.001), and felt that electrical cardioversion outside of the setting of ACLS would not be performed (57% vs 24%, p < 0.005). CONCLUSIONS: Surgical staff expressed more concern about care after DNR status than their ICU counterparts. Determining whether care actually changes clinically warrants further investigation.

Advising and limiting medical treatment during phone consultation: a prospective multicentre study in HEMS settings.
Kangasniemi H(1)(2)(3)(4), Setälä P(5), Huhtala H(6), Olkinuora A(7), Kämäräinen A(8), Virkkunen I(7)(5), Tirkkonen J(9), Yli-Hankala A(10)(11), Jämsen E(10)(12), Hoppu S(5).
ABSTRACT

BACKGROUND: We investigated paramedic-initiated consultation calls and advice given via telephone by Helicopter Emergency Medical Service (HEMS) physicians focusing on limitations of medical treatment (LOMT). METHODS: A prospective multicentre study was conducted on four physician-staffed HEMS bases in Finland during a 6-month period. RESULTS: Of all 6115 (mean 8.4/base/day) paramedic-initiated consultation calls, 478 (7.8%) consultation calls involving LOMTs were included: 268 (4.4%) cases with a pre-existing LOMT, 165 (2.7%) cases where the HEMS physician issued a new LOMT and 45 (0.7%) cases where the patient already had an LOMT and the physician further issued another LOMT. The most common new limitation was a do-not-attempt cardiopulmonary resuscitation (DNACPR) order (n = 122/210, 58%) and/or 'not eligible for intensive care' (n = 96/210, 46%). In 49 (23%) calls involving a new LOMT, termination of an initiated resuscitation attempt was the only newly issued LOMT. The most frequent reasons for issuing an LOMT during consultations were futility of the overall situation (71%), poor baseline functional status (56%), multiple/severe comorbidities (56%) and old age (49%). In the majority of cases (65%) in which the HEMS physician issued a new LOMT for a patient without any pre-existing LOMT, the physician felt that the patient should have already had an LOMT. The patient was in a health care facility or a nursing home in half (49%) of the calls that involved issuing a new LOMT. Access to medical records was reported in 29% of the calls in which a new LOMT was issued by an HEMS physician. CONCLUSION: Consultation calls with HEMS physicians involving patients with LOMT decisions were common. HEMS physicians considered end-of-life questions on the phone and issued a new LOMT in 3.4% of consultations calls. These decisions mainly concerned termination of resuscitation, DNACPR, intubation and initiation of intensive care.

2021 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations: Summary From the Basic Life Support; Advanced Life Support; Neonatal Life Support; Education, Implementation, and Teams; First Aid Task Forces; and the COVID-19 Working Group.

Wyckoff MH, Singletary EM, Soar J, et al

ABSTRACT

The International Liaison Committee on Resuscitation initiated a continuous review of new, peer-reviewed published cardiopulmonary resuscitation science. This is the fifth annual summary of the International Liaison Committee on Resuscitation International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations; a more comprehensive review was done in 2020. This latest summary addresses the most recently published resuscitation evidence reviewed by International Liaison Committee on Resuscitation task force science experts. Topics covered by systematic reviews in this summary include resuscitation topics of video-based dispatch systems; head-up cardiopulmonary resuscitation; early coronary angiography after return of spontaneous circulation; cardiopulmonary resuscitation in the prone patient; cord management at birth for preterm and term infants; devices for administering positive-pressure ventilation at birth; family presence during neonatal resuscitation; self-directed, digitally based basic life support education and training in adults and children; coronavirus disease 2019 infection risk to rescuers from patients in cardiac arrest; and first aid topics, including cooling with water for thermal burns, oral rehydration for exertional dehydration, pediatric tourniquet use, and methods of tick removal. Members from 6 International Liaison Committee on Resuscitation task forces have assessed, discussed, and debated the quality of the evidence, according to the Grading of Recommendations Assessment, Development, and Evaluation criteria, and their statements include consensus treatment recommendations or good practice statements. Insights into the

deliberations of the task forces are provided in Justification and Evidence-to-Decision Framework Highlights sections. In addition, the task forces listed priority knowledge gaps for further research.

Community Variations in Out-of-Hospital Cardiac Arrest Care and Outcomes in Texas.
Huebinger R(1), Jarvis J(1), Schulz K(1), Persse D(1), Chan HK(1), Miramontes D(1), Vithalani V(1), Troutman G(1), Greenberg R(1), Al-Araji R(1), Villa N(1), Panczyk M(1), Wang H(1), Bobrow B(1).
ABSTRACT
Background: Large and unacceptable variation exists in cardiac resuscitation care and outcomes across communities. Texas is the second most populous state in the US with wide variation in community and emergency response infrastructure. We utilized the Texas-CARES registry to perform the first Texas state analysis of out-of-hospital cardiac arrest (OHCA) in Texas, evaluating for variations in incidence, care, and outcomes. Methods: We analyzed the Texas-CARES registry, including all adult, non-traumatic OHCAs from 1/1/2014 through 12/31/2018. We analyzed the incidence and characteristics of OHCA care and outcome, overall and stratified by community. Utilizing mixed models accounting for clustering by community, we characterized variations in bystander CPR, bystander AED in public locations, and survival to hospital discharge across communities, adjusting for age, gender, race, location of arrest, and rate of witnessed arrest (bystander and 911 responder witnessed).Results: There were a total of 26,847 (5,369 per year) OHCAs from 13 communities; median 2,762 per community (IQR 444-2,767, min 136, max 9161). Texas care and outcome characteristics were: bystander CPR (43.3%), bystander AED use (9.1%), survival to discharge (9.1%), and survival with good neurological outcomes (4.0%). Bystander CPR rate ranged from 19.2% to 55.0%, and there were five communities above and five below the adjusted 95% confidence interval. Bystander AED use ranged from 0% to 19.5%, and there was one community below the adjusted 95% confidence interval. Survival to hospital discharge ranged from 6.7% to 14.0%, and there were three communities above and two below the adjusted 95% confidence interval. Conclusion: While overall OHCA care and outcomes were similar in Texas compared to national averages, bystander CPR, bystander AED use, and survival varied widely across communities in Texas. These variations signal opportunities to improve OHCA care and outcomes in Texas.

POST-CARDIAC ARREST TREATMENTS

Multivessel versus Culprit-Only Revascularization Strategies in Cardiac Arrest Survivors.
Chen WT(1), Tsai MS(1), Huang CH(1), Sung CW(2), Chuang PY(3), Wang CH(1), Wu YW(4), Chang WT(1), Chen WJ(1)(5).
ABSTRACT
BACKGROUND: Whether multivessel revascularization or culprit-only revascularization is more beneficial in cardiac arrest survivors with multivessel coronary artery disease remains unclear. We aimed to retrospectively evaluate whether multivessel or culprit-only revascularization following cardiac arrest was associated with a reduced incidence of in-hospital mortality. METHODS: A total of 273 adult nontraumatic cardiac arrest survivors (aged ≥ 18 years) who underwent emergent coronary angiography (CAG) within 24 h following cardiac arrest were retrospectively recruited from three hospitals. Patients without definite coronary artery stenosis (n = 72), one-vessel stenosis (n = 74), or failed percutaneous coronary intervention (PCI; n = 37) were excluded. A total of 90 patients were enrolled for the final analysis and classified into multivessel (revascularization of more than one major vessel during the index CAG; n = 45) and culprit-only (revascularization of the infarct-

related artery alone; n = 45) groups. RESULTS: Twenty-five patients (55.6%) in the culprit-only group and 17 patients (37.8%) in the multivessel group failed to survive to discharge [adjusted hazard ratio (HR) = 0.47, 95% confidence interval (CI) = 0.24-0.95, p = 0.035]. The benefit of multivessel revascularization on survival was obvious among those with a prolonged cardiopulmonary resuscitation duration (> 10 min) (47.82% vs. 76.92%, adjusted HR = 0.27, 95% CI = 0.08-0.93, p = 0.03). No difference in neurological outcomes (favorable = cerebral performance category scores 1-2; poor = 3-5) between groups was observed (60.0% vs. 55.6%, adjusted OR = 1.22, 95% CI = 0.35-4.26, p = 0.753). CONCLUSIONS: Compared with culprit-only revascularization, multivessel revascularization was associated with lower in-hospital mortality among cardiac arrest survivors with multivessel lesions. Owing to the retrospective design and small sample size, the current study should be interpreted as observational and exploratory.

Utility of Glucose Testing and Treatment of Hypoglycemia in Patients with Out-of-Hospital Cardiac Arrest.
Abramson TM, Bosson N, Loza-Gomez A, Eckstein M, Gausche-Hill M.
ABSTRACT
Objective: Many emergency medical services (EMS) protocols for out-of-hospital cardiac arrests (OHCA) include point-of-care (POC) glucose measurement and administration of dextrose, despite limited knowledge of benefit. The objective of this study was to describe the incidence of hypoglycemia and dextrose administration by EMS in OHCA and subsequent patient outcomes. Methods: This was a retrospective analysis of OHCA in a large, regional EMS system from 2011 to 2017. Patients ≥18 years old with non-traumatic OHCA and attempted field resuscitation by paramedics were included. The primary outcomes were frequency of POC glucose measurement, hypoglycemia (glucose <60 mg/dl), and dextrose/glucagon administration (treatment group). The secondary outcomes included field return of spontaneous circulation (ROSC), survival to hospital discharge (SHD), and survival with good neurologic outcome. Results: There were 46,211 OHCAs during the study period of which 33,851 (73%) had a POC glucose test performed. Glucose levels were documented in 32,780 (97%), of whom 2,335 (7%) were hypoglycemic. Among hypoglycemic patients, 41% (959) received dextrose and/or glucagon. Field ROSC was achieved in 30% (286) of hypoglycemic patients who received treatment. Final outcome was determined for 1,714 (73%) of the hypoglycemic cases, of whom 120 (7%) had SHD and 66 (55%) had a good neurologic outcome. Of the 32,780 patients with a documented POC glucose result who were identified as hypoglycemic, only 27 (0.08%) received field treatment, and survived to discharge with good neurologic outcome. 48 (6%) of patients in the treatment group had SHD vs. 72 (8%) without treatment, risk difference -2.0% (95%CI -4.4%, 0.4%), p = 0.1.Conclusion: In this EMS system, POC glucose testing was common in adult OHCA, yet survival to hospital discharge with good neurologic outcome did not differ between patients treated and untreated for hypoglycemia. These results question the common practice of measuring and treating hypoglycemia in OHCA patients.

TARGETED TEMPERATURE MANAGEMENT

Predisposing Factors and Neurologic Outcomes of Patients with Elevated Serum Amylase and/or Lipase after Out-of-Hospital Cardiac Arrest: A Retrospective Cohort Study.
Park SY(1), Kim MJ(1), Park I(1), Kim HY(2), Lee M(2), Park YS(1), Chung SP(1).
ABSTRACT
This study investigated the patient outcomes, incidence, and predisposing factors of elevated pancreatic enzyme levels after OHCA. We conducted a retrospective cohort study of patients treated

with targeted temperature management (TTM) after out-of-hospital cardiac arrest (OHCA). Elevation of pancreatic enzyme levels was defined as serum amylase or lipase levels that were at least three times the upper limit of normal. The factors associated with elevated pancreatic enzyme levels and their association with neurologic outcomes and mortality 28 days after OHCA were analyzed. Among the 355 patients, 166 (46.8%) patients developed elevated pancreatic enzyme levels. In the multivariable analysis (odds ratio, 95% confidence interval), initial shockable rhythm (0.62, 0.39-0.98, p = 0.04), time from collapse to return of spontaneous circulation (1.02, 1.01-1.04, p < 0.001), and history of coronary artery disease (1.7, 1.01-2.87, p = 0.046) were associated with elevated pancreatic enzyme levels. After adjusting for confounding factors, elevated pancreatic enzyme levels were associated with neurologic outcomes (5.44, 3.35-8.83, p < 0.001) and mortality (3.74, 2.39-5.86, p < 0.001). Increased pancreatic enzyme levels are common in patients treated with TTM after OHCA and are associated with unfavorable neurologic outcomes and mortality at 28 days after OHCA.

Targeted Temperature Management: A Program Evaluation.
Kaylor HL(1), Wiencek C(2), Hundt E(3).
ABSTRACT
In the United States, more than 350 000 cardiac arrests occur annually. The survival rate after an out-of-hospital cardiac arrest remains low. The majority of patients who have return of spontaneous circulation will die of complications of hypoxic-ischemic brain injury. Targeted temperature management is the only recommended neuroprotective measure for those who do not regain consciousness after return of spontaneous circulation. Despite current practices, a review of the literature revealed that evidence on the ideal time to achieve target temperature after return of spontaneous circulation remains equivocal. A program evaluation of a targeted temperature management program at an academic center was performed; the focus was on timing components of targeted temperature management. The program evaluation revealed that nurse-driven, evidence-based protocols can lead to optimal patient outcomes in this low-frequency, high-impact therapy.

A Simple Risk Score for Predicting Neurologic Outcome in Out-of-Hospital Cardiac Arrest Patients After Targeted Temperature Management.
Chen CT(1)(2)(3), Lin JW(1), Wu CH(2)(4), Kuo RN(3), Shih CH(5), Hou PC(6), Yen DH(1)(2), How CK(1)(2)(7).
ABSTRACT
OBJECTIVES: Although several risk factors for outcomes of out-of-hospital cardiac arrest patients have been identified, the cumulative risk of their combinations is not thoroughly clear, especially after targeted temperature management. Therefore, we aimed to develop a risk score to evaluate individual out-of-hospital cardiac arrest patient risk at early admission after targeted temperature management regarding poor neurologic status at discharge. DESIGN: Retrospective observational cohort study. SETTING: Two large academic medical networks in the United States. PATIENTS: Out-of-hospital cardiac arrest survivors treated with targeted temperature management with age of 18 years old or older. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: Based on the odds ratios, five identified variables (initial nonShockable rhythm, Leucocyte count < 4 or > 12 K/μL after targeted temperature management, total Adrenalin [epinephrine] ≥ 5 mg, lack of oNlooker cardiopulmonary resuscitation, and Time duration of resuscitation ≥ 20 min) were assigned weighted points. The sum of the points was the total risk score known as the SLANT score (range 0-21 points)

for each patient. Based on our risk prediction scores, patients were divided into three risk categories as moderate-risk group (0-7), high-risk group (8-14), and very high-risk group (15-21). Both the ability of our risk score to predict the rates of poor neurologic outcomes at discharge and in-hospital mortality were significant under the Cochran-Armitage trend test ($p < 0.001$ and $p < 0.001$, respectively). CONCLUSIONS: The risk of poor neurologic outcomes and in-hospital mortality of out-of-hospital cardiac arrest survivors after targeted temperature management is easily assessed using a risk score model derived using the readily available information. Its clinical utility needed further investigation.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

No article identified.

PEDIATRICS AND CHILDREN

1. Front Pediatr. 2022 Feb 22;10:826294. doi: 10.3389/fped.2022.826294. eCollection 2022.
Evaluation of Local Pediatric Out-of-Hospital Cardiac Arrest and Emergency Services Response.
McKenzie K(1), Cameron S(1), Odoardi N(2), Gray K(1), Miller MR(1)(3), Tijssen JA(1)(3).
ABSTRACT
BACKGROUND: Survival after pediatric out-of-hospital cardiac arrest is poor. Paramedic services provide critical interventions that impact survival outcomes. We aimed to describe local pediatric out-of-hospital cardiac arrest (POHCA) events and evaluate the impact of the paramedic service response to POHCA. METHODS: The Canadian Resuscitation Outcomes Consortium and corresponding ambulance call records were used to evaluate deviations from best practice by paramedics for patients aged 1 day to <18 years who had an atraumatic out-of-hospital cardiac arrest between 2012 and 2020 in Middlesex-London County. Deviations were any departure from protocol as defined by Middlesex-London Paramedic Services. RESULTS: Fifty-one patients were included in this study. All POHCA events had at least one deviation, with a total of 188 deviations for the study cohort. Return of spontaneous circulation (ROSC) was achieved in 35.3% of patients and 5.8% survived to hospital discharge. All survivors developed a new, severe neurological impairment. Medication deviations were most common (n = 40, 21.3%) followed by process timing (n = 38, 20.2%), vascular access (n = 27, 14.4%), and airway (n = 27, 14.4%). A delay in vascular access was the most common deviation (n = 25, 49.0%). The median (IQR) time to epinephrine administration was 8.6 (5.90-10.95) min from paramedic arrival. Cardiac arrests occurring in public settings had more deviations than private settings (p = 0.04). ROSC was higher in events with a deviation in any circulation category (p = 0.03). CONCLUSION: Patient and arrest characteristics were similar to other POHCA studies. This cohort exhibited high rates of ROSC and bystander cardiopulmonary resuscitation but low survival to hospital discharge. The study was underpowered for its primary outcome of survival. The total deviations scored was low relative to the total number of tasks in a resuscitation. Epinephrine was frequently administered outside of the recommended timeframe, highlighting an important quality improvement opportunity.

2. Neonatal Netw. 2022 Mar 1;41(2):107-113. doi: 10.1891/NN-2021-0009.
Know the Code: Medications for Resuscitation in Neonates.
McPherson C.
ABSTRACT

Resuscitations in the delivery room or the nursery cause significant stress for caregivers. Diligent preparation will improve the efficacy and safety of life-saving interventions and increase staff comfort. When establishment of an airway and delivery of positive pressure ventilation and chest compressions fail to result in return of spontaneous circulation, pharmacotherapeutic interventions should be considered. Epinephrine is first-line pharmacotherapy for severe bradycardia or cardiac arrest, increasing coronary arterial pressure and blood flow during chest compressions. Despite limited data regarding dosing and efficacy, the first dose of epinephrine may be delivered through the endotracheal tube during attainment of venous access (preferably a low-lying umbilical venous catheter in the delivery room). Intravenous dosing is preferred, and any facility caring for newborns must ensure optimized logistics including readily available dosing guidance and optimal flush volumes. After provision of epinephrine, additional medications may be considered, especially for resuscitations occurring outside of the immediate perinatal period, including normal saline, glucose, adenosine, atropine, and calcium. Clinicians must understand the indications, dosing, and monitoring parameters for these medications and ensure rapid availability for resuscitation. Every second truly counts in a neonatal resuscitation, and optimal understanding and preparation will ensure delivery of pharmacotherapy to optimize both patient outcomes and staff comfort.

Target Temperature Management and Survival with Favorable Neurological Outcome After Out-of-Hospital Cardiac Arrest in Children: A Nationwide Multicenter Prospective Study in Japan.

Matsui S(1)(2), Hirayama A(3), Kitamura T(1), Sobue T(1), Hayashi T(2), Takei H(2), Tanizawa N(2), Ohnishi Y(2), Kuratani S(2), Sameshima T(2), Yoshino G(2), Kurosawa H(4), Tanaka R(2).

ABSTRACT
To assess whether target temperature management (TTM) is effective for 1-month survival with favorable neurological outcome among pediatric patients who achieved return of spontaneous circulation (ROSC) after out-of-hospital cardiac arrest (OHCA). The Japanese Association for Acute Medicine-out-of-hospital cardiac arrest (JAAM-OHCA) Registry, a multicenter prospective observational registry in Japan, included OHCA patients aged ≤17 years who achieved ROSC between June 2014 and December 2017. The primary outcome was 1-month survival with favorable neurological outcomes, defined as pediatric cerebral performance category 1 or 2. We conducted a propensity score analysis with inverse-probability-of-treatment weighting (IPTW) and evaluated the effect of TTM using logistic regression models with IPTW. A total of 167 patients [120 in the non-TTM group (71.9%) and 47 in the TTM group (28.1%)] were eligible for our analysis. The proportion of patients demonstrating 1-month survival with favorable neurological outcomes was 25.5% (12/47) in the TTM group and 16.7% (20/120) in the non-TTM group; there were no significant differences in favorable neurological outcomes (odds ratio, 1.36; 95% confidence interval, 0.55-3.35) between the non-TTM and TTM groups after performing adjustments with IPTW. In our study population composed of pediatric patients who achieved ROSC after OHCA, we did not find a positive association between TTM implementation and 1-month survival with favorable neurological outcomes.

Postoperative Breath-Holding Spells Requiring Cardiopulmonary Resuscitation After Cardiopulmonary Bypass.

Kreis R(1), Robinson JA(2), Ibrahimiye A(2), Ortmann L(2).

ABSTRACT

Breath-holding spells are common in childhood and can be associated with bradycardia and pulselessness. This report details severe breath-holding spells complicating postoperative management after atrial septal defect closure. The patient required cardiopulmonary resuscitation despite the use of a temporary pacemaker to prevent bradycardia. After multiple episodes of chest compressions, the decision was made to not intervene immediately to pulselessness and the patient was able to recover without further intervention.

EXTRACORPOREAL LIFE SUPPORT

Extracorporeal Life-Support For Out-Of-Hospital Cardiac Arrest: A Nationwide Multicenter Study.
Jeong D(1), Lee GT(1), Park JE(1), Chang H(1), Kim T(1)(2), Cha WC(1)(2), Yoon H(1), Hwang SY(1), Shin TG(1), Sim MS(1), Jo I(1), Lee SH(3), Shin SD(4), Choi JH(1)(2).
ABSTRACT
BACKGROUND: Despite potential clinical roles of extracorporeal life support (ECLS) for out-of-hospital cardiac arrest (OHCA) compared to that of conventional cardiopulmonary resuscitation (CCPR), use of ECLS for OHCA is not strongly endorsed by current clinical guidelines. OBJECTIVE: The purpose of this study is to investigate the clinical roles of extracorporeal life support (ECLS) compared with that of conventional cardiopulmonary resuscitation (CCPR) for out-of-hospital cardiac arrest (OHCA) patients. METHODS: The outcomes of OHCA between 2015 and 2020, enrolled in the Korean Cardiac Arrest Research Consortium (KoCARC), a multicenter OHCA patient registry including 65 participating hospitals throughout the Republic of Korea (ClinicalTrials.gov, number NCT03222999). Differences in clinical features were adjusted by matching the propensity for ECLS. The primary outcome was 30-day neurologically favorable survival with cerebral performance category of 1 or 2. Restricted mean survival time (RMST) was used to compare outcomes between groups. RESULTS: Of 12,006 patients included, ECLS was applied to 272 patients (2.2%). The frequency of neurologically favorable survival was higher in the ECLS group than the CCPR group (RMST difference, 5.5 days [95% CI, 4.1-7.0 days], p < 0.001). In propensity score-matched 271 pairs, the clinical outcome of ECLS and CCPR did not differ to a statistically significant extent (RMST difference, 0.4 days [95% CI -1.6-2.5 days], p = 0.67). Subgroup analyses revealed that the clinical roles of ECLS was evident in patients with non-shockable rhythm or CPR time≥20 min (RMST difference, 2.7 days [95% CI 0.5-4.8 days], p = 0.015), but not in patients without these features (RMST difference, -3.7days [95% CI -7.6-0.2 days], p = 0.07). CONCLUSIONS: In this real-world data analysis, ECLS compared to CCPR did not result in better overall clinical outcomes of OHCA. The clinical efficacy of ECLS may be limited to a subgroup of high-risk patients.

Extracorporeal cardiopulmonary resuscitation: is it futile?
Kim C(1), Vigneshwar M(2), Nicolato P(3).
ABSTRACT
PURPOSE OF REVIEW: Extracorporeal cardiopulmonary resuscitation (ECPR) is a treatment modality used to restore end-organ perfusion in the setting of refractory cardiac arrest in patients receiving cardiopulmonary resuscitation (CPR). Despite advances in medicine, survival from cardiac arrest remains low with conventional CPR. The body of literature relating to ECPR is limited to retrospective studies and case series, with data that are inconsistent. Routine use of ECPR is not currently endorsed by the American Heart Association. RECENT FINDINGS: In several single-center retrospective studies, ECPR was associated with a higher level of return of spontaneous circulation and survival to hospital discharge, when compared with conventional CPR. However, data from larger population-based registry studies have not reproduced these findings. Implementation of ECPR is a complex endeavor that requires specialized, multidisciplinary expertise to be successful.

SUMMARY: ECPR may be considered as an adjunct to CPR in cases of refractory cardiac arrest. The success of ECPR relies on specialized expertise, thoughtful patient selection, and timely initiation.

ECMO Predictors of Mortality: A 10-Year Referral Centre Experience.
Treml B(1), Breitkopf R(2), Bukumirić Z(3), Bachler M(1), Boesch J(1), Rajsic S(1).
ABSTRACT
BACKGROUND: Extracorporeal membrane oxygenation (ECMO) is a specialised life support modality for patients with refractory cardiac or respiratory failure. Multiple studies strived to evaluate the benefits of ECMO support, but its efficacy remains controversial with still inconsistent and sparse information. METHODS: This retrospective analysis included patients with ECMO support, admitted between January 2010 and December 2019 at a tertiary university ECMO referral centre in Austria. The primary endpoint of the study was overall all-cause three-month mortality with risk factors and predictors of mortality. Secondary endpoints covered the analysis of demographic and clinical characteristics of patients needing ECMO, including incidence and type of adverse events during support. RESULTS: In total, 358 patients fulfilled inclusion criteria and received ECMO support due to cardiogenic shock (258, 72%), respiratory failure (88, 25%) or hypothermia (12, 3%). In total, 41% (145) of patients died within the first three months, with the median time to death of 9 (1-87) days. The multivariate analysis identified hypothermia (HR 3.8, p < 0.001), the Simplified Acute Physiology Score III (HR 1.0, p < 0.001), ECMO initiation on weekends (HR 1.6, p = 0.016) and haemorrhage during ECMO support (HR 1.7, p = 0.001) as factors with higher risk for mortality. Finally, the most frequent adverse event was haemorrhage (160, 45%) followed by thrombosis. CONCLUSIONS: ECMO is an invasive advanced support system with a high risk of complications. Nevertheless, well-selected patients can be successfully rescued from life-threatening conditions by prolonging the therapeutic window to either solve the underlying problem or install a long-term assist device. Hypothermia, disease severity, initiation on weekends and haemorrhage during ECMO support increase the risk for mortality. In the case of decision making in a setting of limited (ICU) resources, the reported risk factors for mortality may be contemplable, especially when judging a possible ECMO support termination.

EXPERIMENTAL RESEARCH

Baclofen attenuates cognitive deficits in post-cardiac arrest brain injury.
Sun Y(1), Cong T(1), Li L(1), Li J(1), Wu H(1), Chen X(1), Zhou Y(1), Xiao Z(2).
ABSTRACT
Between 30% and 50% of survivors of cardiac arrest (CA) suffer from cognitive deficits. However, no effective medical intervention is available to alleviate cognitive deficits. Baclofen is known to protect damaged neurons, but researchers have still not clearly whether baclofen alleviates CA-induced cognitive deficits. The present study aimed to investigate whether baclofen protects against post-CA cognitive deficits and to reveal the protective mechanism of baclofen. Rats underwent 10 min of asphyxia to establish CA models. Intriguingly, our results indicated that baclofen improved spatial memory 72 h after CA. Baclofen increased plasticity-related protein (PSD95, and GAP43) expression in the brain after CA. Baclofen reduced microglial number and the release of inflammatory factors (IL-1β and IL-18). Furthermore, baclofen significantly reduced the expression of pyroptosis-related molecules after CA. Notably, activation of NLRP3 abolished the anti-pyroptosis effect of baclofen and reduced the expression of synaptic plasticity-related proteins after CA. Taken together, this study first shows that baclofen attenuates cognitive deficits induced by brain injury after CA. The

mechanism is at least partially attributed to baclofen regulating pyroptosis by inhibition of NLRP3 activation.

Inadequate Bioavailability of Intramuscular Epinephrine in a Neonatal Asphyxia Model.
Berkelhamer SK(1), Vali P(2), Nair J(3), Gugino S(3), Helman J(3), Koenigsknecht C(3), Nielsen L(3), Lakshminrusimha S(2).

ABSTRACT
BACKGROUND: Over half a million newborn deaths are attributed to intrapartum related events annually, the majority of which occur in low resource settings. While progress has been made in reducing the burden of asphyxia, novel approaches may need to be considered to further decrease rates of newborn mortality. Administration of intravenous, intraosseous or endotracheal epinephrine is recommended by the Newborn Resuscitation Program (NRP) with sustained bradycardia at birth. However, delivery by these routes requires both advanced skills and specialized equipment. Intramuscular (IM) epinephrine may represent a simple, low cost and highly accessible alternative for consideration in the care of infants compromised at birth. At present, the bioavailability of IM epinephrine in asphyxia remains unclear. METHODS: Four term fetal lambs were delivered by cesarean section and asphyxiated by umbilical cord occlusion with resuscitation after 5 min of asystole. IM epinephrine (0.1 mg/kg) was administered intradeltoid after 1 min of positive pressure ventilation with 30 s of chest compressions. Serial blood samples were obtained for determination of plasma epinephrine concentrations by ELISA. RESULTS: Epinephrine concentrations failed to increase following administration via IM injection. Delayed absorption was observed after return of spontaneous circulation (ROSC) in half of the studies. CONCLUSIONS: Inadequate absorption of epinephrine occurs with IM administration during asphyxial cardiac arrest, implying this route would be ineffective in infants who are severely compromised at birth. Late absorption following ROSC raises concerns for risks of side effects. However, the bioavailability and efficacy of intramuscular epinephrine in less profound asphyxia may warrant further evaluation.

Bradykinin postconditioning protects rat hippocampal neurons after restoration of spontaneous circulation following cardiac arrest via activation of the AMPK/mTOR signaling pathway.
Lin SR(1), Lin QM(2), Lin YJ(3), Qian X(2), Wang XP(2), Gong Z(2), Chen F(2), Song B(4).

ABSTRACT
Bradykinin (BK) is an active component of the kallikrein-kinin system that has been shown to have cardioprotective and neuroprotective effects. We previously showed that BK postconditioning strongly protects rat hippocampal neurons upon restoration of spontaneous circulation (ROSC) after cardiac arrest. However, the precise mechanism underlying this process remains poorly understood. In this study, we treated a rat model of ROSC after cardiac arrest (induced by asphyxiation) with 150 μg/kg BK via intraperitoneal injection 48 hours after ROSC following cardiac arrest. We found that BK postconditioning effectively promoted the recovery of rat neurological function after ROSC following cardiac arrest, increased the amount of autophagosomes in the hippocampal tissue, inhibited neuronal cell apoptosis, up-regulated the expression of autophagy-related proteins LC3 and NBR1 and down-regulated p62, inhibited the expression of the brain injury marker S100β and apoptosis-related protein caspase-3, and affected the expression of adenosine monophosphate-activated protein kinase/mechanistic target of rapamycin pathway-related proteins. Adenosine monophosphate-activated protein kinase inhibitor compound C clearly inhibited BK-mediated activation of autophagy in rats after ROSC following cardiac arrest, which aggravated the injury caused by ROSC. The mechanistic target of rapamycin inhibitor rapamycin enhanced the protective

effects of BK by stimulating autophagy. Our findings suggest that BK postconditioning protects against injury caused by ROSC through activating the adenosine monophosphate-activated protein kinase/mechanistic target of the rapamycin pathway.

4. J Am Heart Assoc. 2022 Mar 9:e023378. doi: 10.1161/JAHA.121.023378. Online ahead of print.

Trimetazidine Alleviates Postresuscitation Myocardial Dysfunction and Improves 96-Hour Survival in a Ventricular Fibrillation Rat Model.

Li J(1), Qi Y(2), Wang J(1), Dai C(1), Chen B(1), Li Y(1).

ABSTRACT

Background Myocardial dysfunction is a critical cause of post-cardiac arrest hemodynamic instability and circulatory failure that may lead to early mortality after resuscitation. Trimetazidine is a metabolic agent that has been demonstrated to provide protective effects in myocardial ischemia. However, whether trimetazidine protects against postresuscitation myocardial dysfunction is unknown. Methods and Results Cardiopulmonary resuscitation was initiated after 8 minutes of untreated ventricular fibrillation in Sprague-Dawley rats. Animals were randomized to 4 groups immediately after resuscitation (n=15/group): (1) normothermia control (NTC); (2) targeted temperature management; (3) trimetazidine-normothermia; (4) trimetazidine-targeted temperature management. TMZ was administered at a single dose of 10 mg/kg in rats with trimetazidine. The body temperature was maintained at 34.0°C for 2 hours and then rewarmed to 37.5°C in rats with targeted temperature management. Postresuscitation hemodynamics, 96-hours survival, and pathological analysis were assessed. Heart tissues and blood samples of additional rats (n=6/group) undergoing the same experimental procedure were collected to measure myocardial injury, inflammation and oxidative stress-related biomarkers with ELISA-based quantification assays. Compared with normothermia control, tumor necrosis factor-α, and cardiac troponin-I were significantly reduced, whereas the left ventricular ejection fraction and 96-hours survival rates were significantly improved in the 3 experimental groups. Furthermore, inflammation and oxidative stress-related biomarkers together with collagen volume fraction were significantly decreased in rats undergoing postresuscitation interventions. Conclusions Trimetazidine significantly alleviates postresuscitation myocardial dysfunction and improves survival by decreasing oxidative stress and inflammation in a ventricular fibrillation rat model. A single dose of trimetazidine administrated immediately after resuscitation can effectively improve cardiac function, whether used alone or combined with targeted temperature management.

CASE REPORTS

1. Cureus. 2022 Feb 3;14(2):e21867. doi: 10.7759/cureus.21867. eCollection 2022 Feb.

Cardiac Arrest and Hypoxic-Ischemic Encephalopathy Following an Emergency Caesarean Section in a COVID-19 Patient.

Palati S(1), Sanchez A(1), Campbell M(1), Castaneda M(2).

ABSTRACT

While young, healthy individuals without underlying medical conditions have generally not suffered catastrophic health consequences from the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), gravid patients appear to be at much higher risk of complications from this virus. A 29-year-old G3P2 patient at 30 weeks and three days presented with worsening dyspnea and chest pain after testing positive for coronavirus disease 2019 (COVID-19) infection two days prior. Notably, she had not received COVID-19 vaccination. A non-reassuring fetal tracing and fetal bradycardia were discovered on routine prenatal monitoring during admission, and an urgent caesarean section was performed. She subsequently required supplemental oxygen due to respiratory distress and

remained hospitalized. She clinically deteriorated from a respiratory standpoint. Several days later, she experienced cardiac arrest with a return of spontaneous circulation (ROSC) in nine minutes. While the baby was discharged home and is doing well, the patient, unfortunately, expired from hypoxic encephalopathy secondary to COVID-19 pneumonia and complications of cardiorespiratory arrest. This case highlights the severe sequelae of COVID-19 infection in a postpartum patient, including ventilator-dependent respiratory failure, sudden cardiac death, hypoxic encephalopathy, and coma.

Enhanced Interplay of Neuronal Coherence and Coupling in the Dying Human Brain.
Vicente R(1)(2), Rizzuto M(3), Sarica C(4), Yamamoto K(4), Sadr M(3), Khajuria T(2), Fatehi M(3), Moien-Afshari F(5), Haw CS(3), Llinas RR(6), Lozano AM(4), Neimat JS(7), Zemmar A(1)(4)(7).
ABSTRACT
The neurophysiological footprint of brain activity after cardiac arrest and during near-death experience (NDE) is not well understood. Although a hypoactive state of brain activity has been assumed, experimental animal studies have shown increased activity after cardiac arrest, particularly in the gamma-band, resulting from hypercapnia prior to and cessation of cerebral blood flow after cardiac arrest. No study has yet investigated this matter in humans. Here, we present continuous electroencephalography (EEG) recording from a dying human brain, obtained from an 87-year-old patient undergoing cardiac arrest after traumatic subdural hematoma. An increase of absolute power in gamma activity in the narrow and broad bands and a decrease in theta power is seen after suppression of bilateral hemispheric responses. After cardiac arrest, delta, beta, alpha and gamma power were decreased but a higher percentage of relative gamma power was observed when compared to the interictal interval. Cross-frequency coupling revealed modulation of left-hemispheric gamma activity by alpha and theta rhythms across all windows, even after cessation of cerebral blood flow. The strongest coupling is observed for narrow- and broad-band gamma activity by the alpha waves during left-sided suppression and after cardiac arrest. Albeit the influence of neuronal injury and swelling, our data provide the first evidence from the dying human brain in a non-experimental, real-life acute care clinical setting and advocate that the human brain may possess the capability to generate coordinated activity during the near-death period.

Neonatal ischemic limb lesions: From etiology to topical nitroglycerine. A case series analysis.
Falsaperla R(1)(2), Lo Bianco M(3), Giugno A(3), Lena G(3), Sciuto L(3), Spata F(4), Guarneri C(5), Pavone P(6), Ruggieri M(7).
ABSTRACT
Although rare, ischemic lesions in neonates may occur in Neonatal Intensive Care Units (NICUs) secondary to routine procedures and/or medicaments. We present double-center case series, reporting three preterm neonates with ischemic lesions following cardiac arrest and radial blood sampling. The overall outcome after treatment with 2% nitroglycerine (NTG) ointment showed optimal results with no adverse events. The most frequent causes responsible for the onset of such lesions are peripheral arterial catheterization procedures and dopamine extravasation. Our series describe the cardiac arrest as an underestimated cause of onset. Despite the optimal results emerging from the treatment of such lesions with NTG ointment, both in our experience and in the scientific literature, a defined protocol for its use in NICUs is not currently available, hence the need for further studies.

Fatal Cardiac Tamponade Due to a Pericardial Inflammatory Myofibroblastic Tumor.

Ohsaka H(1), Muramatsu KI(1), Ota S(1), Nagasawa H(1), Ryo W(2), Yanagawa Y(1).

ABSTRACT

The patient was a 34-year-old woman who suddenly collapsed. On arrival, she was in cardiac arrest. Cardiac ultrasound revealed cardiac tamponade; thus, urgent thoracotomy with pericardiotomy was performed. Spontaneous circulation was temporarily obtained; however, her circulation was not stabilized, and she ultimately died. An autopsy revealed a pericardial inflammatory myofibroblastic tumor (IMT) causing bloody cardiac tamponade. There were no signs of cardiac rupture, myocardial infarction or aortic dissection. We reported the first case of fatal bloody cardiac tamponade due to pericardial IMT in an adult. An autopsy is important for clarifying the etiology in cases of fatal cardiac tamponade of unknown cause.

Cardiac Arrest during Cesarean Section - A Case Report and Review of the Differential Diagnosis.
Lukac S(1), Mayer S(2), Mühlen K(3), Flock F(3).

ABSTRACT

AIM: According to the World Health Organization, approximately 810 pregnant women die every day as a consequence of peripartum complications. A large proportion of deaths happen in developing countries. Peripartum cardiac arrest is a rare event that must be treated immediately. It is important to consider the differential diagnoses in order to save lives. METHODS: In this review, we discuss a differential diagnosis of cardiac arrest according to the BEAU-CHOPS scheme of the American Heart Association in the relation to the case report of our 40-year-old G5/P3 patient who went into cardiac arrest during cesarean delivery. RESULTS: Typical differentials for cardiac arrest during labor are bleeding, embolism, anesthetic complications, cardiovascular diseases, eclampsia, and sepsis. All of them were considered and ruled out in this patient. In the end, we suspect that physiological cardio-inhibitory reflexes triggered by sudden profound hypovolemia after placental separation along with the patient's risk factors, especially obesity and maternal age, and the administration of spinal anesthesia all potentially contributed to the cardiac arrest. CONCLUSIONS: This review highlights that the cardiac arrest during labor can be triggered by the multifactorial etiology, but firstly the typical differential diagnosis needs to be excluded.