This week's PubMed 17th – 30th July 2022: articles of interest n = 86

CPR AND COVID-19

1. Cardiol Clin. 2022 Aug;40(3):355-364. doi: 10.1016/j.ccl.2022.03.009. Epub 2022 Mar 29.
Impact of Coronavirus Disease 2019 Pandemic on Cardiac Arrest and Emergency Care.
Bharmal M(1), DiGrande K(1), Patel A(1), Shavelle DM(2), Bosson N(3).
ABSTRACT
The incidence of both out-of-hospital and in-hospital cardiac arrest increased during the coronavirus disease 2019 (COVID-19) pandemic. Patient survival and neurologic outcome after both out-of-hospital and in-hospital cardiac arrest were reduced. Direct effects of the COVID-19 illness combined with indirect effects of the pandemic on patient's behavior and health care systems contributed to these changes. Understanding the potential factors offers the opportunity to improve future response and save lives.

2. Resuscitation. 2022 Jul 19;178:55-62. doi: 10.1016/j.resuscitation.2022.07.018. Online ahead of print.
Predicting neurological outcomes after in-hospital cardiac arrests for patients with Coronavirus Disease 2019.
Mayampurath A(1), Bashiri F(2), Hagopian R(3), Venable L(4), Carey K(4), Edelson D(4), Churpek M(5); American Heart Association's Get With The Guidelines®-Resuscitation Investigators.
ABSTRACT
BACKGROUND: Machine learning models are more accurate than standard tools for predicting neurological outcomes in patients resuscitated after cardiac arrest. However, their accuracy in patients with Coronavirus Disease 2019 (COVID-19) is unknown. Therefore, we compared their performance in a cohort of cardiac arrest patients with COVID-19. METHODS: We conducted a retrospective analysis of resuscitation survivors in the Get With The Guidelines®-Resuscitation (GWTG-R) COVID-19 registry between February 2020 and May 2021. The primary outcome was a favorable neurological outcome, indicated by a discharge Cerebral Performance Category score ≤ 2. Pre- and peri-arrest variables were used as predictors. We applied our published logistic regression, neural network, and gradient boosted machine models developed in patients without COVID-19 to the COVID-19 cohort. We also updated the neural network model using transfer learning. Performance was compared between models and the Cardiac Arrest Survival Post-Resuscitation In-Hospital (CASPRI) score. RESULTS: Among the 4,125 patients with COVID-19 included in the analysis, 484 (12 %) patients survived with favorable neurological outcomes. The gradient boosted machine, trained on non-COVID-19 patients was the best performing model for predicting neurological outcomes in COVID-19 patients, significantly better than the CASPRI score (c-statistic: 0.75 vs 0.67, $P < 0.001$). While calibration improved for the neural network with transfer learning, it did not surpass the gradient boosted machine in terms of discrimination. CONCLUSION: Our gradient boosted machine model developed in non-COVID patients had high discrimination and adequate calibration in COVID-19 resuscitation survivors and may provide clinicians with important information for these patients.

3. Acta Anaesthesiol Scand. 2022 Jul 27. doi: 10.1111/aas.14117. Online ahead of print.
Cardiopulmonary resuscitation missed by bystanders: collateral damage of COVID-19?
Stirparo G(1)(2), Fagoni N(3)(4), Bellini L(1), Oradini-Alacreu A(1), Migliari M(2), Villa GF(2), Botteri M(2)(3), Signorelli C(1), Sechi GM(2), Zoli A(2).
ABSTRACT

OBJECTIVE: The COVID-19 pandemic changed the time-dependent cardiac arrest network. This study aims to understand whether the rescue standards of CPR and out-of-hospital cardiac arrest (OHCA) were handled differently during pandemic compared to the previous year. METHODS: Data for the years 2019 and 2020 were provided by the records of the Lombardy office of the Regional Agency for Emergency and Urgency (AREU). We analysed where the cardiac arrest occurred, when CPR started and whether the bystanders used PAD. RESULTS: During 2020, there was a reduction in CPRs performed by bystanders (OR = 0.936 [CI95% 0.882-0.993], P = 0.029) and in the return of spontaneous circulation (ROSC) (OR = 0.621 [CI95% 0.563- 0.685], P < 0.0001), while there was no significant reduction in the use of PAD. Analysing only March, the period of the first wave in Lombardy, the comparison shows a reduction in bystanders CPRs (OR = 0.727 [CI95% 0.602- 0.877], P = 0.0008), use of PAD (OR = 0.441 [CI95% 0.272-0.716], P = 0.0009) and in ROSC (OR = 0.179 [CI95% 0.124-0.257], P < 0.0001). These phenomena could be influenced by the different setting in which the OHCAs occurred; in fact, those that occurred in public places with a mandatory PAD were strongly reduced (OR = 0.49 [CI95% , 0.44-0.55], P < 0.0001). CONCLUSIONS: COVID-19 had a profound impact on the time-dependant OHCA network. During the first pandemic wave, CPR and PAD used by bystanders decreased. The different context in which OHCAs occurred may partially explain these differences.

4. J Clin Med. 2022 Jul 16;11(14):4143. doi: 10.3390/jcm11144143.
Occurrence and Temporal Variability of Out-of-Hospital Cardiac Arrest during COVID-19 Pandemic in Comparison to the Pre-Pandemic Period in Poland-Observational Analysis of OSCAR-POL Registry.
Ratajczak J(1)(2), Szczerbiński S(3), Kubica A(1).
ABSTRACT
An investigation of the chronobiology of out-of-hospital cardiac arrest (OHCA) during the coronavirus disease 2019 (COVID-19) pandemic and the differences in comparison to the 6-year pre-pandemic period. A retrospective analysis of the dispatch cards from the Emergency Medical Service between January 2014 and December 2020 was performed within the OSCAR-POL registry. The circadian, weekly, monthly, and seasonal variabilities of OHCA were investigated. A comparison of OHCA occurrence between the year 2020 and the 6-year pre-pandemic period was made. A total of 416 OHCAs were reported in 2020 and the median of OHCAs during the pre-pandemic period was 379 (interquartile range 337-407) cases per year. Nighttime was associated with a decreased number of OHCAs (16.6%) in comparison to afternoon (31.5%, p < 0.001) and morning (30.0%, p < 0.001). A higher occurrence at night was observed in 2020 compared to 2014-2019 (16.6% vs. 11.7%, p = 0.001). Monthly and seasonal variabilities were observed in 2020. The months with the highest OHCA occurrence in 2020 were November (13.2%) and October (11.1%) and were significantly higher compared to the same months during the pre-pandemic period (9.1%, p = 0.002 and 7.9%, p = 0.009, respectively). Autumn was the season with the highest rate of OHCA, which was also higher compared to the pre-pandemic period (30.5% vs. 25.1%, p = 0.003). The COVID-19 pandemic was related to a higher occurrence of OHCA. The circadian, monthly, and seasonal variabilities of OHCA occurrence were confirmed. In 2020, the highest occurrence of OHCA was observed in October and November, which coincided with the highest occurrence of COVID-19 infections in Poland.

CPR/MECHANICAL CHEST COMPRESSION

1. Anesth Prog. 2022 Jun 1;69(2):11-16. doi: 10.2344/anpr-68-03-13.
A Comparison of Two Stool Positions for Stabilizing a Dental Chair During CPR.

Hitosugi T(1), Awata N(1), Miki Y(2), Tsukamoto M(3), Yokoyama T(1).
ABSTRACT
OBJECTIVE: Most dental chairs lack sufficient stability to perform effective manual chest compression (MCC) during cardiopulmonary resuscitation (CPR). A stabilizing stool can significantly reduce backrest vertical displacement in all chair types; however, a severely curved exterior backrest may negatively impact the stool's effectiveness. This study evaluated the efficacy of 2 stool positions for stabilizing a dental chair during MCC. METHODS: Chest compressions were performed on a manikin positioned in a dental chair while vertical displacement of the chair backrest during MCC was recorded using video and measured. Vertical displacement data were captured with no stool and with a stabilizing stool in 2 different positions. Reduction ratios were calculated to evaluate the effectiveness of the 2 stool positions. RESULTS: With no stool, the backrest median (interquartile range) vertical displacement during chest compressions was 16.5 (2.5) mm as compared with 12.0 (1.5) mm for the stabilizing stool positioned under the area of MCC and 8.5 (1.0) mm under the shoulders. The stool positioned under the shoulders produced a significantly increased calculated reduction ratio of 48% (14%) compared with 27% (20%) under the area of MCC ($P < .001$). CONCLUSIONS: Positioning a stabilizing stool under the shoulders was more effective at reducing vertical displacement of the dental chair backrest during chest compressions than positioning the stool under the area of MCC.

2. Cureus. 2022 Jun 20;14(6):e26131. doi: 10.7759/cureus.26131. eCollection 2022 Jun.
Retrospective Comparison of Prehospital Sustained Return of Spontaneous Circulation (ROSC) Rates Within a Single Basic Life Support Jurisdiction Using Manual vs Lund University Cardiac Assist System (LUCAS-2) Mechanical Cardiopulmonary Resuscitation.
Mastenbrook J(1), Redinger KE(1), Vos D(2), Dickson C(3).
ABSTRACT
Objective Several studies have examined the impact of mechanical cardiopulmonary resuscitation (CPR) devices among multi-jurisdictional emergency medical services (EMS) systems; however, the variability across such systems can inject bias and confounding variables. We focused our investigation on the effect of introducing the Lund University Cardiac Assist System 2 (LUCAS-2) into a single basic life support (BLS) fire department first response jurisdiction served by a single private advanced life support (ALS) agency, hypothesizing that the implementation of the device would increase prehospital return of spontaneous circulation (ROSC) rates as compared with manual CPR. Methods A retrospective observational analysis of adult non-traumatic prehospital cardiac arrest ALS agency records was conducted. Descriptive statistics were computed, and logistic regression was used to assess the impact of CPR method, response time, age, gender, CPR initiator, witnessed status, automated external defibrillator (AED) initiator, and presence of an initial shockable rhythm on ROSC rates. A Chi-square analysis was used to compare ROSC rates among compression modalities both before and after the implementation of LUCAS-2 on July 1, 2011. Results From an initial dataset of 857 cardiac arrest records, only 264 (74 pre-LUCAS period, 190 LUCAS-2 period) met inclusion criteria for the primary objective. The ROSC rates were 29.7% (22/74) and 29.5% (56/190), respectively, for manual-only and LUCAS-assisted CPR ($p=0.9673$). Logistic regression revealed a significant association between ROSC and two of the independent variables: arrest witnessed (OR 3.104; 95% CI 1.896-5.081; $p<0.0001$) and initial rhythm shockable (OR 2.785; 95% CI 1.492-5.199; $p<0.0013$). Conclusions Analyses support the null hypothesis that there is no difference in prehospital ROSC rates among adult non-traumatic cardiac arrest patients when comparing mechanical-assisted and manual-only CPR. These results are consistent with other larger multi-jurisdictional mechanical CPR studies. Systems with limited personnel might consider augmenting their resuscitations with a mechanical CPR device, although cost and system design

should be factored into the decision. Secondary analysis of independent variables suggests that prehospital cardiac arrest patients with a witnessed arrest or an initial rhythm that is shockable have a higher likelihood of attaining ROSC. The power of our primary objective was limited by the sample size. Additionally, we were not able to adequately assess the quality of CPR among the two comparison groups with a lack of consistent end-tidal carbon dioxide (EtCO2) data.

3. Prehosp Disaster Med. 2022 Jul 25:1-8. doi: 10.1017/S1049023X22001042. Online ahead of print.
Manual versus Mechanical Delivery of High-Quality Cardiopulmonary Resuscitation on a River-Based Fire Rescue Boat.
Manoukian MAC(1), Tancredi DJ(2), Linvill MT(1), Wynia EH(1), Beaver B(1), Rose JS(1), Mumma BE(1).

ABSTRACT
OBJECTIVES: Studies have demonstrated the efficacy of mechanical devices at delivering high-quality cardiopulmonary resuscitation (HQ-CPR) in various transport settings. Herein, this study investigates the efficacy of manual and mechanical HQ-CPR delivery on a fire rescue boat. METHODS: A total of 15 active firefighter-paramedics were recruited for a prospective manikin-based trial. Each paramedic performed two minutes manual compression-only CPR while navigating on a river-based fire rescue boat. The boat was piloted in either a stable linear manner or dynamic S-turn manner to simulate obstacle avoidance. For each session of manual HQ-CPR, a session of mechanical HQ-CPR was also performed with a LUCAS 3 (Stryker; Kalamazoo, Michigan USA). A total of 60 sessions were completed. Parameters recorded included compression fraction (CF) and the percentage of compressions with correct depth >5cm (D%), correct rate 100-120 (R%), full release (FR%), and correct hand position (HP%). A composite HQ-CPR score was calculated as follows: ((D% + R% + FR% + HP%)/4) * CF%). Differences in magnitude of change seen in stable versus dynamic navigation within study conditions were evaluated with a Z-score calculation. Difficulty of HQ-CPR delivery was assessed utilizing the Borg Rating of Perceived Exertion Scale. RESULTS: Participants were mostly male and had a median experience of 20 years. Manual HQ-CPR delivered during stable navigation out-performed manual HQ-CPR delivered during dynamic navigation for composite score and trended towards superiority for FR% and R%. There was no difference seen for any measured variable when comparing mechanical HQ-CPR delivered during stable navigation versus dynamic navigation. Mechanical HQ-CPR out-performed manual HQ-CPR during both stable and dynamic navigation in terms of composite score, FR%, and R%. Z-score calculation demonstrated that manual HQ-CPR delivery was significantly more affected by drive style than mechanical HQ-CPR delivery in terms of composite HQ-CPR score and trended towards significance for FR% and R%. Borg Rating of Perceived Exertion was higher for manual CPR delivered during dynamic sessions than for stable sessions. CONCLUSION: Mechanical HQ-CPR delivery is superior to manual HQ-CPR delivery during both stable and dynamic riverine navigation. Whereas manual HQ-CPR delivery was worse during dynamic transportation conditions compared to stable transport conditions, mechanical HQ-CPR delivery was unaffected by drive style. This suggests the utility of routine use of mechanical HQ-CPR devices in the riverine patient transport setting.

REGISTRIES, REVIEWS AND EDITORIALS

1. Emergencias. 2022 Aug;34(4):259-267.
Persistent gender gaps in out-of-hospital cardiac arrest in Spain from 2013 through 2018.
[Article in English, Spanish; Abstract available in Spanish from the publisher]
Mateo-Rodríguez I(1), Knox EC(2), Ruiz-Azpiazu JI(3), Fernández Del Valle P(4), Daponte-Codina A(5), Jiménez-Fàbrega X(6), Navalpotro-Pascual JMª(7), Iglesias-Vázquez JA(8), Echarri-Sucunza A(9),

Alonso-Moreno D(10), Forner-Canos AB(11), García-Ochoa Blanco MªJ(12), Del Pozo-Pérez C(13), Mainar-Gómez B(14), Batres-Gómez S(15), Cortés-Ramas JA(16), Ceniceros-Rozalén MªI(17), Guirao-Salinas FÁ(18), Fernández-Martínez B(19), Mora MÁ(6), Carriedo-Scher C(20), Bragado-Blas MªL(3), Mellado-Vergel FJ(21), Rosell-Ortiz F(3).

ABSTRACT

OBJECTIVES: To examine gender-related differences in the management and survival of out-of-hospital cardiac arrest (OHCA) in Spain during 2 time series. MATERIAL AND METHODS: Analysis of data recorded in the prospective Spanish OHCA registry (OHSCAR in its Spanish acronym) for 2 time series (2013-2014 and 2017-2018). We included all 11 036 consecutive cases in which an emergency team intervened. The dependent variables were arrival at the hospital after return of spontaneous circulation, overall survival to discharge, and overall survival with good neurological outcomes. Sex was the independent variable. We report descriptive statistics, patient group comparisons, and changes over time. RESULTS: Women were significantly older and less likely to experience an OHCA in a public place, receive automatic external defibrillation, have a shockable heart rhythm, and be attended by an ambulance team within 15 minutes. In addition, fewer women underwent percutaneous coronary interventions or received treatment for hypothermia on admission to the hospital. In 2013-2014 and 2017-2018, respectively, the likelihood of survival was lower for women than men on admission (odds ratio [OR], 0.52 vs OR, 0.61; P .001 and P = .009 in the 2 time series) and at discharge (OR, 0.69 vs 0.72 for men; P = .001 in both time series). Survival with good neurological outcomes was also less likely in women (OR, 0.50 vs 0.63; P .001 in both series). CONCLUSION: The odds for survival and survival with good neurological outcomes were lower for women in nearly all patient groups in both time series. These findings suggest the need to adopt new approaches to address gender differences in OHCA.

2. J Am Coll Emerg Physicians Open. 2022 Jul 14;3(4):e12773. doi: 10.1002/emp2.12773. eCollection 2022 Aug.

Cardiac arrest: An interdisciplinary scoping review of clinical literature from 2020.

Murphy TW(1)(2)(3), Cohen SA(3), Hwang CW(3), Avery KL(4), Balakrishnan MP(3), Balu R(5), Chowdhury MAB(3), Crabb DB(3), Elmelige Y(3), Maciel CB(5)(6)(7), Gul SS(8), Han F(3)(9), Becker TK(1)(3); Interdisciplinary Cardiac Arrest Research Review (ICARE) group.

ABSTRACT

OBJECTIVES: The Interdisciplinary Cardiac Arrest Research Review (ICARE) group was formed in 2018 to conduct an annual search of peer-reviewed literature relevant to cardiac arrest. Now in its third year, the goals of the review are to highlight annual updates in the interdisciplinary world of clinical cardiac arrest research with a focus on clinically relevant and impactful clinical and population-level studies from 2020. METHODS: A search of PubMed using keywords related to clinical research in cardiac arrest was conducted. Titles and abstracts were screened for relevance and sorted into 7 categories: Epidemiology & Public Health Initiatives; Prehospital Resuscitation, Technology & Care; In-Hospital Resuscitation & Post-Arrest Care; Prognostication & Outcomes; Pediatrics; Interdisciplinary Guidelines & Reviews; and a new section dedicated to the coronavirus disease 2019 (COVID-19) pandemic. Screened manuscripts underwent standardized scoring of methodological quality and impact on the respective fields by reviewer teams lead by a subject matter expert editor. Articles scoring higher than 99 percentiles by category were selected for full critique. Systematic differences between editors' and reviewers' scores were assessed using Wilcoxon signed-rank test. RESULTS: A total of 3594 articles were identified on initial search; of these, 1026 were scored after screening for relevance and deduplication, and 51 underwent full critique. The leading category was Prehospital Resuscitation, Technology & Care representing 35% (18/51) of fully reviewed articles. Four COVID-19 related articles were included for formal review that was attributed to a relative lack

of high-quality data concerning cardiac arrest and COVID-19 specifically by the end of the 2020 calendar year. No significant differences between editor and reviewer scoring were found among review articles (P = 0.697). Among original research articles, section editors scored a median 1 point (interquartile range, 0-3; P < 0.01) less than reviewers. CONCLUSIONS: Several clinically relevant studies have added to the evidence base for the management of cardiac arrest patients including methods for prognostication of neurologic outcome following arrest, airway management strategy, timing of coronary intervention, and methods to improve expeditious performance of key components of resuscitation such as chest compressions in adults and children.

3. J Pers Med. 2022 Jun 27;12(7):1047. doi: 10.3390/jpm12071047.
Delirium in ICU Patients after Cardiac Arrest: A Scoping Review.
Mędrzycka-Dąbrowska W(1), Lange S(2), Religa D(3), Dąbrowski S(4), Friganović A(5)(6), Oomen B(7), Krupa S(8).
ABSTRACT
INTRODUCTION: The incidence of delirium in the intensive care unit is high, although it may differ according to the specific characteristics of the unit. Despite the rapid development of research on delirium in recent years, the pathophysiological mechanisms leading to the clinical presentation of delirium are still subject to hypotheses. The aim of this review was to describe the incidence of delirium in cardiac arrest survivors and the clinical impact of delirium on patient outcomes. METHODS: A scoping review was conducted in the second quarter of 2022. The number of articles retrieved during each search test was limited to studies conducted between 2010 and 2020. Strict inclusion and exclusion criteria were applied. The last search was conducted in May 2022. RESULTS: A total of 537 records was initially obtained from the databases. After discarding duplicates, selecting titles and abstracts, and then analyzing full-text articles, 7 studies met the inclusion criteria. The incidence of delirium in the cardiac arrest survivor population ranged from 8% to as high as 100%. The length of stay in ICU and hospital was significantly longer in patients with delirium than those without. Ninety-eight percent of patients had cognitive or perceptual impairment and psychomotor impairment. Of the seven studies included in the analysis, the RASS, CAM, and NuDesc scales were used to diagnose delirium. Potential risk factors that may influence the duration of delirium include age and time since resuscitation; propofol use shortened the duration of delirium. CONCLUSION: the incidence of delirium in ICU patients who survived CA is high. Cardiac arrest is an additional predisposing factor for delirium. In cardiac arrest survivors, the occurrence of delirium prolongs the duration of ICU and hospital stay and adversely affects functional outcomes. The most common type of delirium among this population was hypoactive delirium. A large percentage of patients manifested symptoms such as cognitive or perception impairment, psychomotor impairment, and impaired concentration and attention.

4. Pediatr Crit Care Med. 2022 Jul 27. doi: 10.1097/PCC.0000000000003040. Online ahead of print.
Calcium Administration During Cardiopulmonary Resuscitation for In-Hospital Cardiac Arrest in Children With Heart Disease Is Associated With Worse Survival-A Report From the American Heart Association's Get With The Guidelines-Resuscitation (GTWT-R) Registry.
Dhillon GS(1)(2), Kleinman ME(2), Staffa SJ(2), Teele SA(3), Thiagarajan RR(3); American Heart Association’s Get With The Guidelines - Resuscitation (GTWT-R) Investigators.
ABSTRACT
OBJECTIVES: IV calcium administration during cardiopulmonary resuscitation (CPR) for pediatric in-hospital cardiac arrest (IHCA) is associated with worse survival. We evaluated survival to hospital discharge in children with heart disease (HD), where calcium is more frequently administered during CPR. DESIGN: Retrospective study of a multicenter registry database. SETTING: Data reported to the

American Heart Association's (AHA) Get With The Guidelines-Resuscitation registry. PATIENTS: Children younger than 18 years with HD experiencing an index IHCA event requiring CPR between January 2000 and January 2019. Using propensity score matching (PSM), we selected matched cohorts of children receiving and not receiving IV calcium during CPR and compared the primary outcome of survival to hospital discharge. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: We included 4,556 children with HD experiencing IHCA. Calcium was administered in 1,986 (44%), more frequently in children younger than 1 year old (65% vs 35%; $p < 0.001$) and surgical cardiac (SC) compared with medical cardiac patients (51% vs 36%; $p < 0.001$). Calcium administration during CPR was associated with longer duration CPR (median 27 min [interquartile range (IQR): 10-50 min] vs 5 min [IQR, 2-16 min]; $p < 0.001$) and more frequent extracorporeal-CPR deployment (25% vs 8%; $p < 0.001$). In the PSM cohort, those receiving calcium had decreased survival to hospital discharge (39% vs 46%; $p = 0.02$) compared with those not receiving calcium. In a subgroup analysis, decreased discharge survival was only seen in SC cohorts. CONCLUSIONS: Calcium administration during CPR for children with HD experiencing IHCA is common and is associated with worse survival. Administration of calcium during CPR in children with HD should be restricted to specific indications as recommended by the AHA CPR guidelines.

5. PLoS One. 2022 Jul 22;17(7):e0271605. doi: 10.1371/journal.pone.0271605. eCollection 2022.
The association of different target temperatures in targeted temperature management with neurological outcome after out-of-hospital cardiac arrest based on a prospective multicenter observational study in Korea (the KORHN-PRO registry): IPTW analysis.
Kim HJ(1), Youn CS(1), Park KN(1), Kim YM(1), Lee BK(2), Jeung KW(2), Kim WY(3), Choi SP(4), Kim SH(4); Korean Hypothermia Network Investigator.
ABSTRACT
BACKGROUND: Among comatose survivors of out-of-hospital cardiac arrest (OHCA), targeted temperature management (TTM) has improved neurological outcomes. However, although the target temperature shifted from 33°C to 33°C~36°C, the optimal target temperature is still unclear. The goal of this study was to evaluate neurological outcomes at 6 months at target temperatures of 33°C and 36°C. MATERIALS AND METHODS: We analyzed OHCA survivors who underwent TTM and were recorded in the Korean Hypothermia Network, a prospective multicenter registry, from October 2015 to December 2018. The primary outcome was good neurological outcome at six months, defined as a cerebral performance category of 1-2, and the secondary outcome was survival at 6 months. RESULTS: A total of 1339 patients were treated with TTM in twenty-two emergency departments. Of those, 1054 were treated at 33°C, and 285 were treated at 36°C. There was no significant difference in good neurological outcomes at 6 months (30.6% vs. 31.2%, $p = 0.850$, adjusted OR 0.97, 95% CI = 0.73-1.29]) and survival at six months (41.4% vs. 38.7%, $p = 0.401$, adjusted HR 1.08, 95% CI = 0.91-1.28]) between TTM 33°C and TTM 36°C. After propensity score matching, good neurological outcomes at 6 months (OR 0.93, 95% CI = 0.74-1.18) and survival at 6 months (HR 1.05, 95% CI = 0.92-1.21) were still not associated with TTM 33°C and TTM 36°C. CONCLUSION: In this study, patients treated with a target temperature of 33°C had similar good neurological outcomes and survival at six months compared with those treated with a target temperature of 36°C.

6. Crit Care. 2022 Jul 26;26(1):226. doi: 10.1186/s13054-022-04102-0.
Optimizing PO(2) during peripheral veno-arterial ECMO: a narrative review.
Winiszewski H(1)(2), Guinot PG(3), Schmidt M(4), Besch G(5)(6), Piton G(7)(6), Perrotti A(8)(6), Lorusso R(9), Kimmoun A(10), Capellier G(7)(11)(6).
ABSTRACT

During refractory cardiogenic shock and cardiac arrest, veno-arterial extracorporeal membrane oxygenation (VA-ECMO) is used to restore a circulatory output. However, it also impacts significantly arterial oxygenation. Recent guidelines of the Extracorporeal Life Support Organization (ELSO) recommend targeting postoxygenator partial pressure of oxygen (PPOSTO2) around 150 mmHg. In this narrative review, we intend to summarize the rationale and evidence for this PPOSTO2 target recommendation. Because this is the most used configuration, we focus on peripheral VA-ECMO. To date, clinicians do not know how to set the sweep gas oxygen fraction (FSO2). Because of the oxygenator's performance, arterial hyperoxemia is common during VA-ECMO support. Interpretation of oxygenation is complex in this setting because of the dual circulation phenomenon, depending on both the native cardiac output and the VA-ECMO blood flow. Such dual circulation results in dual oxygenation, with heterogeneous oxygen partial pressure (PO2) along the aorta, and heterogeneous oxygenation between organs, depending on the mixing zone location. Data regarding oxygenation during VA-ECMO are scarce, but several observational studies have reported an association between hyperoxemia and mortality, especially after refractory cardiac arrest. While hyperoxemia should be avoided, there are also more and more studies in non-ECMO patients suggesting the harm of a too restrictive oxygenation strategy. Finally, setting FSO2 to target strict normoxemia is challenging because continuous monitoring of postoxygenator oxygen saturation is not widely available. The threshold of PPOSTO2 around 150 mmHg is supported by limited evidence but aims at respecting a safe margin, avoiding both hypoxemia and severe hyperoxemia.

IN-HOSPITAL CARDIAC ARREST

1. Resuscitation. 2022 Aug;177:78-84. doi: 10.1016/j.resuscitation.2022.05.006. Epub 2022 May 14.
Acute respiratory distress syndrome after in-hospital cardiac arrest.
Shih JA(1), Robertson HK(2), Issa MS(3), Grossestreuer AV(3), Donnino MW(4), Berg KM(5), Moskowitz A(6).

ABSTRACT

OBJECTIVE: Acute respiratory distress syndrome (ARDS) after out-of-hospital cardiac arrest is common and associated with worse outcomes. In the hospital setting, there are many potential risk factors for post-arrest ARDS, such as aspiration, sepsis, and shock. ARDS after in-hospital cardiac arrest (IHCA) has not been characterized. METHODS: We performed a single-center retrospective study of adult patients admitted to the hospital between 2014-2018 who suffered an IHCA, achieved return of spontaneous circulation (ROSC), and were either already intubated at the time of arrest or within 2 hours of ROSC. Post-IHCA ARDS was defined as meeting the Berlin criteria in the first 3 days following ROSC. Outcomes included alive-and-ventilator free days across 28 days, hospital length-of-stay, hospital mortality, and hospital disposition. RESULTS: Of 203 patients included, 146 (71.9%) developed ARDS. In unadjusted analysis, patients with ARDS had fewer alive-and-ventilator-free days over 28 days with a median of 1 (IQR: 0, 21) day, compared to 18 (IQR: 0, 25) days in patients without ARDS (p = 0.03). However, this association was not significant after multivariate adjustment. There was also a non-significant longer hospital length-of-stay (15 [IQR: 7, 26] vs 10 [IQR: 7, 22] days, p = 0.25; median adjusted increase in ARDS patients: 3 [95% CI: -2 to 8] days, p = 0.27) and higher hospital mortality (53% vs 44%, p = 0.26; aOR 1.6 [95% CI: 0.8-2.9], p = 0.17) in the ARDS group. CONCLUSION: Among IHCA patients, almost three-quarters developed ARDS within 3 days of ROSC. As in out of hospital cardiac arrest, post-IHCA ARDS is common.

2. Resuscitation. 2022 Jul 21;178:69-77. doi: 10.1016/j.resuscitation.2022.07.022. Online ahead of print.
Impact of trained intensivist coverage on survival outcomes after in-hospital cardiopulmonary resuscitation: A nationwide cohort study in South Korea.

Oh TK(1), Cho M(2), Song IA(3).

ABSTRACT

AIM: We aimed to investigate whether trained intensivist coverage affects survival outcomes following in-hospital cardiopulmonary resuscitation (ICPR) for in-hospital cardiac arrest (IHCA). METHODS: All adult patients who received ICPR for IHCA between January 1, 2016 and December 31, 2019 in South Korea were included. Patients who received ICPR in hospitals with trained intensivist coverage for ICU staffing were defined as the intensivist group, whereas other patients were considered the non-intensivist group. RESULTS: In total 68,286 adult patients (36,025 [52.8%] in the intensivist group and 32,261 [47.2%] in the non-intensivist group) were included in the analysis. After propensity score (PS) matching 40,988 patients (20,494 in each group) were included. In logistic regression after PS matching, the intensivist group showed a 17% (odds ratio: 1.17; 95% confidence interval [CI]: 1.12-1.22; P < 0.001) higher live discharge rate after ICPR than the non-intensivist group. In Cox regression after PS matching, the 6-month and the 1-year mortality rates in the intensivist group after ICPR were 11% (hazard ratio [HR]: 0.89; 95% CI: 0.87-0.91; P < 0.001) and 10% (HR: 0.90; 95% CI: 0.88-0.92; P < 0.001) lower than those in the non-intensivist group, respectively. In Kaplan-Meir estimation the median survival time after ICPR in the intensivist group was 12.0 days (95% CI: 11.6-12.4) while that in the non-intensivist group was 8.0 days (95% CI: 7.7-8.3). CONCLUSIONS: Trained intensivist coverage in the ICU was associated with improvements in both short and long-term survival outcomes after ICPR for IHCA.

3. Resuscitation. 2022 Jul 14:S0300-9572(22)00604-9. doi: 10.1016/j.resuscitation.2022.07.013. Online ahead of print.

Is frailty associated with long-term survival, neurological function and patient-reported outcomes after in-hospital cardiac arrest? - A Swedish cohort study.

Jonsson H(1), Piscator E(2), Israelsson J(3), Lilja G(4), Djärv T(5).

ABSTRACT

BACKGROUND: Frailty is associated with poor 30-days survival after in-hospital cardiac arrests (IHCA). The aim was to assess how pre-arrest frailty was associated with long-term survival, neurological function and patient-reported outcomes in elderly survivors after IHCA. METHODS: Patients aged ≥65 years with IHCA at Karolinska University Hospital between 2013-2021 were studied. Frailty was assessed by the Clinical Frailty Scale (CFS) based on clinical records and categorised into non-frail (1-4) or frail (5-7). Survival was assessed in days. Neurological function was assessed by the Cerebral Performance Category scale (CPC). A telephone interview was performed six months post-IHCA and included the questionnaires EuroQoL-5 Dimensions-5 Levels and Hospital Anxiety and Depression Scale. RESULTS: Totally, 232 (28%) out of 817 eligible patients survived to 30-days. Out of 232, 65 (28%) were frail. Long-term survival was better for non-frail than frail patients (6months (92% versus 75%, p-value <0.01), 3 years (74% vs 22%, p-value <0.01)). The vast majority of both non-frail and frail patients had unchanged CPC from admittance to discharge from hospital (87% and 85%, respectively). The 121 non-frail patients reported better health compared to 27 frail patients (EQ-VAS median 70 versus 50 points, p-value <0.01) and less symptoms of depression than frail (16% and 52%, respectively, p-value <0.01). CONCLUSION: Frail patients suffering IHCA survived with largely unchanged neurological function. Although one in five frail patients survived to three years, frailty was associated with a marked decrease in long-term survival as well as increased symptoms of depression and poorer general health.

4. Anesth Analg. 2022 Jul 25. doi: 10.1213/ANE.0000000000006132. Online ahead of print.

Factors Associated With In-Hospital Post-Cardiac Arrest Survival in a Referral Level Hospital in Uganda.

Alum RA(1), Kiwanuka JK(1), Nakku D(2), Kakande ER(3), Nyaiteera V(2), Ttendo SS(1).

ABSTRACT

BACKGROUND: Cardiac arrest (CA) is still associated with high mortality and morbidity across all practice settings despite resuscitation attempts and advancements in its management. Patient outcomes vary and are affected by multiple factors. Nonetheless, there is a paucity of information on survival after CA and associated factors in low-resource settings such as East Africa where Uganda is located. This study set out to describe post-CA survival, associated factors, and neurological outcome at a hospital in Southwestern Uganda. METHODS: This was a descriptive study in which we followed up with resuscitated CA patients from any of the selected hospital locations at Mbarara Regional Referral Hospital in Southwestern Uganda. We included all patients who were resuscitated after an index CA in the operating room (OR), intensive care unit (ICU), the pediatric ward, or accident and emergency (A&E) wards. Details of resuscitation were obtained from resuscitation team leader interviews and patient medical records. We followed up with patients with return of spontaneous circulation (ROSC) for up to 7 days after CA when neurological outcomes were measured using the age-appropriate Cerebral Performance Category (CPC) score. Factors affecting survival were then determined. RESULTS: A total of 74 participants were enrolled over 8 months. Seven-day survival was 14.86%. Eight of the 11 survivors had a CPC score of 1 seven days after CA. Admission with trauma was associated with increased mortality with an adjusted hazard ratio (HR) of 4.06; 95% confidence interval (CI), 1.19-13.82. Compared to the A&E ward, HR for index CA in OR, ICU, and pediatric ward was 0.15; 95% CI, 0.05-0.45; 0.67; 95% CI, 0.32-1.40, and 0.65; 95% CI, 0.25-1.69, respectively. Compared to cardiopulmonary resuscitation (CPR) <10 minutes, the HR for CPR duration between 10 and 20 minutes was 2.26; 95% CI, 0.78-3.24 and for >20 minutes was 2.26; 95% CI, 1.12-4.56. Prevention of hypotension after ROSC was associated with decreased mortality with an HR of 0.23; 95% CI, 0.08-0.58. CONCLUSIONS: Whereas 7-day survival of resuscitated CA patients at Mbarara Regional Referral Hospital (MRRH) was low, survivors had a good neurologic outcome. CA in the OR, CPR <20 minutes, and prevention of hypotension postarrest seemed to be associated with survival.

5. Resuscitation. 2022 Jul 26:S0300-9572(22)00617-7. doi: 10.1016/j.resuscitation.2022.07.026. Online ahead of print.

Continuous Heart Rate Dynamics Preceding In-Hospital Pulseless Electrical Activity or Asystolic Cardiac Arrest of Respiratory Etiology.

Shan R(1), Yang J(2), Kuo A(3), Lee R(4), Hu X(5), Boyle N(1), Do DH(6).

ABSTRACT

INTRODUCTION: Respiratory failure is a common cause of pulseless electrical activity (PEA) and asystolic cardiac arrest, but the changes in heart rate (HR) pre-arrest is not well described. We describe HR dynamics prior to in-hospital cardiac arrest (IHCA) among PEA/asystole arrest patients with respiratory etiology. METHODS: In this retrospective study, we evaluated 139 patients with 3-24 hours of continuous electrocardiogram data recorded preceding PEA/asystole IHCA from 2010-2017. We identified respiratory failure cases by chart review and evaluated electrocardiogram data to identify patterns of HR changes, sinus bradycardia or sinus arrest, escape rhythms, and development right ventricular strain prior to IHCA. RESULTS: A higher proportion of respiratory cases (58/73, 79%) fit a model of HR response characterized by tachycardia followed by rapid HR decrease prior to arrest, compared to non-respiratory cases (30/66, 45%, p<0.001). Among the 58 respiratory cases fitting this model, 36 (62%) had abrupt increase in HR occurring 64 (IQR 23-191) minutes prior to arrest, while 22 (38%) had stable tachycardia until time of HR decrease. Mean peak HR was 123±21 bpm. HR decrease occurred 3.0 (IQR 2.0-7.0) minutes prior to arrest. Sinus arrest occurred during the bradycardic phase in 42/58 of cases; escape rhythms were present in all but 2/42 (5%) cases. Right ventricular strain ECG pattern, when present, occurred at a median of 2.2 (IQR -0.05-17) minutes prior to onset of HR decrease. CONCLUSION: IHCAs of respiratory etiology follow a model of HR increase from physiologic compensation to hypoxia, followed by rapid HR decrease prior to arrest.

INJURIES AND CPR

1. Ann Intensive Care. 2022 Jul 18;12(1):69. doi: 10.1186/s13613-022-01045-1.

Impact of early mean arterial pressure level on severe acute kidney injury occurrence after out-of-hospital cardiac arrest.

Dupont V(1)(2), Bonnet-Lebrun AS(3), Boileve A(4), Charpentier J(5), Mira JP(5)(6), Geri G(7)(8)(9), Cariou A(5)(6)(10)(11)(12), Jozwiak M(13)(14).

ABSTRACT

BACKGROUND: The optimal early mean arterial pressure (MAP) level in terms of renal function remains to be established in patients with out-of-hospital cardiac arrest (OHCA). We aimed to evaluate the association between early MAP level and severe acute kidney injury (AKI) occurrence in patients with OHCA. RESULTS: In 568 consecutive patients, the percentage time spent below a predefined MAP threshold and the corresponding area below threshold (ABT) were calculated from continuous MAP measurement. Both MAP-derived variables were calculated for different MAP thresholds (65, 75 and 85 mmHg) and time periods (the first 6 and 12 after ICU admission). 274 (48%) patients developed severe AKI defined as stage 3 of KDIGO. Both ABT and percentage time were independently associated with severe AKI, regardless of the MAP threshold and time period considered. Highest adjusted odds ratios for developing severe AKI were observed while considering the first 6 h period. Within the first 6 h, every 100 mmHg-h increase in ABT under MAP thresholds of 65, 75 and 85 mmHg increased severe AKI risk by 69% (OR = 1.69; 95% CI 1.26-2.26; $p < 0.01$), 13% (OR = 1.13; 95% CI 1.07-1.20; $p < 0.01$) and 4% (OR = 1.04; 95% CI 1.02-1.06; $p < 0.01$), respectively. Every 10% increase in percentage time spent under MAP thresholds of 65, 75 and 85 mmHg increased severe AKI risk by 19% (OR = 1.19; 95% CI 1.06-1.33; $p < 0.01$), 12% (OR = 1.12; 95% CI 1.04-1.19; $p < 0.01$) and 8% (OR = 1.08; 95% CI 1.02-1.14; $p < 0.01$), respectively. CONCLUSIONS: Both severity and duration of early arterial hypotension after ICU admission remained associated with severe AKI occurrence while considering a MAP threshold as high as 85 mmHg after OHCA.

CAUSE OF THE ARREST

1. Thorac Cardiovasc Surg. 2022 Jul 19. doi: 10.1055/s-0042-1750304. Online ahead of print.

Outcomes and Characteristics of Patients with Intraprocedural Cardiopulmonary Resuscitation during TAVR.

Gerfer S(1), Kuhn EW(1), Gablac H(1), Ivanov B(1), Djordjevic I(1), Mauri V(2), Adam M(2), Mader N(1), Baldus S(2), Eghbalzadeh K(1), Wahlers TCW(1).

ABSTRACT

BACKGROUND: Transcatheter aortic valve replacement (TAVR) has become an established alternative to surgical aortic valve replacement (AVR) for higher risk patients. Periprocedural TAVR complications decreased with a growing expertise of implanters. Yet, TAVR can be accompanied by life-threatening adverse events such as intraprocedural cardiopulmonary resuscitation (CPR). This study retrospectively analyzed predictors and outcomes in a cohort of patients from a high-volume center undergoing periprocedural CPR during TAVR. METHODS: A total of 729 patients undergoing TAVR, including 59 with intraprocedural CPR, were analyzed with respect to peri- and postprocedural outcomes. RESULTS: Patients undergoing CPR showed a significantly lower left ventricular ejection fraction (LVEF) and lower baseline transvalvular mean and peak pressure gradients. The systolic blood pressure measured directly preoperatively was significantly lower in the CPR cohort. CPR patients were in a higher need for intraprocedural defibrillation, heart-lung circulatory support, and conversion to open heart surgery. Further, they showed a higher incidence

of atrioventricular block grade III , valve malpositioning, and pericardial tamponade. The in-hospital mortality was significantly higher after intraprocedural CPR, accompanied by a higher incidence of disabling stroke, new pacemaker implantation, more red blood cell transfusion, and longer stay in intensive care unit. CONCLUSION: Impaired preoperative LVEF and instable hemodynamics before valve deployment are independent risk factors for CPR and are associated with compromised outcomes. Heart rhythm disturbances, malpositioning of the prosthesis, and pericardial tamponade are main causes of the high mortality of 17% reported in the CPR group. Nevertheless, mechanical circulatory support and conversion to open heart surgery reduce mortality rates of CPR patients.

2. Sci Rep. 2022 Jul 19;12(1):12307. doi: 10.1038/s41598-022-16543-2.

Hypertension and diabetes including their earlier stage are associated with increased risk of sudden cardiac arrest.

Kim YG(#)(1), Roh SY(#)(2), Han KD(3), Jeong JH(1), Choi YY(1), Min K(1), Shim J(1), Choi JI(4), Kim YH(1).

ABSTRACT

Sudden cardiac arrest (SCA) is a medical disaster for both the victim and the society. Despite intrinsic limitations in the management of SCA, primary prevention has been overlooked and risk factors for SCA are not fully understood. We aimed to evaluate whether hypertension and diabetes mellitus (DM), including pre-hypertension and impaired fasting glucose (IFG), are associated with increased risk of SCA. We performed a nationwide population-based analysis using the Korean National Health Insurance Service. People who underwent a national health check-up in 2009 were enrolled. The risk of SCA was evaluated in people with hypertension and DM with a clinical follow-up through December 2018. A total of 4,056,423 people with 33,345,378 person-years of follow-up and 16,352 SCA events were examined. People with hypertension had 65.4% increased risk of SCA (adjusted hazard ratio [HR] = 1.654 [1.572-1.739]; $p < 0.001$). Pre-hypertension was also associated with 21.3% increased risk of SCA (adjusted HR = 1.213 [1.158-1.272]; $p < 0.001$). People who had IFG and DM showed 7.5% (adjusted HR = 1.075 [1.035-1.117]; $p < 0.001$) and 80.1% (adjusted HR = 1.801 [1.731-1.875]; $p < 0.001$) increased risk of SCA, respectively. People with DM who took anti-diabetic medication showed significantly lower risk of SCA compared with uncontrolled DM patients (fasting glucose ≥ 200 mg/dL) (adjusted HR = 0.625 [0.533-0.733]; $p < 0.001$). Coexistence of hypertension and DM was associated with an even higher risk of SCA (adjusted HR = 3.078 [2.877-3.293]; $p < 0.001$). In conclusion, the risk of SCA is significantly higher in people with hypertension and DM, including pre-hypertension and IFG. Adequate control of blood pressure and serum glucose can have a profound impact for the primary prevention of SCA in the general population.

3. Eur Heart J. 2022 Jul 21;43(28):2685-2694. doi: 10.1093/eurheartj/ehac288.

A new score for life-threatening ventricular arrhythmias and sudden cardiac death in adults with transposition of the great arteries and a systemic right ventricle.

Ladouceur M(1)(2), Van De Bruaene A(3), Kauling R(4), Budts W(3), Roos-Hesselink J(4), Albert SV(5), Perez IS(5), Sarubbi B(6), Fusco F(6), Gallego P(7), Rodriguez-Puras MJ(7), Bouchardy J(8)(9), Blanche C(9), Rutz T(8), Prokselj K(10)(11), Labombarda F(12)(13), Iserin L(1)(2), Wong T(14)(15), Gatzoulis MA(14)(15).

ABSTRACT

AIMS: To investigate the incidence of major adverse ventricular arrhythmias and related events (MAREs) and to develop a stratification tool predicting MAREs in adults with a systemic right ventricle (sRV). METHODS AND RESULTS: In a multicentre approach, all adults (≥16 years old) with a sRV undergoing follow-up between 2000 and 2018 were identified. The incidence of MAREs, defined as sudden cardiac death, sustained ventricular tachycardia, and appropriate implantable

cardioverter-defibrillator (ICD) therapy, was analysed. The association of MAREs with clinical, electrical, and echocardiographic parameters was evaluated. A total of 1184 patients (median age 27.1 years; interquartile range 19.9-34.9 years; 59% male; 70% with atrial switch repair for D-transposition of the great arteries) were included. The incidence of MAREs was 6.3 per 1000 patient-years. On multivariate analysis, age, history of heart failure, syncope, QRS duration, severe sRV dysfunction and at least moderate left ventricular outflow tract obstruction were retained in the final model with a C-index of 0.78 [95% confidence interval (CI) 0.72-0.83] and a calibration slope of 0.93 (95% CI 0.64-1.21). For every five ICDs implanted in patients with a 5-year MARE risk >10%, one patient may potentially be spared from a MARE. CONCLUSION: Sudden cardiac death remains a devastating cause of death in a contemporary adult cohort with a sRV. A prediction model based on clinical, electrocardiographic, and echocardiographic parameters was devised to estimate MARE risk and to identify high-risk patients who may benefit from primary prevention ICD implantation.

4. Heart Vessels. 2022 Jul 29. doi: 10.1007/s00380-022-02145-5. Online ahead of print.
Comparison of in-hospital outcomes of acute myocardial infarction between patients with cardiogenic shock and with cardiac arrest.
Kasahara T(1), Sakakura K(2), Hori N(1), Jinnouchi H(1), Taniguchi Y(1), Tsukui T(1), Watanabe Y(1), Yamamoto K(1), Seguchi M(1), Wada H(1), Fujita H(1).
ABSTRACT
In-hospital mortality of acute myocardial infarction (AMI) complicated with cardiogenic shock (CS) remains high. Also, in-hospital mortality of AMI complicated with cardiac arrest (CA) has been reported to be highest among any AMI. However, there were few reports that compared in-hospital mortality directly between AMI complicated with CS and complicated with CA. The purpose of this study was to compare in-hospital outcomes between AMI complicated with CS and complicated with CA. We retrospectively included 195 AMI patients complicated by CS or CA, and divided those into the CA group (n = 109) and the CS group (n = 86). We also subdivided the CA group into CA with persistent CS (n = 83) and CA without persistent CS (n = 26). One-third of the study population died during the index admission. In-hospital death was more frequently observed in the CA group (45.0%) than in the CS group (20.9%) ($p < 0.001$). In-hospital mortality was highest in the CA with persistent CS group (68.7%), followed by the CS group (20.9%), and least in the CA without persistent CS group (11.5%) ($p < 0.001$). Favorable neurological function was more frequently observed in the CA without persistent CS group (76.9%) and the CS group (74.4%) than in the CA with persistent CS group (27.7%) ($p < 0.001$). In conclusion, in-hospital mortality was higher in AMI patients with CA than in those with CS. However, when we divided AMI patients with CA into those with and without persistent CS, in-hospital mortality was lowest in CA without persistent CS, followed by CS, and highest in CA with persistent CS.

5. Cureus. 2022 Jun 26;14(6):e26351. doi: 10.7759/cureus.26351. eCollection 2022 Jun.
Cardiac Arrest Induced by an Anaphylactic Reaction Associated With the First Dose of Cetuximab.
Hane A(1), Ito A(1), Ishikura K(1), Imai H(1), Okugawa Y(2).
ABSTRACT
Cetuximab is a chimeric mouse-human monoclonal antibody biologic used for the treatment of epidermal growth factor receptor-positive colorectal cancer and head and neck cancer. The incidence of severe anaphylaxis after infusion of cetuximab is a rare but fatal complication. Galactose-α-1,3-galactose (α-gal), a side-chain component in cetuximab, can cause the α-gal syndrome, an allergic cross-reaction to the α-gal contained in mammalian muscle. Here, we report a case of cardiac arrest induced by an anaphylactic reaction from cetuximab infusion. After the initial dosing of cetuximab in an outpatient setting, the patient developed sudden cardiac arrest. Flushing

of the skin and bronchoconstriction led to the diagnosis of a severe anaphylactic reaction, whereupon he was treated with repeated doses of epinephrine, steroids, and continuous epinephrine infusion. The patient responded well to initial treatment, leading to a full recovery. The patient's history and subsequent blood tests did not show any meat allergies. As an increasing number of patients receive chemotherapy as outpatients, it is important to be aware of the possibility of severe allergic reactions induced by these drugs.

6. Eur Heart J Cardiovasc Pharmacother. 2022 Jul 27:pvac043. doi: 10.1093/ehjcvp/pvac043. Online ahead of print.

Use of sodium-glucose cotransporter-2 inhibitors and the risk for sudden cardiac arrest and for all-cause death in patients with type 2 diabetes mellitus.

Eroglu TE(1)(2), Coronel R(3), Zuurbier CJ(4), Blom M(5)(6), de Boer A(1), Souverein PC(1).

ABSTRACT

AIMS: Sodium-glucose cotransporter-2 inhibitors (SGLT-2is) are antidiabetic agents that can have direct cardiac effects by impacting on cardiac ion transport mechanisms that control cardiac electrophysiology. We studied the association between SGLT-2i use and all-cause mortality and the risk of sudden cardiac arrest (SCA) in patients with type 2 diabetes. METHODS: Using data from the UK Clinical Practice Research Datalink, a cohort study among patients initiating a new antidiabetic drug class on or after January 2013 through September 2020 was conducted. Cox regression with time-dependent covariates was performed to estimate the hazard ratios (HRs) of SCA and all-cause mortality comparing SGLT-2is with other second- to third-line antidiabetic drugs. Stratified analyses were performed according to sex, diabetes duration (<5 or ≥ 5 years), and the presence of cardiovascular disease. RESULTS: A total of 152 591 patients were included. Use of SGLT-2i was associated with reduced HR of SCA when compared to other second- to third-line antidiabetic drugs after adjustment for common SCA risk factors, although this association marginally failed to reach statistical significance (HR:0.62 [95%-CI:0.38-1.01]). The HR of all-cause mortality associated with SGLT-2i use when comparing to other second-to third-line antidiabetics was 0.43 (95%-CI:0.39-0.48) and did not vary by sex, diabetes duration or the presence of cardiovascular disease. SGLT-2i use remained associated with lower all-cause mortality in patients without concomitant insulin use (HR:0.56 [95%-CI:0.50-0.63]). CONCLUSION: SGLT-2i use was associated with reduced all-cause mortality in patients with type 2 diabetes. The association between use of SGLT-2i and reduced risk of SCA was not statistically significant.

7. Heart Rhythm. 2022 Aug;19(8):1304-1305. doi: 10.1016/j.hrthm.2022.05.007. Epub 2022 May 10.

Does depolarization or repolarization play a role in sudden cardiac death in the general population?

Warming PE(1), Winkel BG(1), Tfelt-Hansen J(2).

NO ABSTRACT AVAILABLE

END-TIDAL CO_2

1. Resuscitation. 2022 Jul 15:S0300-9572(22)00606-2. doi: 10.1016/j.resuscitation.2022.07.015. Online ahead of print.

Investigating the Airway Opening Index during Cardiopulmonary Resuscitation.

Bhandari S(1), Coult J(2), Counts CR(3), Bulger NE(3), Kwok H(3), Latimer AJ(4), Sayre MR(5), Rea TD(6), Johnson NJ(7).

ABSTRACT

INTRODUCTION: Chest compressions during CPR induce oscillations in capnography (ETCO2) waveforms. Studies suggest ETCO2 oscillation characteristics are associated with intrathoracic airflow dependent on airway patency. Oscillations can be quantified by the Airway Opening Index (AOI). We sought to evaluate multiple methods of computing AOI and their association with return of spontaneous circulation (ROSC). METHODS: We conducted a retrospective study of 307 out-of-hospital cardiac arrest (OHCA) cases in Seattle, WA during 2019. ETCO2 and chest impedance waveforms were annotated for the presence of intubation and CPR. We developed four methods for computing AOI based on peak ETCO2 and the oscillations in ETCO2 during CCs (ΔETCO2). We examined the feasibility of automating ΔETCO2 and AOI calculation and evaluated differences in AOI across the methods using nonparametric testing ($p=0.05$). RESULTS: Median [interquartile range] AOI across all cases using Methods 1-4 was 28.0% [17.9-45.5%], 20.6% [13.0-36.6%], 18.3% [11.4-30.4%], and 22.4% [12.8-38.5%], respectively ($p<0.001$). Cases with ROSC had a higher median AOI than those without ROSC across all methods, though not statistically significant. Cases with ROSC had a significantly higher median [interquartile range] ΔETCO2 of 7.3 mmHg [4.5-13.6 mmHg] compared to those without ROSC (4.8 mmHg [2.6-9.1 mmHg], $p<0.001$). CONCLUSION: We calculated AOI using four proposed methods resulting in significantly different AOI. Additionally, AOI and ΔETCO2 were larger in cases achieving ROSC. Further investigation is required to characterize AOI's ability to predict OHCA outcomes, and whether this information can improve resuscitation care.

ORGAN DONATION

No articles identified.

FEEDBACK

1. Resusc Plus. 2022 Jul 9;11:100273. doi: 10.1016/j.resplu.2022.100273. eCollection 2022 Sep.
Paediatric chest compression performance improves via novel augmented-reality cardiopulmonary resuscitation feedback system: A mixed-methods pilot study in a simulation-based setting.
Jeffers JM(1), Schreurs BA(2), Dean JL(2), Scott B(2), Canares T(1), Tackett S(3), Smith B(1), Billings E(1), Billioux V(1), Sampathkumar HD(4), Kleinman K(1).

ABSTRACT

AIM: More than 20,000 children experience a cardiac arrest event each year in the United States. Most children do not survive. High-quality cardiopulmonary resuscitation (CPR) has been associated with improved outcomes yet adherence to guidelines is poor. We developed and tested an augmented reality head mounted display chest compression (CC) feedback system (AR-CPR) designed to provide real-time CC feedback and guidance. METHODS: We conducted an unblinded randomized crossover simulation-based study to determine whether AR-CPR changes a user's CC performance. A convenience sample of healthcare providers who perform CC on children were included. Subjects performed three two-minute cycles of CC during a simulated 18-minute paediatric cardiac arrest. Subjects were randomized to utilize AR-CPR in the second or third CC cycle. After, subjects participated in a qualitative portion to inquire about their experience with AR-CPR and offer criticisms and suggestions for future development. RESULTS: There were 34 subjects recruited. Sixteen subjects were randomly assigned to have AR-CPR in cycle two (Group A) and 18 subjects were randomized to have AR-CPR in cycle three (Group B). There were no differences between

groups CC performance in cycle one (baseline). In cycle two, subjects in Group A had 73% (SD 18%) perfect CC epochs compared to 17% (SD 26%) in Group B ($p < 0.001$). Overall, subjects enjoyed using AR-CPR and felt it improved their CC performance. CONCLUSION: This novel AR-CPR feedback system showed significant CC performance change closer to CC guidelines. Numerous hardware, software, and user interface improvements were made during this pilot study.

2. Hu Li Za Zhi. 2022 Aug;69(4):33-42. doi: 10.6224/JN.202208_69(4).06.
[The Effect of Using a Real-Time Feedback Device on the Quality of Cardio Pulmonary Resuscitation (CPR)]. [Article in Chinese; Abstract available in Chinese from the publisher]
Lee PH(1), Hsiao YH(2), Weng SR(3), Lin PH(4), Lin SC(5).
ABSTRACT
BACKGROUND: Cardiopulmonary resuscitation (CPR) is a standard procedure delivered to patients experiencing cardiac arrest. CPR quality is associated with the rate of survival of patients with cardiac arrest. PURPOSE: To determine the efficacy of a real-time feedback device in terms of improving CPR performance quality and CPR self-efficacy in nursing staffs. METHODS: A total of 72 nursing staffs were enrolled in this randomized trial (intervention n = 38, control n = 34). A real-time feedback device was used to monitor CPR quality and provide real-time feedback. The participants performed CPR on a manikin with (intervention) or without (control) feedback for 5 cycles (about 2 minutes). Data on participant demographic characteristics and CPR self-efficacy scores were also collected. RESULTS: The intervention group performed better in terms of the compression adequate rate ratio (76.3 vs. 52.3, $p < .001$), mean depth (52.8 mm vs. 50.6 mm, $p = .003$), adequate depth ratio (65.6 vs. 55.1, $p = .014$), quality of CPR performance score (44.1 vs. 26.1, $p < .001$), proportion of excellent CPR (60.5 vs. 26.5, $p < .001$), and CPR self-efficacy score (40.22 vs. 36.71, $p < .001$). However, no significant differences between the two groups were found in terms of proportion of complete chest decompression and chest compression fracture ($p > .05$). CONCLUSIONS: Using a real-time feedback device may not only significantly improve the quality of CPR performed on a manikin but also improve self-confidence to implement CPR correctly in practice.

3. Am J Emerg Med. 2022 Jun 26;60:34-39. doi: 10.1016/j.ajem.2022.06.045. Online ahead of print.
A Smartphone application to provide real-time cardiopulmonary resuscitation quality feedback.
Stumpf E(1), Ambati RT(2), Shekhar R(2), Staffa SJ(3), Zurakowski D(3), Sinha P(4).
ABSTRACT
BACKGROUND: Quality of cardiopulmonary resuscitation (CPR) contributes significantly to outcomes. Key determinants of CPR quality pertaining to chest compressions are compression rate, compression depth, duration of interruptions, and chest recoil. Several studies have demonstrated that real-time audiovisual feedback improves CPR quality. We hypothesize that a mobile application using sensor data from built-in accelerometers in smartphones can provide accurate chest compression quality feedback in real time. This study aims to develop and validate an application for smartphone which can provide real-time audiovisual and haptic feedback on determinants of CPR quality. METHODS: A mobile application was developed to detect the compression depth and compression rate in real time using data captured from a smartphone's intrinsic accelerometer. The mobile device was placed on an adult manikin's chest at the point of compressions. In a simulated environment, data obtained using the application was compared directly to data obtained from a validated standard CPR quality tool. RESULTS: CPR quality parameters were obtained from the application and industry standard for 60, 30s-long sessions. Bland-Altman plot analysis for compression depth showed agreement between the app measurements and standard within ±4 mm (<10% error). The interclass correlation for agreement in the measurement of compression count was 0.92 (95% CI: 0.88-0.95), indicative of very strong agreement. CONCLUSIONS: Smart device

applications using acceleration sensor data derived from smart phones can accurately provide real-time CPR quality feedback. With further development and validation, they can provide a ubiquitously available CPR feedback tool valuable for out-of-hospital arrests and in-hospital arrests in under-privileged areas.

DRUGS

1. Pediatr Crit Care Med. 2022 Jul 26. doi: 10.1097/PCC.0000000000003045. Online ahead of print.
Sodium Bicarbonate Use During Pediatric Cardiopulmonary Resuscitation: A Secondary Analysis of the ICU-RESUScitation Project Trial.
Cashen K(1), Reeder RW(2), Ahmed T(3), Bell MJ(4), Berg RA(5), Burns C(6), Carcillo JA(7), Carpenter TC(8), Dean JM(2), Diddle JW(4), Federman M(9), Fink EL(7), Frazier AH(10)(11), Friess SH(12), Graham K(5), Hall M(13), Hehir DA(5), Horvat CM(7), Huard LL(9), Maa T(13), Manga A(12), McQuillen PS(14), Morgan RW(5), Mourani PM(8), Nadkarni VM(5), Naim MY(5), Notterman D(15), Palmer CA(2), Pollack MM(4), Schneiter C(8), Sharron MP(4), Srivastava N(9), Wessel D(4), Wolfe HA(5), Yates AR(13), Zuppa AF(5), Sutton RM(5), Meert KL(3); Eunice Kennedy Shriver National Institute of Child Health and Human Development Collaborative Pediatric Critical Care Research Network (CPCCRN) and National Heart Lung and Blood Institute ICU-RESUScitation Project Investigators.

ABSTRACT
OBJECTIVES: To evaluate associations between sodium bicarbonate use and outcomes during pediatric in-hospital cardiac arrest (p-IHCA). DESIGN: Prespecified secondary analysis of a prospective, multicenter cluster randomized interventional trial. SETTING: Eighteen participating ICUs of the ICU-RESUScitation Project (NCT02837497). PATIENTS: Children less than or equal to 18 years old and greater than or equal to 37 weeks post conceptual age who received chest compressions of any duration from October 2016 to March 2021. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: Child and event characteristics, prearrest laboratory values (2-6 hr prior to p-IHCA), pre- and intraarrest hemodynamics, and outcomes were collected. In a propensity score weighted cohort, the relationships between sodium bicarbonate use and outcomes were assessed. The primary outcome was survival to hospital discharge. Secondary outcomes included return of spontaneous circulation (ROSC) and survival to hospital discharge with favorable neurologic outcome. Of 1,100 index cardiopulmonary resuscitation events, median age was 0.63 years (interquartile range, 0.19-3.81 yr); 528 (48.0%) received sodium bicarbonate; 773 (70.3%) achieved ROSC; 642 (58.4%) survived to hospital discharge; and 596 (54.2%) survived to hospital discharge with favorable neurologic outcome. Among the weighted cohort, sodium bicarbonate use was associated with lower survival to hospital discharge rate (adjusted odds ratio [aOR], 0.7; 95% CI, 0.54-0.92; p = 0.01) and lower survival to hospital discharge with favorable neurologic outcome rate (aOR, 0.69; 95% CI, 0.53-0.91; p = 0.007). Sodium bicarbonate use was not associated with ROSC (aOR, 0.91; 95% CI, 0.62-1.34; p = 0.621). CONCLUSIONS: In this propensity weighted multicenter cohort study of p-IHCA, sodium bicarbonate use was common and associated with lower rates of survival to hospital discharge.

TRAUMA

1. Am Surg. 2022 Jul 18:31348221091937. doi: 10.1177/00031348221091937. Online ahead of print.
Traumatic Cardiac Arrest in Pediatric Patients: An Analysis of the National Trauma Database 2007-2016.

Faulkner J(1), Carballo C(1), Colosimo C(2), Gratton A(1), Mentzer C(3), Yon J(1).

ABSTRACT

The purpose of this study was to identify the population of pediatric patients who arrive without signs of life and describe outcomes using a national database. Patients eighteen and younger with no signs of life were pulled from the National Trauma Database (NTDB) from the years 2007-2016. A total of N = 7503 patients were separated into two cohorts for comparison. Subset analysis was also conducted for patients undergoing a thoracotomy. Statistical analysis was performed on the collected data. Over the 9-year period most patients died in the ED or hospital (95.7%), very few patients were discharged home (1.3%), and ED thoracotomies were performed rarely (9%) with most patients dying (97%). Arrival to the trauma bay without signs of life is associated with a dismal prognosis. Clinical judgment must be carefully applied to choose the small number of patients who would benefit from an aggressive approach.

VENTILATION

1. Clin Exp Emerg Med. 2022 Jun;9(2):93-100. doi: 10.15441/ceem.21.074. Epub 2022 Jun 30.

Association of transport time interval with neurologic outcome in out-of-hospital cardiac arrest patients without return of spontaneous circulation on scene and the interaction effect according to prehospital airway management.

Jang Y(1), Kim TH(2), Lee SY(1), Ro YS(1), Hong KJ(1), Song KJ(2), Shin SD(1).

ABSTRACT

OBJECTIVE: This study analyzed the association of transport time interval (TTI) with survival rate and neurologic outcome in out-of-hospital cardiac arrest (OHCA) patients without return of spontaneous circulation (ROSC) and the interaction effect of TTI according to prehospital airway management. METHODS: A retrospective observational study based on the nationwide OHCA database from January 2013 to December 2017 was designed. Emergency medical service (EMS)-treated OHCA patients aged ≥18 years were included. TTI was categorized into four groups of quartiles (≤4, 5-7, 8-11, ≥12 minutes). The primary outcome was favorable neurologic outcome at discharge. The secondary outcome was survival to discharge from the hospital. Multivariable logistic regression was used to analyze outcomes according to TTI. A different effect of TTI according to the administration of prehospital EMS advanced airway was evaluated. RESULTS: In total, 83,470 patients were analyzed. Good neurologic recovery decreased as TTI increased (1.0% for TTI ≤4 minutes, 0.9% for TTI 5-7 minutes, 0.6% for TTI 8-11 minutes, and 0.5% for TTI ≥12 minutes; P for trend <0.05). The adjusted odds ratio of prolonged TTI (≥12 minutes) was 0.73 (95% confidence interval, 0.57-0.93; P<0.01) for good neurologic recovery. However, the negative effect of prolonged TTI on neurological outcome was insignificant when advanced airway or entotracheal intubation were performed by EMS providers (adjusted odds ratio, 1.17; 95% confidence interval, 0.42-3.29; P=0.76). CONCLUSION: EMS TTI was negatively associated with the neurologic outcome of OHCA without ROSC on scene. When advanced airway was performed on scene, TTI was insignificantly associated with the outcome.

2. Resuscitation. 2022 Aug;177:41-42. doi: 10.1016/j.resuscitation.2022.06.021. Epub 2022 Jul 3.

The importance of measuring ventilation during resuscitation.

Idris AH(1).

NO ABSTRACT AVAILABLE

CERERBRAL MONITORING

1. Neurocrit Care. 2022 Jul 28. doi: 10.1007/s12028-022-01570-8. Online ahead of print.

The SLANT Score Predicts Poor Neurologic Outcome in Comatose Survivors of Cardiac Arrest: An External Validation Using a Retrospective Cohort.

Luck TG(1), Locke K(1), Sherman BC(1), Vibbert M(2), Hefton S(2), Shah SO(3).

ABSTRACT

BACKGROUND: Hypoxic brain injury is the leading cause of death in comatose patients following resuscitation from cardiac arrest. Neurological outcome can be difficult to prognosticate following resuscitation, and goals of care discussions are often informed by multiple prognostic tools. One tool that has shown promise is the SLANT score, which encompasses five metrics including initial nonshockable rhythm, leukocyte count after targeted temperature management, total adrenaline dose during resuscitation, lack of bystander cardiopulmonary resuscitation, and time to return of spontaneous circulation. This cohort study aimed to provide an external validation of this score by using a database of comatose cardiac arrest survivors from our institution. METHODS: We retrospectively queried our database of cardiac arrest survivors, selecting for patients with coma, sustained return of spontaneous circulation, and use of targeted temperature management to have a comparable sample to the index study. We calculated SLANT scores for each patient and separated them into risk levels, both according to the original study and according to a Youden index analysis. The primary outcome was poor neurologic outcome (defined by a cerebral performance category score of 3 or greater at discharge), and the secondary outcome was in-hospital mortality. Univariable and multivariable analyses, as well as a receiver operator characteristic curve, were used to assess the SLANT score for independent predictability and diagnostic accuracy for poor outcomes. RESULTS: We demonstrate significant association between a SLANT group with increased risk and poor neurologic outcome on univariable ($p = 0.005$) and multivariable analysis (odds ratio 1.162, 95% confidence interval 1.003-1.346, $p = 0.046$). A receiver operating characteristic analysis indicates that SLANT scoring is a fair prognostic test for poor neurologic outcome (area under the curve 0.708, 95% confidence interval 0.536-0.879, $p = 0.024$). Among this cohort, the most frequent SLANT elements were initial nonshockable rhythm (84.5%) and total adrenaline dose ≥ 5 mg (63.9%). There was no significant association between SLANT score and in-hospital mortality ($p = 0.064$). CONCLUSIONS: The SLANT score may independently predict poor neurologic outcome but not in-hospital mortality. Including the SLANT score as part of a multimodal approach may improve our ability to accurately prognosticate comatose survivors of cardiac arrest.

2. PLoS One. 2022 Jul 26;17(7):e0270954. doi: 10.1371/journal.pone.0270954. eCollection 2022.

Cerebrospinal fluid features in comatose survivors of cardiac arrest: A pilot study.

Paul M(1)(2), Benghanem S(3)(4), Merceron S(1), Bellut H(1), Dumas F(4)(5)(6)(7), Henry A(8), Bruneel F(1), Bedos JP(1), Cariou A(2)(3)(4)(6)(7), Legriel S(1)(2)(9).

ABSTRACT

INTRODUCTION: Lumbar puncture is among the investigations used to identify various neurological conditions, including some that can cause cardiac arrest (CA). However, CA per se may alter cerebrospinal fluid (CSF) characteristics. Few studies have investigated CSF findings after CA. In this descriptive work, we assessed the frequency and risk factors of abnormal CSF findings after CA and the contribution of CSF analysis to the etiological diagnosis. MATERIALS AND METHODS: We retrospectively studied data from prospectively established databases of consecutive patients who were admitted to two French ICUs in 2007-2016 with sustained return of spontaneous circulation (ROSC) after CA and who underwent lumbar puncture as an etiological investigation. RESULTS: Of 1984 patients with sustained ROSC, 55 (2.7%) underwent lumbar puncture and were included. Lumbar puncture identified a neurological cause of CA in 2/55 (3.6%) patients. Nonspecific CSF abnormalities were noted in 37/53 (69.8%) patients. By multivariate analysis, postresuscitation shock was positively associated with CSF abnormalities (OR, 6.92; 95% confidence interval [95%CI],

1.62-37.26; P = 0.013). A no-flow time above 6 minutes (OR, 0.19; 95%CI, 0.03-1.11; P = 0.076) and a respiratory cause of CA (OR, 2.91; 95%CI, 0.53-23.15; P = 0.24) were not statistically associated with CSF abnormalities. Nonspecific CSF abnormalities were not significantly associated with poor outcomes (Cerebral Performance Category ≥3; P = 0.06). CONCLUSIONS: Lumbar puncture, although infrequently performed, may contribute to the etiological diagnosis of CA, albeit rarely. Nonspecific CSF abnormalities seem common after CA, notably with postresuscitation shock, and may be related to blood-brain barrier disruption. These findings may help to interpret CSF findings after CA. Further studies are warranted to assess our results.

ULTRASOUND AND CPR

No articles identified.

ORGANISATION AND TRAINING

1. Rev Lat Am Enfermagem. 2022 Jul 15;30:e3601. doi: 10.1590/1518-8345.5623.3601. eCollection 2022.

Cardiopulmonary resuscitation for lay people: Evaluation of videos from the perspective of digital health literacy.

Vilela SR(1)(2), Leão-Cordeiro JAB(1), Moraes KL(3), Suzuki K(1), Brasil VV(1), Silva AMTC(4).

ABSTRACT

OBJECTIVE: to analyze the quality indicators and technical content of the videos for lay people posted on the YouTube platform, on cardiopulmonary resuscitation in adults and their audiovisual production regarding the principles of digital health literacy. METHOD: a descriptive and exploratory study, which selected videos recorded between December 2015 and April 2021. They were analyzed by indicators of the production of audiovisual material, considering the American Heart Association guidelines and the principles of digital health literacy. Descriptive and inferential statistics were performed. RESULTS: of the 121 videos analyzed, 26 did not comply with any indicator on cardiopulmonary resuscitation, four reached 81% compliance, eight videos reached 79%, nine reached 69% and 74 videos, from 6% to 63%. According to the principles of digital health literacy, one video met 85% of the indicators, 81 met from 50% to 80% and 39, from 10% to 49%. A positive correlation was identified between literacy and cardiopulmonary resuscitation. CONCLUSION: no video presented 100% compliance with the American Heart Association guidelines. The absence of mechanisms for supervision and control over health-related contents allows for the posting of mistaken videos, which have been used as a learning method by people and can thus miss their greatest goal: save lives.

2. J Educ Health Promot. 2022 Jun 11;11:165. doi: 10.4103/jehp.jehp_1011_21. eCollection 2022.

High school basic life support training: Is the trainer's experience of cardiopulmonary resuscitation in the actual setting important? A randomized control trial.

Sanati A(1), Jaberi AA(2), Bonabi TN(3).

ABSTRACT

BACKGROUND: Although basic life support (BLS) has been taught in school by a variety of professionals, it is still unclear that, whether the instructor's previous cardiopulmonary resuscitation (CPR) experience is an important factor. This study aimed to compare the effect of BLS training, based on trainer experience in actual situations, on knowledge and skills of secondary high school students. MATERIALS AND METHODS: In this randomized controlled trial, 150 high school students were selected based on the inclusion criteria and then assigned into two groups, (76 in Group A),

and (74 in Group B) randomly. Both groups were trained according to adult BLS: 2020 American Heart Association guidelines on mannequins in three 60 min in-person training sessions. The knowledge and skill scores were measured for both groups before, immediately, and 1 month after intervention by a questionnaire. Data were analyzed by the SPSS software version 22, using Chi-square, Mann-Whitney U, repeated-measure ANOVA tests, and statistically modeling at a significance level of 0.05. RESULTS: There were no significant differences between groups regarding demographic characteristics. The knowledge and skill scores in both groups increased significantly compared to baseline immediately and 1 month after the intervention (P = 0.001). However, there was no significant difference in knowledge scores between groups (P = 0.076(. However, at the immediacy and 1 month after the intervention, the skill score in "Group A" was significantly higher than the "Group B" (P = 0.001). CONCLUSIONS: The trainer's experience of CPR in the actual setting in the transfer of BLS knowledge is not important, but it improved Student's BSL skill acquisition score.

3. Clin Exp Emerg Med. 2022 Jun;9(2):162-163. doi: 10.15441/ceem.21.023.e1. Epub 2022 Jun 30.
Erratum to "2020 Korean Guidelines for Cardiopulmonary Resuscitation. Part 4. Adult advanced life support".
Oh J(1), Cha KC(2), Lee JH(3), Park S(4), Kim DH(5), Lee BK(6), Park JS(7), Chung SP(8), Kim YM(9), Park JD(9), Kim HS(10), Lee MJ(11), Na SH(12), Cho GC(13), Kim AE(14), Hwang SO(2).
NO ABSTRACT AVAILABLE

4. Resuscitation. 2022 Jul 20:S0300-9572(22)00612-8. doi: 10.1016/j.resuscitation.2022.07.021. Online ahead of print.
Evaluation of Telephone-Assisted Cardiopulmonary Resuscitation Recommendations for Out-Of-Hospital Cardiac Arrest.
Guerrero A(1), Blewer AL(2), Joiner AP(3), Sh Leong B(4), Shahidah N(5), Pin Pek P(6), Yng Ng Y(7), Arulanandam S(8), Østbye T(9), Gordee A(10), Kuchibhatla M(10), Eh Ong M(11).
ABSTRACT
AIM OF THE STUDY: While out-of-hospital cardiac arrest (OHCA) is associated with poor survival, early bystander CPR (B-CPR) and telephone CPR (T-CPR) improves survival from OHCA. American Heart Association (AHA) Scientific Statements outline recommendations for T-CPR. We assessed these recommendations and hypothesized that meeting performance standards is associated with increased likelihood of survival. Additional variables were analyzed to identify future performance measurements. METHODS: We conducted a retrospective cohort study of non-traumatic, adult, OHCA using the Singapore Pan-Asian Resuscitation Outcomes Study. The primary outcome was likelihood of survival; secondary outcomes were pre-hospital Return of Spontaneous Circulation (ROSC) and B-CPR. RESULTS: From 2012-2016, 2,574 arrests met inclusion criteria. Mean age was 68±15; of 2,574, 1,125 (44%) received T-CPR with 5% (135/2574) survival. T-CPR cases that met the Lerner et al. performance metrics analyzed, demonstrated no statistically significant association with survival. Cases which met the Kurz et al. criteria, "Time for Dispatch to Recognize Need for CPR" and "Time to First Compression," had adjusted odds ratios of survival of 1.01 (95% CI:1.00, 1.02; p=<0.01) and 0.99 (95% CI:0.99, 0.99; p=<0.01), respectively. Identified barriers to CPR decreased the odds of T-CPR and B-CPR being performed. Patients with prehospital ROSC had higher odds of B-CPR being performed. EMS response time < 8 minutes was associated with increased survival among patients receiving T-CPR. CONCLUSION: AHA scientific statements on T-CPR programs serve as ideal starting points for increasing the quality of T-CPR systems and patient outcomes. More work is needed to identify other system performance measures.

5. Resusc Plus. 2022 Jul 16;11:100274. doi: 10.1016/j.resplu.2022.100274. eCollection 2022 Sep.
Neighborhood-level out-of-hospital cardiac arrest risk and the impact of local CPR interventions.
Cash RE(1), Nassal M(2), Keseg D(2)(3), Panchal AR(2)(4)(5).
ABSTRACT
INTRODUCTION: It is unclear how best to identify "high-risk" areas for out-of-hospital cardiac arrest (OHCA) and if neighborhood-level interventions improve bystander cardiopulmonary resuscitation (BCPR). Our objectives were to 1) identify and compare community characteristics between high and low-risk neighborhoods; and 2) examine change in BCPR after a targeted hands-only CPR intervention. METHODS: This was a cross-sectional analysis of OHCA events in Franklin County, Ohio between 1/1/2010-12/31/2017. Adult (≥18 years) OHCAs in a non-healthcare setting with emergency medical services resuscitation attempted were included. High-risk neighborhoods based on OHCA incidence and BCPR rates were identified using global Empirical Bayes, Local Moran's I, and spatial scan statistic. We compared characteristics of high and low-risk neighborhoods and examined change in BCPR. RESULTS: From the 3,841 included OHCAs, the mean adjusted OHCA incidence per census tract was 0.81 per 1,000, BCPR rate was 37.2%, and survival to hospital discharge was 11.5%. Of the 35 census tracts identified as high-risk, ten persisted from previous work. OHCA incidence was higher in high-risk neighborhoods (1.30 per 1,000 vs. 0.73, $p < 0.001$) and BCPR rates were lower (30.2% vs. 38.5%, $p < 0.001$). There were significant differences in characteristics between high and low-risk neighborhoods (e.g., Black population: 45.3% vs. 25.7%, $p < 0.001$). The neighborhoods targeted for the community education intervention had similar pre- and post-intervention BCPR rates. CONCLUSIONS: Demographic and socioeconomic characteristics differed between high- and low-risk neighborhoods. BCPR rates were lower in high-risk neighborhoods despite a targeted BCPR intervention. Educational interventions may be necessary, but not sufficient, to improve OHCA outcomes.

6. Arch Orthop Trauma Surg. 2022 Aug;142(8):1769-1773. doi: 10.1007/s00402-021-03806-2. Epub 2021 Feb 14.
Pre-operative resuscitation discussion with patients undergoing fractured neck of femur repair: a service evaluation and discussion of current standards.
Heylen J(1), Kemp O(2), Macdonald NJ(3), Mohamedfaris K(3), Scarborough A(4), Vats A(3).
ABSTRACT
INTRODUCTION: The majority of neck of femur (NOF) fracture patients are frail and at a higher risk of cardiac arrest. This makes discussion of treatment escalation vital to informed care. The optimal time for these discussions is prior to admission or trauma. However, when this has not occurred, it is vital that these discussions happen early in the patient's admission when family is often present and before further deterioration in their condition. We undertook a service evaluation to evaluate and discuss the effect of clinician education on improving rates of timely discussion amongst orthopaedic doctors. MATERIALS AND METHODS: The first cycle included 94 patients. Their notes were reviewed for presence of a ReSPECT (Recommend Summary Plan for Emergency Care and Treatment) form prior to operation and whether this it countersigned by a consultant. Following this, clinician education was undertaken and a re-audit was carried out involving 57 patients. RESULTS: ReSPECT form completion rates rose from 23% in cycle 1-32% in cycle 2 following intervention. The proportion which consultants signed rose from 41% to 56% following intervention. CONCLUSION: This project demonstrates how a basic education program can prove limited improvements in the rates of timely resuscitation discussions. We discuss a current lack in quality research into educational programs for discussion of treatment escalation for orthopaedic trainees. We suggest there is room to improve national best practice guidelines and training to ensure these discussions are carried out more frequently and to a better standard.

7. J Clin Med. 2022 Jul 21;11(14):4248. doi: 10.3390/jcm11144248.

Disparities in Survival Outcomes of Out-of-Hospital Cardiac Arrest Patients between Urban and Rural Areas and the Identification of Modifiable Factors in an Area of South Korea.

Park SY(1), Lim D(2), Kim SC(3), Ryu JH(4), Kim YH(5), Choi B(6), Kim SH(6).

ABSTRACT

This retrospective study aimed to compare the survival outcomes of adult out-of-hospital cardiac arrest (OHCA) patients between urban (Busan, Ulsan, Changwon) and rural (Gyeongnam) areas in South Korea and identify modifiable factors in the chain of survival. The primary and secondary outcomes were survival to discharge and modifiable factors in the chain of survival were identified using logistic regression analysis. In total, 1954 patients were analyzed. The survival to discharge rates in the whole region and in urban and rural areas were 6.9%, 8.7% (Busan 8.7%, Ulsan 10.3%, Changwon 7.2%), and 3.4%, respectively. In the urban group, modifiable factors associated with survival to discharge were no advanced airway management (adjusted odds ratio (aOR) 2.065, 95% confidence interval (CI): 1.138-3.747), no mechanical chest compression (aOR 3.932, 95% CI: 2.015-7.674), and an emergency medical service (EMS) transport time of more than 8 min (aOR 3.521, 95% CI: 2.075-5.975). In the rural group, modifiable factors included an EMS scene time of more than 15 min (aOR 0.076, 95% CI: 0.006-0.883) and an EMS transport time of more than 8 min (aOR 4.741, 95% CI: 1.035-21.706). To improve survival outcomes, dedicated resources and attention to EMS practices and transport time in urban areas and EMS scene and transport times in rural areas are needed.

8. Int J Environ Res Public Health. 2022 Jul 7;19(14):8334. doi: 10.3390/ijerph19148334.

Factors Influencing Self-Confidence and Willingness to Perform Cardiopulmonary Resuscitation among Working Adults-A Quasi-Experimental Study in a Training Environment.

Jaskiewicz F(1), Kowalewski D(1), Kaniecka E(1), Kozlowski R(1), Marczak M(2), Timler D(1).

ABSTRACT

Background: There is a potential relationship between the self-confidence and the willingness of bystanders to undertake resuscitation (CPR) and its training. The current guidelines increasingly focus on both the importance of the human factor and the fact that training programs should increase the willingness of bystanders to undertake resuscitation, which may have a direct impact on improving survival in out-of-hospital cardiac arrest (OHCA). Aim: The objective of the study was to analyze factors influencing the assessment of own skills crucial in basic life support (BLS) and the willingness to provide CPR to individual victims. Methods: A pre-test and post-test quasi-experimental design was used in this study. The data was collected from 4 December 2019 to 3 October 2020 in workplaces, during instructor-led BLS courses. Each intervention (training) consisted of a theoretical and a practical part. The program was focused both on the skills and the human factor. Results: Comparison of pre-test and post-test data concerning self-confidence scores of the ability to recognize OHCA among 967 participants demonstrated a significant difference (respectively, Me = 2.2, IQR [2-3] vs. Me = 3.4, IQR [3-4]; p = 0.000). Additionally, self-assessment scores for the ability to perform proper chest compressions between pre-test and post-test also differed significantly (respectively Me = 2.3, IQR [2-3] vs. Me = 3.3, IQR [3-4]; p = 0.000). A highly significant difference was found in the likelihood of changing the decision in favor of the willingness to undertake CPR for all types of victims, with the greatest difference found in relation to the willingness to conduct resuscitation on strangers (OR = 7.67, 95% CI 5.01-11.73; p < 0.01). Conclusions: Completing hands-on training has a highly significant, beneficial effect on the readiness

to undertake resuscitation for all types of victims, strangers in particular. Training programs should place particular emphasis on developing readiness to undertake resuscitation for both those who have never been trained and those who had their last training more than one year ago.

9. J Emerg Med. 2022 Jul 21:S0736-4679(22)00322-5. doi: 10.1016/j.jemermed.2022.05.010. Online ahead of print.

Effect of Coaching with Repetitive Verbal Encouragements on Dispatch-Assisted Cardiopulmonary Resuscitation: A Randomized Simulation Study.

Takano K(1), Asai H(1), Fukushima H(1).

ABSTRACT

BACKGROUND: Current guidelines emphasize the assistance of the emergency dispatcher in bystander cardiopulmonary resusitation (CPR). Its quality, however, has varied across cases. OBJECTIVE: To determine the effect of repetitive coaching by dispatchers using verbal encouragement on the quality of lay-rescuer CPR. METHODS: We conducted a dispatch-assisted CPR (DACPR) simulation study. Participants with no CPR training within the previous year were assigned randomly to 1 of 2 DACPR simulations. One was the No Coaching Group: callers were told to perform CPR and the dispatcher periodically confirmed that the caller was performing CPR. The second group was the Coaching Group: the dispatcher repetitively coached, encouraged, and counted aloud using a metronome. Participants performed CPR for 2 min under instruction from the study dispatcher. Parameters including chest compression depth, rate, and chest compression fraction were recorded by video camera and CPR manikin. RESULTS: Forty-nine participants 20 to 50 years of age were recruited, and 48 completed the simulation (Coaching Group, n = 27; No Coaching Group, n = 21). The chest compression fraction was higher in the Coaching Group (99.4% vs. 93.0%, p = 0.005) and no participants interrupted chest compression more than 10 s in this group. When comparing the average depth of each 30-s period in each group, the depth increased over time in the Coaching Group (40.9 mm, 43.9 mm, 44.1 mm, and 42.8 mm), while it slightly decreased in the No Coaching Group (40.6 mm, 40.1 mm, 39.4 mm, and 39.8 mm). CONCLUSIONS: Repetitive verbal encouragements augmented chest compression depth with less-hands off time. Continuous coaching by dispatchers can optimize lay-rescuer CPR.

10. Front Public Health. 2022 Jul 7;10:895367. doi: 10.3389/fpubh.2022.895367. eCollection 2022.

Improve Cardiac Emergency Preparedness by Building a Team-Based Cardiopulmonary Resuscitation Educational Plan.

Xu J(1)(2), Dong X(3), Yin H(2), Guan Z(1), Li Z(1), Qu F(2), Chen T(1), Wang C(2), Fang Q(2), Zhang L(1)(2).

ABSTRACT

OBJECTIVE: To design an innovative team-based cardiopulmonary resuscitation (CPR) educational plan for multiple bystanders and evaluate whether it was associated with better teamwork and higher quality of resuscitation. METHODS: The team-based CPR plan defined the process for a three-person team, emphasize task allocation, leadership, and closed-loop communication. Participants qualified for single-rescuer CPR skills were randomized into teams of 3. The teamwork performance and CPR operation skills were evaluated in one simulated cardiac arrest scenario before and after training on the team-based CPR plan. The primary outcomes were measured by the Team Emergency Assessment Measure (TEAM) scale and chest compression fraction (CCF). RESULTS: Forty-three teams were included in the analysis. The team-based CPR plan significantly improved the team performance (global rating 6.7 ± 1.3 vs. 9.0 ± 0.7, corrected $p < 0.001$ after Bonferroni's correction). After implementing the team-based CPR plan, CCF increased [median 59 (IQR 48-69) vs.

64 (IQR 57-71%)%, corrected p = 0.002], while hands-off time decreased [median 233.2 (IQR 181.0-264.0) vs. 207 (IQR 174-222.9) s, corrected p = 0.02]. We found the average compression depth was significantly improved through the team-based CPR training [median 5.1 (IQR 4.7-5.6) vs. 5.3 (IQR 4.9-5.5) cm, p = 0.03] but no more significantly after applying the Bonferroni's correction (corrected p = 0.35). The compression depths were significantly improved by collaborating and exchanging the role of compression among the participants after the 6th min. CONCLUSION: The team-based CPR plan is feasible for improving bystanders teamwork performance and effective for improving resuscitation quality in prearrival care. We suggest a wide application of the team-based CPR plan in the educational program for better resuscitation performance in real rescue events.

11. Resuscitation. 2022 Jul 26:S0300-9572(22)00616-5. doi: 10.1016/j.resuscitation.2022.07.024. Online ahead of print.
Investigation of Sudden Cardiac Arrest: time to put guidelines into practice.
Skinner JR(1), Kumar S(2).
NO ABSTRACT AVAILABLE

POST-CARDIAC ARREST TREATMENTS

1. Resuscitation. 2022 Jul 20:S0300-9572(22)00611-6. doi: 10.1016/j.resuscitation.2022.07.020. Online ahead of print.
Resuscitative endovascular occlusion of the aorta (REBOA) as a mechanical method for increasing the coronary perfusion pressure in non-traumatic out-of-hospital cardiac arrest patients.
Jang DH(1), Keon Lee D(2), Hwan Jo Y(3), Min Park S(4), Taeck Oh Y(5), Woo Im C(6).
ABSTRACT
AIM: of the study Resuscitative endovascular balloon occlusion of the aorta (REBOA), originally designed to block blood flow to the distal part of the aorta by placing a balloon in trauma patients, has recently been shown to increase coronary perfusion in cardiac arrest patients. This study evaluated the effect of REBOA on aortic pressure and coronary perfusion pressure (CPP) in non-traumatic out of-hospital cardiac arrest (OHCA) patients. METHODS: Adult OHCA patients with cerebral performance category 1 or 2 prior to cardiac arrest, and without evidence of aortic disease, were enrolled from January to December 2021. Aortic pressure and right atrial pressure were measured before and after balloon occlusion. The CPP was calculated using the measured aortic and right atrial pressures, and the values before and after the balloon occlusion were compared. RESULTS: Fifteen non-traumatic OHCA patients were enrolled in the study. The median call to balloon time was 46.0 (IQR, 38.0-54.5) min. The median CPP before and after balloon occlusion was 13.5 (IQR, 5.8-25.0) and 25.2 (IQR, 12.0-44.6) mmHg, respectively (P = 0.001). The median increase in the estimated CPP after balloon occlusion was 86.7%. CONCLUSIONS: The results of this study suggest that REBOA may increase the CPP during cardiopulmonary resuscitation in patients with non-traumatic OHCA. Additional studies are needed to investigate the effect on clinical outcomes.

2. Resuscitation. 2022 Jul 21;178:63-68. doi: 10.1016/j.resuscitation.2022.07.023. Online ahead of print.
Coronary angiographic findings for out-of-hospital cardiac arrest survivors presenting with nonshockable rhythms and no ST elevation post resuscitation.
Harhash AA(1), Kluge MA(1), Muthukrishnan A(1), Noc M(2), Radsel P(2), Jentzer JC(3), Seder DB(4), Lee K(5), Lotun K(5), Stub D(6), Hsu CH(5), Kern KB(7).
ABSTRACT
BACKGROUND: Recent guidelines suggest that coronary angiography (CAG) should be considered for out-of-hospital cardiac arrest (OHCA) survivors, including those without ST elevation (STE) and without shockable rhythms. However, there is no prospective data to support CAG for survivors with

nonshockable rhythms and no STE post resuscitation. METHODS: This was a re-analysis of the PEARL study (randomized OHCA survivors without STE to early CAG versus not). Patients were subdivided by initial rhythm as nonshockable (Nsh) vs shockable (Sh). The primary outcome was coronary angiographic evidence of acute culprit lesion, with secondary outcomes being survival to hospital discharge and neurological recovery. RESULTS: The PEARL study included 99 patients with OHCA from a presumed cardiac etiology, 24 with nonshockable and 75 with shockable rhythms. There was no difference in the frequency of CAG between the two groups [71% (Nsh) and 75% (Sh); p = 0.79], presence of CAD [81% (Nsh) and 68% (sh); p = 0.37, or culprit lesions identified in each group [50% (Nsh) and 45% (Sh); p = 0.78. Nonshockable patients had worse discharge survival [33% (Nsh) vs 57% (Sh); p = 0.04] and those survived, had worse neurological recovery [30% (Nsh) vs 54% (Sh); p = 0.02] compared to shockable patients. CONCLUSIONS: OHCA survivors presenting with nonshockable rhythms and no STE post resuscitation had similar prevalence of culprit coronary lesions to those with shockable rhythms. CAG may be considered in patients with OHCA without STE regardless of initial presenting rhythm. There was no benefit of emergent CAG both in shockable and non-shockable rhythms.

3. CJEM. 2022 Jul 22. doi: 10.1007/s43678-022-00351-8. Online ahead of print.
Does immediate coronary angiography improve survival following out-of-hospital cardiac arrest?
Kareemi H(1), Eagles D(2), Rosenberg H(2).
NO ABSTRACT AVAILABLE

4. EuroIntervention. 2022 Jul 25:EIJ-D-22-00336. doi: 10.4244/EIJ-D-22-00336. Online ahead of print.
Timing and predictors of definite stent thrombosis in comatose survivors of out-of-hospital cardiac arrest undergoing percutaneous coronary intervention and therapeutic hypothermia (ST-OHCA study).
Rauber M(1)(2)(3), Nicol P(4), Sabic E(4), Joner M(4), Noc M(1)(3).
ABSTRACT
BACKGROUND: Incidence of stent thrombosis (ST) in comatose survivors of out-of-hospital cardiac arrest (OHCA) undergoing immediate percutaneous coronary intervention (PCI) and therapeutic hypothermia (TH) varies considerably, from 2.7% to 31.2%, in retrospective studies. AIMS: We aimed to investigate occurrence, timing and predictors of definite ST. METHODS: We prospectively investigated consecutive comatose survivors of OHCA with presumed cardiac aetiology undergoing immediate PCI with drug-eluting stents (DES) and TH targeted at 32-34°C admitted between August 2016 and July 2021. Repeat coronary angiography (CAG) was performed if ST was suspected and systematically between day 8-12 in the absence of clinical signs. All deceased patients underwent autopsy and histopathological analysis. Results: Among 362 comatose survivors of OHCA, immediate PCI with stenting was performed in 169 patients (47%). Since 18 patients did not complete follow-up, 151 patients were ultimately enrolled in ST analysis. Definite ST was confirmed in 29 patients (19.2%; 95% confidence interval [CI]: 12.9%-25.6%) either by CAG (n=18) or autopsy (n=11). ST occurred within 3 days in 62% and presented with at least one clinical sign in 79%. Survival with good neurological recovery was observed in 17% of patients with ST and in 60% of patients without ST (p<0.001). Independent predictors of ST were longer prehospital resuscitation, lower arterial pH and increased creatinine on admission. CONCLUSIONS: The incidence of definite ST in comatose survivors of OHCA undergoing immediate PCI and TH targeted at 32-34°C is substantial (19.2%) and significantly higher than in other PCI subsets despite systematic use of contemporary DES and anticoagulation/antiplatelet treatment.

5. Catheter Cardiovasc Interv. 2022 Jul 28. doi: 10.1002/ccd.30355. Online ahead of print.
Early coronary angiography in patients after out-of-hospital cardiac arrest without ST-segment elevation: Meta-analysis of randomized controlled trials.

Freund A(1)(2), van Royen N(3), Kern KB(4), Jobs A(1)(2)(5), Thiele H(1), Lemkes JS(6), DeschS(1)(2)(5); TOMAHAWK, PEARL, and COACT investigators.

ABSTRACT

OBJECTIVES: To compare early coronary angiography to a delayed or selective approach in out-of-hospital cardiac arrest (OHCA) without ST-segment elevation of possible cardiac cause by means of meta-analysis of available randomized controlled trials (RCTs). METHODS: We searched MEDLINE and the Cochrane Central Register of Controlled Trials for RCTs comparing early with delayed or selective coronary angiography in OHCA patients of possible cardiac origin without ST-segment elevation. The primary endpoint was all-cause short-term mortality (PROSPERO CRD42021271484). RESULTS: The search strategy identified three RCTs enrolling a total of 1167 patients. An early invasive approach was not associated with improved short-term mortality (odds ratio 1.19, 95% confidence interval 0.94-1.52; p = 0.15). Further, no significant differences were shown with respect to the risk of severe neurological deficit, the composite of all-cause mortality or severe neurological deficit, need for renal replacement therapy due to acute renal failure, and significant bleeding at short-term follow-up. CONCLUSION: Early coronary angiography in OHCA without ST-segment elevation is not superior compared to a delayed/selective approach.

TARGETED TEMPERATURE MANAGEMENT

1. Resusc Plus. 2022 Jul 12;11:100271. doi: 10.1016/j.resplu.2022.100271. eCollection 2022 Sep.

Hemodynamics and vasopressor support during targeted temperature management after cardiac arrest with non-shockable rhythm: A post hoc analysis of a randomized controlled trial.

Petit M(1)(2), Lascarrou JB(3)(4)(5), Colin G(6), Merdji H(7)(8), Cariou A(4)(5)(9), Geri G(10); HYPERION investigators.

ABSTRACT

BACKGROUND: Patients admitted after cardiac arrest with non-shockable rhythm frequently experience hemodynamic instability. This study assessed the hemodynamic consequences of TTM in this sub population. METHODS: This is a post hoc analysis of the HYPERION trial (NCT01994772), that randomized patients to either hypothermia or normothermia after non-shockable rhythm related cardiac arrest. Patients with no, moderate or severe circulatory failure were identified with cardiovascular Sequential Organ Failure Assessment at randomization. Primary outcome was the number of patients at day 7 with resolution of shock, accounting for the risk of death (competing risk analysis). Secondary endpoint included neurological outcome and death at day-90. RESULTS: 584 patients were included in the analysis: 195 (34%), 46 (8%) and 340 (59%) had no, moderate and severe circulatory failure, respectively. Resolution of circulatory failure at day 7 was more frequently observed in the normothermia group than in the TTM group (60% [95 %CI 54-66] versus 53% [95 %CI 46-60], Gray-test: p = 0.016). The severity of circulatory failure at randomization was associated with its less frequent resolution at day 7 accounting for the risk of death (76 % [62-86] versus 54% [49-59] for patients with moderate versus severe circulatory failure, Gray test, p < 0.001, respectively). At day 90, the proportion of patients with Cerebral Performance Category score of 1 or 2 was lower in patients presenting severe circulatory failure (p = 0.038). CONCLUSION: Circulatory failure is frequent after CA with non-shockable rhythm. Its severity at admission and TTM were associated with delayed resolution of circulatory failure.

2. Acta Anaesthesiol Scand. 2022 Aug;66(7):880-886. doi: 10.1111/aas.14078. Epub 2022 May 29.

Quantitative pupillometry in comatose out-of-hospital cardiac arrest patients: A post-hoc analysis of the TTH48 trial.

Paramanathan S(1), Grejs AM(1)(2), Søreide E(3)(4), Duez CHV(2), Jeppesen AN(2)(5), Reinertsen ÅJ(3), Strand K(6), Kirkegaard H(2).

ABSTRACT
BACKGROUND: Quantitative pupillometry is an objective method to examine pupil reaction and subsequently grade the response on a neurological pupil index (NPi) scale from 0 to 5. The aim of the present sub-study was to explore the long-term prognostic value of NPi in comatose out-of-hospital cardiac arrest patients undergoing targeted temperature management (TTM). METHODS: This planned sub-study of the "Targeted temperature management for 48 versus 24 h and neurological outcome after out-of-hospital cardiac arrest: A randomized clinical trial." NPi was assessed from admission and throughout day 3 and linked to the Cerebral Performance Categories score at 6 months. We compared the prognostic performance of NPi in 65 patients randomized to a target temperature of 33 ± 1°C for 24 or 48 h. RESULTS: The NPi values were not different between TTM groups ($p > .05$). When data were pooled, NPi was strongly associated with neurological outcome at day 1 with a mean NPi of 3.6 (95% CI 3.4-3.8) versus NPi 3.9 (3.6-4.1) in the poor versus good outcome group, respectively ($p < .01$). At day 2, NPi values were 3.6 (3.1-4.0) and 4.1 (3.9-4.2) ($p = .01$) and at day 3, the values were 3.3 (2.6-4.0) and 4.3 (4.1-4.6), respectively ($p < .01$). The prognostic ability of NPi, defined by area under the receiver operating characteristic curve was best at day three. CONCLUSION: Quantitative pupillometry measured by NPi was not different in the two TTM groups, but overall, significantly associated with good and poor neurological outcomes at 6 months. NPI has a promising diagnostic accuracy, but larger studies are warranted.

3. Resuscitation. 2022 Aug;177:43-51. doi: 10.1016/j.resuscitation.2022.06.022. Epub 2022 Jul 3.
Association of intentional cooling, achieved temperature and hypothermia duration with in-hospital mortality in patients treated with extracorporeal cardiopulmonary resuscitation: An analysis of the ELSO registry.
Nakashima T(1), Ogata S(2), Noguchi T(3), Nishimura K(2), Hsu CH(4), Sefa N(4), Haas NL(4), Bělohlávek J(5), Pellegrino V(6), Tonna JE(7), Haft J(8), Neumar RW(4).
ABSTRACT
AIM: To investigate whether intentional cooling, achieved temperature and hypothermia duration were associated with in-hospital death in patients treated with extracorporeal cardiopulmonary resuscitation (ECPR) for refractory cardiac arrest. METHODS: This is a retrospective analysis of the Extracorporeal Life Support Organization Registry. Patients 18-79 years of age who received ECPR between 2010 and 2019 were included. We compared outcomes for intentional cooling versus no intentional cooling. Then, among those who completed intentional cooling, we compared the outcomes between i) achieved temperature ≤ 34 °C, 34-36 °C, and > 36 °C, and ii) duration ≤ 36 °C for < 12 h, 12-48 h, and ≥ 48 h. The primary outcome was in-hospital mortality within 90 days. Cox proportional hazard models were generated with adjustment for covariates. RESULTS: Among 4,214 ECPR patients, 1,511 patients were included in the final analysis. After multivariable adjustment, there was no significant difference in in-hospital mortality between patients with intentional cooling and no intentional cooling (hazard ratio [HR], 1.06 [95% CI 0.93-1.21]; p = 0.394). In the 609 patients who completed intentional cooling, temperature at 34-36 °C had a significantly lower adjusted HR for in-hospital mortality compared with > 36 °C (HR, 0.73 [0.55-0.96]; p = 0.025). Moreover, temperature ≤ 36 °C for 12-48 h had a significantly lower adjusted HR for in-hospital mortality compared with ≤ 36 °C for < 12 h (HR, 0.69 [0.53-0.90]; p = 0.005). CONCLUSION: Intentional cooling was not associated with lower in-hospital mortality in ECPR patients. However, among patients with intentional cooling, achieving temperature of 34-36 °C for 12-48 h was associated with lower in-hospital mortality.

4. BMC Cardiovasc Disord. 2022 Jul 30;22(1):342. doi: 10.1186/s12872-022-02778-4.

Kinetics of 2 different high-sensitive troponins during targeted temperature management in out-of-hospital cardiac arrest patients with acute myocardial infarction: a post hoc sub-study of a randomised clinical trial.

Larsen AI(1)(2), Grejs AM(3)(4), Vistisen ST(3)(4), Strand K(5), Skadberg Ø(6), Jeppesen AN(7), Duez CHV(3)(8), Kirkegaard H(3)(8), Søreide E(9)(10).

ABSTRACT

INTRODUCTION: Short term hypothermia has been suggested to have cardio protective properties in acute myocardial infarction (AMI) by reducing infarct size as assessed by troponins. There are limited data on the kinetics of these biomarkers in comatose out-of-hospital cardiac arrest (OHCA) patients, with and without AMI, undergoing targeted temperature management (TTM) in the ICU. PURPOSE: The aim of this post hoc analyses was to evaluate and compare the kinetics of two high-sensitivity cardiac troponins in OHCA survivors, with and without acute myocardial infarction (AMI), during TTM of different durations [24 h (standard) vs. 48 h (prolonged)]. METHODS: In a sub-cohort (n = 114) of the international, multicentre, randomized controlled study "TTH48" we measured high-sensitive troponin T (hs-cTnT), high-sensitive troponin I (hs-cTnI) and CK-MB at the following time points: Arrival, 24 h, 48 h and 72 h from reaching the target temperature range of 33 ± 1 °C. All patients diagnosed with an AMI at the immediate coronary angiogram (CAG)-18 in the 24-h group and 25 in the 48-h group-underwent PCI with stent implantation. There were no stent thromboses. RESULTS: Both the hs-cTnT and hs-cTnI changes over time were highly influenced by the cause of OHCA (AMI vs. non-AMI). In contrast to non-AMI patients, both troponins remained elevated at 72 h in AMI patients. There was no difference between the two time-differentiated TTM groups in the kinetics for the two troponins. CONCLUSION: In comatose OHCA survivors with an aetiology of AMI levels of both hs-cTnI and hs-cTnT remained elevated for 72 h, which is in contrast to the well-described kinetic profile of troponins in normotherm AMI patients. There was no difference in kinetic profile between the two high sensitive assays. Different duration of TTM did not influence the kinetics of the troponins.

5. Med Intensiva (Engl Ed). 2022 Aug;46(8):481-482. doi: 10.1016/j.medine.2022.05.010. Epub 2022 May 31.

Should we abandon target temperature management at 33°C in post cardiac arrest patients?

Blandino Ortiz A(1), Higuera Lucas J(2), Márquez Alonso JA(3), de Pablo R(4).

NO ABSTRACT AVAILABLE

6. Neurocrit Care. 2022 Jul 28. doi: 10.1007/s12028-022-01564-6. Online ahead of print.

Cardiac Arrest Treatment Center Differences in Sedation and Analgesia Dosing During Targeted Temperature Management.

Ceric A(1), May TL(2), Lybeck A(3), Cronberg T(4), Seder DB(2), Riker RR(2), Hassager C(5), Kjaergaard J(5), Haxhija Z(6), Friberg H(7), Dankiewicz J(8), Nielsen N(6).

ABSTRACT

BACKGROUND: Sedation and analgesia are recommended during targeted temperature management (TTM) after cardiac arrest, but there are few data to provide guidance on dosing to bedside clinicians. We evaluated differences in patient-level sedation and analgesia dosing in an international multicenter TTM trial to better characterize current practice and clinically important outcomes. METHODS: A total 950 patients in the international TTM trial were randomly assigned to a TTM of 33 °C or 36 °C after resuscitation from cardiac arrest in 36 intensive care units. We recorded cumulative doses of sedative and analgesic drugs at 12, 24, and 48 h and normalized to midazolam and fentanyl equivalents. We compared number of medications used, dosing, and titration among centers by using multivariable models, including common severity of illness factors.

We also compared dosing with time to awakening, incidence of clinical seizures, and survival. RESULTS: A total of 614 patients at 18 centers were analyzed. Propofol (70%) and fentanyl (51%) were most frequently used. The average dosages of midazolam and fentanyl equivalents were 0.13 (0.07, 0.22) mg/kg/h and 1.16 (0.49, 1.81) μg/kg/h, respectively. There were significant differences in number of medications ($p < 0.001$), average dosages ($p < 0.001$), and titration at all time points between centers ($p < 0.001$), and the outcomes of patients in these centers were associated with all parameters described in the multivariate analysis, except for a difference in the titration of sedatives between 12 and 24 h ($p = 0.40$). There were associations between higher dosing at 48 h ($p = 0.003$, odds ratio [OR] 1.75) and increased titration of analgesics between 24 and 48 h ($p = 0.005$, OR 4.89) with awakening after 5 days, increased titration of sedatives between 24 and 48 h with awakening after 5 days ($p < 0.001$, OR > 100), and increased titration of sedatives between 24 and 48 h with a higher incidence of clinical seizures in the multivariate analysis ($p = 0.04$, OR 240). There were also significant associations between decreased titration of analgesics and survival at 6 months in the multivariate analysis ($p = 0.048$). CONCLUSIONS: There is significant variation in choice of drug, dosing, and titration when providing sedation and analgesics between centers. Sedation and analgesia dosing and titration were associated with delayed awakening, incidence of clinical seizures, and survival, but the causal relation of these findings cannot be proven.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

1. Heart Rhythm. 2022 Aug;19(8):1297-1303. doi: 10.1016/j.hrthm.2022.04.016. Epub 2022 Apr 25.
Risk of sudden cardiac death associated with QRS, QTc, and JTc intervals in the general population.
Tikkanen JT(1), Kentta T(1), Porthan K(2), Anttonen O(3), Eranti A(1), Aro AL(4), Kerola T(3), Rissanen HA(5), Knekt P(5), Heliövaara M(5), Holkeri A(1), Haukilahti A(1), Niiranen T(6), Hernesniemi J(7), Jula A(5), Nieminen MS(4), Myerburg RJ(8), Albert CM(9), Salomaa V(5), Huikuri HV(1), Junttila MJ(10).
ABSTRACT
BACKGROUND: QRS duration and corrected QT (QTc) interval have been associated with sudden cardiac death (SCD), but no data are available on the significance of repolarization component (JTc interval) of the QTc interval as an independent risk marker in the general population. OBJECTIVE: In this study, we sought to quantify the risk of SCD associated with QRS, QTc, and JTc intervals. METHODS: This study was conducted using data from 3 population cohorts from different eras, comprising a total of 20,058 individuals. The follow-up period was limited to 10 years and age at baseline to 30-61 years. QRS duration and QT interval (Bazett's) were measured from standard 12-lead electrocardiograms at baseline. JTc interval was defined as QTc interval - QRS duration. Cox proportional hazards models that controlled for confounding clinical factors identified at baseline were used to estimate the relative risk of SCD. RESULTS: During a mean period of 9.7 years, 207 SCDs occurred (1.1 per 1000 person-years). QRS duration was associated with a significantly increased risk of SCD in each cohort (pooled hazard ratio [HR] 1.030 per 1-ms increase; 95% confidence interval [CI] 1.017-1.043). The QTc interval had borderline to significant associations with SCD and varied among cohorts (pooled HR 1.007; 95% CI 1.001-1.012). JTc interval as a continuous variable was not associated with SCD (pooled HR 1.001; 95% CI 0.996-1.007). CONCLUSION: Prolonged QRS durations and QTc intervals are associated with an increased risk of SCD. However, when the QTc interval is deconstructed into QRS and JTc intervals, the repolarization component (JTc) appears to have no independent prognostic value.

2. Int J Environ Res Public Health. 2022 Jul 25;19(15):9065. doi: 10.3390/ijerph19159065.
Network of Automated External Defibrillators in Poland before the SARS-CoV-2 Pandemic: An In-Depth Analysis.

Ślęzak D(1), Robakowska M(2), Żuratyński P(1)(3), Krzyżanowski K(1).
ABSTRACT
INTRODUCTION: Sudden cardiac arrest (SCA), which causes more than half of all cardiovascular related deaths, can be regarded as a common massive global public health problem. Analyzing out-of-hospital cardiac arrest (OHCA) cases, one of the key components is automatic external defibrillators (AEDs). AIM: The aim of this study was to analyze the use and distribution of AEDs in Polish public places. MATERIALS AND METHODS: The data were analyzed by using the Excel and R calculation programs. RESULTS: The data represents 120 uses of automatic external defibrillators used in Polish public space in the period 2008-2018. The analysis describes 1165 locations of AEDs in Poland. It was noted that the number of uses in the period 2010-2016 fluctuated at a constant value, with a significant rise in 2017. When analyzing the time of interventions in detail the following was noted: the highest percentage of interventions was observed in April, and the lowest in November; the highest number of interventions was observed on a Friday, while the least number of interventions was observed on a Sunday; most occurred between 12:00 to 16:00, and least between 20:00 to 8:00. CONCLUSIONS: The observed growth in the number of cases of AED use in public places is associated with the approach to training, the emphasis on public access to defibrillation, and, therefore, the growth of social awareness. This study will be continued. The next analysis would include 2020-2022 and would be a comparative analysis with the current research.

PEDIATRICS AND CHILDREN

1. Pediatr Res. 2022 Jul 29. doi: 10.1038/s41390-022-02187-5. Online ahead of print.
Seizures in children undergoing extracorporeal membrane oxygenation: a systematic review and meta-analysis.
Lin G(#)(1), Li Y(#)(1), Zhuang Y(1), Fan Q(2), Luo Y(1)(3), Zeng H(4).
ABSTRACT
OBJECTIVES: To investigate the incidence of seizures and short-term mortality associated with seizures in children undergoing extracorporeal membrane oxygenation (ECMO). METHODS: PubMed, Embase, and Web of Science were searched from inception to September 2021. Study quality was assessed using the Newcastle-Ottawa Scale. Random effects meta-analysis was conducted. RESULTS: Fourteen studies met the inclusion criteria for quantitative meta-analysis. The cumulative estimate of seizure incidence was 15% (95% CI: 12-17%). Studies using electroencephalography reported a higher incidence of seizures compared with those using electro-clinical criteria (19% vs. 9%, P = 0.034). Furthermore, 75% of seizures were subclinical. Children receiving extracorporeal cardiopulmonary resuscitation (ECPR) exhibited a higher incidence of seizures compared to children with respiratory and cardiac indications. Seizure incidence was higher in patients undergoing venoarterial (VA) ECMO compared with venovenous (VV) ECMO. The pooled odds ratio of mortality was 2.58 (95% CI: 2.25-2.95) in those developed seizures. CONCLUSION: The incidence of seizures in children requiring ECMO was 15% and majority of seizures were subclinical. The incidence of seizures was higher in patients receiving ECPR than in those with respiratory and cardiac indications. Seizures were more frequent in patients undergoing VA ECMO than VV ECMO. Seizures were associated with increased short-term mortality. IMPACT: The incidence of seizures in children undergoing extracorporeal membrane oxygenation (ECMO) was ~15% and majority of the seizures were subclinical. Seizures were associated with increased short-term mortality. Risk factors for seizures were extracorporeal cardiopulmonary resuscitation and venoarterial ECMO. Electroencephalography (EEG) monitoring is recommended in children undergoing ECMO and further studies on the optimal protocol for EEG monitoring are necessary.

2. Resusc Plus. 2022 Jul 22;11:100276. doi: 10.1016/j.resplu.2022.100276. eCollection 2022 Sep.
One-rescuer newborn CPR using a face mask or an i-gel supraglottic airway and two-finger compressions - A manikin study with cross-over desgin.
Isobe A(1), Asui R(1), Katayama T(2), Mizumoto H(1).
ABSTRACT
INTRODUCTION: When unanticipated neonatal asphyxia occurs, it may be necessary for a single resuscitator to commence advanced resuscitation before others arrive. We hypothesised that a single rescuer can provide positive pressure ventilations and chest compressions using higher inflation pressures and better adherence to the recommended compression rate with an i-gel supraglottic airway than with a face mask. METHOD: A manikin-based cross-over study was conducted. Twenty-one midwives performed both positive pressure ventilation using a T-piece and chest compressions with the two-finger technique on a newborn manikin alone. They performed ventilation with a face mask or an i-gel. The peak inspiratory pressure (PIP) was set to 30 cmH2O. The actual PIPs were evaluated based on the values displayed on the manometer. The total amount of time taken to complete 30 cycles of three compressions and one ventilation was also evaluated. RESULTS: The mean of the average PIP for each participant was significantly lower with a face mask than with an i-gel (17.3 ± 4.4 vs 28.2 ± 2.0 cmH2O, $p < 0.00001$). The amount of time taken to complete 30 cycles was significantly longer with a face mask than with an i-gel (66.2 ± 6.1 vs 60.6 ± 3.4 seconds, $p < 0.0001$). CONCLUSION: During one-rescuer newborn resuscitation using a T-piece and the two-finger technique, the PIPs are consistently high and 30 cycles of CPR are better adhered to 60 seconds using an i-gel.

EXTRACORPOREAL LIFE SUPPORT

1. J Intensive Care Med. 2022 Jul 19:8850666221115606. doi: 10.1177/08850666221115606. Online ahead of print.
Prognostic Implication of Pre-Cannulation Cardiac Arrest in Patients Undergoing Extracorporeal Membrane Oxygenation for the Management of Cardiogenic Shock.
Whiteside HL(1), Hillerson D(2), Abdel-Latif A(1), Gupta VA(1).
ABSTRACT
BACKGROUND: The application of veno-arterial extracorporeal membrane oxygenation (VA-ECMO) in contemporary management of cardiogenic shock (CS) has dramatically increased. Despite increased utilization, few predictive models exist to estimate patient survival based on pre-ECMO characteristics. Furthermore, the prognostic implications of pre-ECMO cardiac arrest are not well defined. METHODS: Utilizing an institutional VA-ECMO database, all consecutive patients undergoing VA-ECMO for the management of CS from January 1, 2014, to July 1, 2019, were identified. Survival to hospital discharge was analyzed based on cannulation indication in patients with and without pre-ECMO cardiac arrest. Patients who received extracorporeal cardiopulmonary resuscitation (eCPR) were analyzed separately. RESULTS: Of the 214 patients identified, 110 did not suffer a cardiac arrest prior to cannulation (cohort 1), 57 patients had a cardiac arrest with sustained ROSC (cohort 2), and 47 were cannulated as a component of eCPR (cohort 3). Despite sustained ROSC (cohort 2), the presence of pre-ECMO cardiac arrest was associated with a significant reduction in survival to hospital discharge (22.8% vs. 55.5% in cohort 1; $p < 0.001$). Comparatively, survival to discharge was similar in patients undergoing eCPR (22.8% vs. 17.0%; $p = 0.464$). Finally, patients with a cardiac arrest were significantly more likely to have a neurological etiology death with VA-ECMO than patients supported prior to hemodynamic collapse (18.3% vs. 2.7%; $p < 0.001$). This result is seen in those with sustained ROSC (21.1% vs. 2.7%; $p < 0.001$) and those with eCPR (14.9% vs. 2.7%; $p = 0.004$).CONCLUSION: In our cohort, pre-ECMO cardiac arrest carries a negative prognostic value across all indications and is associated with an increased prevalence of neurological-etiology death.

This finding is true in patients with sustained ROSC as well as those resuscitated with eCPR. Cardiac arrest can inform survival probability with VA-ECMO as early implementation of VA-ECMO may mitigate adverse outcomes in patients at the highest risk of hemodynamic collapse.

2. Resuscitation. 2022 Aug;177:85-92. doi: 10.1016/j.resuscitation.2022.05.004. Epub 2022 May 16.
Association of chest compression pause duration prior to E-CPR cannulation with cardiac arrest survival outcomes.
Lauridsen KG(1), Lasa JJ(2), Raymond TT(3), Yu P(4), Niles D(5), Sutton RM(5), Morgan RW(5), Fran Hazinski M(6), Griffis H(7), Hanna R(8), Zhang X(7), Berg RA(5), Nadkarni VM(5); pediRES-Q Investigators.

ABSTRACT
OBJECTIVE: To characterize chest compression (CC) pause duration during the last 5 minutes of pediatric cardiopulmonary resuscitation (CPR) prior to extracorporeal-CPR (E-CPR) cannulation and the association with survival outcomes. METHODS: Cohort study from a resuscitation quality collaborative including pediatric E-CPR cardiac arrest events ≥ 10 min with CPR quality data. We characterized CC interruptions during the last 5 min of defibrillator-electrode recorded CPR (prior to cannulation) and assessed the association between the longest CC pause duration and survival outcomes using multivariable logistic regression. RESULTS: Of 49 E-CPR events, median age was 2.0 [Q1, Q3: 0.6, 6.6] years, 55% (27/49) survived to hospital discharge and 18/49 (37%) with favorable neurological outcome. Median duration of CPR was 51 [43, 69] min. During the last 5 min of recorded CPR prior to cannulation, median duration of the longest CC pause was 14.0 [6.3, 29.4] sec: 66% >10 sec, 25% >29 sec, 14% >60 sec, and longest pause 168 sec. Following planned adjustment for known confounders of age and CPR duration, each 5-sec increase in longest CC pause duration was associated with lower odds of survival to hospital discharge [adjusted OR 0.89, 95 %CI: 0.79-0.99] and lower odds of survival with favorable neurological outcome [adjusted OR 0.77, 95 %CI: 0.60-0.98]. CONCLUSIONS: Long CC pauses were common during the last 5 min of recorded CPR prior to E-CPR cannulation. Following adjustment for age and CPR duration, each 5-second incremental increase in longest CC pause duration was associated with significantly decreased rates of survival and favorable neurological outcome.

3. Resusc Plus. 2022 Jul 22;11:100278. doi: 10.1016/j.resplu.2022.100278. eCollection 2022 Sep.
A qualitative analysis of physician decision making in the use of extracorporeal cardiopulmonary resuscitation for refractory cardiac arrest.
Tonna JE(1)(2), Keenan HT(3), Weir C(4).

ABSTRACT
AIM OF STUDY: To prepare for the design of future randomized clinical trials of extracorporeal cardioupulmonary resuscitation (ECPR), we sought to understand physician beliefs regarding the use of ECPR and subsequent management, among physicians who already perform ECPR, as these physicians would be likely to be involved in many planned ECPR trials. METHODS: We performed 12 semi-structured interviews of physicians who already perform ECPR across a variety of medical specialties, centers and geographic regions, but all with 10-50+ cases of ECPR experience. We qualitatively analyzed these interview to identify key characteristics of their experience using ECPR, the tensions involved in patient identification, the complications of subsequent management, and their willingness to enroll potential ECPR patients in randomized trials of ECPR. RESULTS: Physicians who routinely perform ECPR have strong beliefs regarding the use of ECPR, and typically have protocols they follow, though they are willing to break these protocols to cannulate young or healthy patients, or patients with immediate pre-hospital CPR and shockable rhythms. We found that physicians lacked equipoise to randomize these types of patients to continued conventional CPR. Future RCTs might be successful in enrolling older patients, younger patients without immediate pre-hospital care/bystander CPR, or patients with obvious comorbidities. CONCLUSIONS: RCTs for ECPR will need to avoid targeting patients in whom physicians feel strongly compelled to do

ECPR or not do ECPR, instead identifying the middle range of patients in whom the physicians consider ECPR reasonable, but not required or contraindicated.

4. J Clin Med. 2022 Jul 20;11(14):4211. doi: 10.3390/jcm11144211.
Optimal Arterial Blood Gas Tensions for the Prognosis of Favorable Neurological Outcomes in Survivors after Extracorporeal Cardiopulmonary Resuscitation.
Hong S(1), Jang JH(2), Yang JH(3)(4), Cho YH(5), Ahn J(6), Ryu JA(3)(7).
ABSTRACT
Our aim is to assess the optimal levels of oxygen and carbon dioxide for the prognosis of favorable neurologic outcomes in survivors after extracorporeal cardiopulmonary resuscitation (ECPR). We obtained the mean levels of PaCO2 and PaO2 in arterial blood gas samples 72 h after ECPR. The primary outcome was the neurological status, according to the Cerebral Performance Categories (CPC) scale, upon discharge. Of 119 (48.6%) survivors, 95 (38.8%) had favorable neurologic outcomes (CPC 1 or 2). There was a U-shaped relationship between mean arterial blood gas tensions and poor neurological outcomes. The risk of poor neurological outcome was lowest in patients with the second tertile of mean PaCO2 (30-42 mm Hg) and PaO2 (120-160 mm Hg). In a multivariable analysis, third tertile of mean PaCO2, third tertile of mean PaO2, age, shockable rhythm, out of hospital cardiac arrest, duration of cardiopulmonary resuscitation, and ECPR at cardiac catheterization lab were found to be significantly associated with poor neurologic outcomes. Additionally, hypercapnia and extreme hyperoxia were found to be significantly associated with poor neurological outcomes after ECPR. Therefore, maintaining adequate arterial levels of oxygen and carbon dioxide may be important for favorable neurological prognoses in survivors after ECPR.

5. J Intensive Care Med. 2022 Jul 25:8850666221116594. doi: 10.1177/08850666221116594. Online ahead of print.
E-CPR in Cardiac Arrest due to Accidental Hypothermia Using Intensivist Cannulators: A Case Series of Nine Consecutive Patients.
Kraai E(1), Wray TC(2), Ball E(2), Tawil I(2), Mitchell J(2), Guliani S(3), Dettmer T(2), Marinaro J(2).
ABSTRACT
Background: Severe accidental hypothermia (AH) accounts for over 1300 deaths/year in the United States. Early extracorporeal life support (ECLS) is recommended for hypothermic cardiac arrest. We describe the use of a rapid-deployment extracorporeal cardiopulmonary resuscitation (E-CPR) team using intensivist physicians (IPs) as cannulators and report the outcomes of consecutive patients cannulated for ECLS to manage cardiac arrest due to AH. Methods: We reviewed all patients managed with veno-arterial (V-A) ECLS for hypothermic cardiac arrest between January 1, 2017 and November 1, 2021. For each patient- age, sex, cause of hypothermia, initial core temperature, initial rhythm, time from arrest to cannulation, cannula configuration, pH, lactate, potassium, cannulation complications, duration of ECLS, hospital length of stay, mortality, and cerebral performance category (CPC) at discharge were reviewed. Results: Nine consecutive patients were identified that underwent V-A ECLS for cardiac arrest due to AH. Seven (78%) were witnessed arrests. Initial rhythm was ventricular fibrillation (VF) in eight patients and pulseless electrical activity (PEA) in one. The mean initial core temperature was 23.8 degrees Celsius. The mean time from arrest to cannulation was 58 min (range 17 to 251 min). There were no complications related to cannulation. The mean duration of ECLS was 39.1 h. All nine patients were discharged alive with a Cerebral Performance score of one or two. Conclusion: In this case series of consecutive patients reporting intensivist-deployed E-CPR for cardiac arrest due to AH, all patients survived to discharge with a favorable neurologic outcome. A rapidly available E-CPR team utilizing intensivist cannulators may improve outcomes in patients with cardiac arrest due to AH.

6. J Intensive Care. 2022 Jul 28;10(1):37. doi: 10.1186/s40560-022-00630-7.
Outcome prediction for hypothermic patients in cardiac arrest.

Pasquier M(1), Hugli O(2), Hall N(2), Rousson V(3), Darocha T(4).

ABSTRACT

The 5A score predicts in-hospital mortality of patients suffering from accidental hypothermia, including those not in cardiac arrest. The HOPE score was specifically developed to predict survival for the subgroup of hypothermic patients in cardiac considered for extracorporeal life support rewarming. The C-statistic in the external validation study of the HOPE score was 0.825 (95% CI: 0.753-0.897), confirming its excellent discrimination. In addition, its good calibration allows for a reliable interpretation of the corresponding survival probability after rewarming. The HOPE score should be used for predicting outcome and selecting hypothermic patients in cardiac arrest for rewarming.

EXPERIMENTAL RESEARCH

1. Oxid Med Cell Longev. 2022 Jul 7;2022:7736416. doi: 10.1155/2022/7736416. eCollection 2022.

Ketone Body Improves Neurological Outcomes after Cardiac Arrest by Inhibiting Mitochondrial Fission in Rats.

Tan Y(1)(2), Zhang J(1)(2), Ge Q(1)(2), Fang X(1)(2), Song F(1)(2), Yu T(1)(2), Jiang L(1)(2), Wei Y(3), Wang P(1)(2).

ABSTRACT

Ketone bodies including β-hydroxybutyrate (β-HB) have been proved the therapeutic potential in diverse neurological disorders. However, the role of β-HB in the regulation of neurological injury after cardiac arrest (CA) remains unclear. We investigated the effect of β-HB on brain mitochondrial dysfunction and neurological function after CA. A rat model of CA was established by asphyxia. The rats were randomly divided into three groups: sham group, control group, and β-HB group. Animals received 200 mg/kg β-HB or same volume vehicle at 10 minutes after return of spontaneous circulation by intraperitoneal injection. Neurological function was evaluated by neurologic deficit score and Y-maze. Neuronal cell loss and apoptosis were detected through hematoxylin-eosin staining, Nissl staining, and TdT-mediated dUTP nick-end labeling assay. Oxidative stress levels were determined by immunohistochemical staining of 4-hydoxynonenal and 8-hydroxy-2'-deoxyguanosine. Furthermore, mitochondrial ultrastructure of brain cells was observed by transmission electron microscopy. In addition, the protein expression levels of Bak, caspase 3, gasdermin D, caspase 1, brain-derived neurotrophic factor, dynamin-related protein 1 (Drp1), and phospho-Drp1 (ser616) were measured. We found that neurological function and survival rate were significantly higher in the β-HB group compared with the control group. β-HB also reduced neurons death and neurological oxidative stress after CA. Moreover, β-HB reduced neurological injury from apoptosis and pyroptosis after CA. In addition, β-HB maintained the structural integrity of brain mitochondria, prevented mitochondrial fission, and increased brain energy metabolism after CA. In conclusion, β-HB beneficially affected the neurological function of rats after global cerebral ischemia, associated with decreased mitochondrial fission, and improved mitochondrial function. Our results suggest that β-HB might benefit patients suffering from neurological dysfunction after CA.

2. J Cereb Blood Flow Metab. 2022 Jul 19:271678X221113022. doi: 10.1177/0271678X221113022. Online ahead of print.

Resuscitation with epinephrine worsens cerebral capillary no-reflow after experimental pediatric cardiac arrest: An in vivo multiphoton microscopy evaluation.

Oghifobibi OA(1)(2), Toader AE(3), Nicholas MA(1)(2), Nelson BP(1)(2), Alindogan NG(2), Wolf MS(2)(4), Kline AE(2)(5), Nouraie SM(6), Bondi CO(2)(5), Iordanova B(7), Clark RS(1)(2)(4)(8), Bayır

H(1)(2)(4)(8), Loughran PA(9), Watkins SC(10), St Croix CM(10), Kochanek PM(1)(2)(4)(8), Vazquez AL(11)(7), Manole MD(1)(2)(8).

ABSTRACT

Epinephrine is the principal resuscitation therapy for pediatric cardiac arrest (CA). Clinical data suggest that although epinephrine increases the rate of resuscitation, it fails to improve neurological outcome, possibly secondary to reductions in microvascular flow. We characterized the effect of epinephrine vs. placebo administered at resuscitation from pediatric asphyxial CA on microvascular and macrovascular cortical perfusion assessed using in vivo multiphoton microscopy and laser speckle flowmetry, respectively, and on brain tissue oxygenation (PbO2), behavioral outcomes, and neuropathology in 16-18-day-old rats. Epinephrine-treated rats had a more rapid return of spontaneous circulation and brisk immediate cortical reperfusion during 1-3 min post-CA vs. placebo. However, at the microvascular level, epinephrine-treated rats had penetrating arteriole constriction and increases in both capillary stalling (no-reflow) and cortical capillary transit time 30-60 min post-CA vs. placebo. Placebo-treated rats had increased capillary diameters post-CA. The cortex was hypoxic post-CA in both groups. Epinephrine treatment worsened reference memory performance vs. shams. Hippocampal neuron counts did not differ between groups. Resuscitation with epinephrine enhanced immediate reperfusion but produced microvascular alterations during the first hour post-resuscitation, characterized by vasoconstriction, capillary stasis, prolonged cortical transit time, and absence of compensatory cortical vasodilation. Targeted therapies mitigating the deleterious microvascular effects of epinephrine are needed.

3. Bioelectron Med. 2022 Jul 20;8(1):10. doi: 10.1186/s42234-022-00092-0.

Threshold adjusted vagus nerve stimulation after asphyxial cardiac arrest results in neuroprotection and improved survival.

Choudhary RC(#)(1)(2)(3), Ahmed U(#)(2), Shoaib M(#)(1)(2)(4), Alper E(4), Rehman A(1), Kim J(1)(2)(3)(4), Shinozaki K(1)(3)(5), Volpe BT(5)(6), Chavan S(2), Zanos S(2), Tracey KJ(2), Becker LB(7)(8)(9).

ABSTRACT

BACKGROUND: Vagus nerve stimulation (VNS) has shown therapeutic potential in a variety of different diseases with many ongoing clinical trials. The role of VNS in reducing ischemic injury in the brain requires further evaluation. Cardiac arrest (CA) causes global ischemia and leads to the injury of vital organs, especially the brain. In this study, we investigated the protective effects of customized threshold-adjusted VNS (tVNS) in a rat model of CA and resuscitation. METHODS: Sprague-Dawley rats underwent 12 min asphyxia-CA followed by resuscitation. Rats were assigned to either post-resuscitation tVNS for 2 h or no-tVNS (control). tVNS was applied by electrode placement in the left cervical vagus nerve. To optimize a threshold, we used animal's heart rate and determined a 15-20% drop from baseline levels as the effective and physiological threshold for each animal. The primary endpoint was 72 h survival; secondary endpoints included neurological functional recovery, reduction in brain cellular injury (histopathology), cardiac and renal injury parameters (troponin I and creatinine levels, respectively). RESULTS: In comparison to the control

group, tVNS significantly improved 72 h survival and brain functional recovery after 12 minutes of CA. The tVNS group demonstrated significantly reduced numbers of damaged neurons in the CA1 hippocampal region of the brain as compared to the control group. Similarly, the tVNS group showed decreased trend in plasma troponin I and creatinine levels as compared to the control group. CONCLUSIONS: Our findings suggest that using tVNS for 2 h after 12 minutes of CA attenuates ischemia neuronal cell death, heart and kidney damage, and improves 72 h survival with improved neurological recovery.

4. Nitric Oxide. 2022 Aug 1;125-126:47-56. doi: 10.1016/j.niox.2022.06.005. Epub 2022 Jun 16.
Inhaled nitric oxide improves post-cardiac arrest outcomes via guanylate cyclase-1 in bone marrow-derived cells.
Miyazaki Y(1), Hayashida K(1), Ikeda K(1), Marutani E(1), Magliocca A(1), Nagashima F(1), Ikeda T(1), Tainsh RET(1), Buys ES(2), Ichinose F(3).
ABSTRACT
RATIONALE: Nitric oxide (NO) exerts its biological effects primarily via activation of guanylate cyclase (GC) and production of cyclic guanosine monophosphate. Inhaled NO improves outcomes after cardiac arrest and cardiopulmonary resuscitation (CPR). However, mechanisms of the protective effects of breathing NO after cardiac arrest are incompletely understood. OBJECTIVE: To elucidate the mechanisms of beneficial effects of inhaled NO on outcomes after cardiac arrest. METHODS: Adult male C57BL/6J wild-type (WT) mice, GC-1 knockout mice, and chimeric WT mice with WT or GC-1 knockout bone marrow were subjected to 8 min of potassium-induced cardiac arrest to determine the role of GC-1 in bone marrow-derived cells. Mice breathed air or 40 parts per million NO for 23 h starting at 1 h after CPR. RESULTS: Breathing NO after CPR prevented hypercoagulability, cerebral microvascular occlusion, an increase in circulating polymorphonuclear neutrophils and neutrophil-to-lymphocyte ratio, and right ventricular dysfunction in WT mice, but not in GC-1 knockout mice, after cardiac arrest. The lack of GC-1 in bone marrow-derived cells diminished the beneficial effects of NO breathing after CPR. CONCLUSIONS: GC-dependent signaling in bone marrow-derived cells is essential for the beneficial effects of inhaled NO after cardiac arrest and CPR.

5. Front Cardiovasc Med. 2022 Jul 7;9:894004. doi: 10.3389/fcvm.2022.894004. eCollection 2022.
Effects of Methylprednisolone on Myocardial Function and Microcirculation in Post-resuscitation: A Rat Model.
Wang C(1)(2), Bischof E(3)(4), Xu J(2), Guo Q(2), Zheng G(2), Ge W(2), Hu J(2), Georgescu Margarint EL(5), Bradley JL(2), Peberdy MA(2)(6), Ornato JP(2)(6), Zhu C(1), Tang W(2)(7).
ABSTRACT
BACKGROUND: Previous studies have demonstrated that inflammation and impaired microcirculation are key factors in post-resuscitation syndromes. Here, we investigated whether methylprednisolone (MP) could improve myocardial function and microcirculation by suppressing the systemic inflammatory response following cardiopulmonary resuscitation (CPR) in a rat model of cardiac arrest (CA). METHODS: Sprague-Dawley rats were randomly assigned to (1) sham, (2) control, and (3) drug groups. Ventricular fibrillation was induced and then followed by CPR. The rats were infused with either MP or vehicle at the start of CPR. Myocardial function and microcirculation were assessed at baseline and after the restoration of spontaneous circulation. Blood samples were drawn at baseline and 60-min post-resuscitation to assess serum cytokine (TNF-α, IL-1β, and IL-6) levels. RESULTS: Myocardial function [estimated by the ejection fraction (EF), myocardial performance index (MPI), and cardiac output (CO)] improved post-ROSC in the MP group compared with those in

the control group ($p < 0.05$). MP decreased the levels of the aforementioned pro-inflammatory cytokines and alleviated cerebral, sublingual, and intestinal microcirculation compared with the control ($p < 0.05$). A negative correlation emerged between the cytokine profile and microcirculatory blood flow. CONCLUSION: MP treatment reduced post-resuscitation myocardial dysfunction, inhibited pro-inflammatory cytokines, and improved microcirculation in the initial recovery phase in a CA and resuscitation animal model. Therefore, MP could be a potential clinical target for CA patients in the early phase after CPR to alleviate myocardial dysfunction and improve prognosis.

6. Brain Sci. 2022 Jul 15;12(7):928. doi: 10.3390/brainsci12070928.
Identification and Validation of Novel Potential Pathogenesis and Biomarkers to Predict the Neurological Outcome after Cardiac Arrest.
Zhang Q(1), Zhang C(2), Liu C(1), Zhan H(2), Li B(1), Lu Y(1), Wei H(2), Cheng J(1), Li S(2), Wang C(1), Hu C(2), Liao X(1).
ABSTRACT
Predicting neurological outcomes after cardiac arrest remains a major issue. This study aimed to identify novel biomarkers capable of predicting neurological prognosis after cardiac arrest. Expression profiles of GSE29540 and GSE92696 were downloaded from the Gene Expression Omnibus (GEO) database to obtain differentially expressed genes (DEGs) between high and low brain performance category (CPC) scoring subgroups. Weighted gene co-expression network analysis (WGCNA) was used to screen key gene modules and crossover genes in these datasets. The protein-protein interaction (PPI) network of crossover genes was constructed from the STRING database. Based on the PPI network, the most important hub genes were identified by the cytoHubba plugin of Cytoscape software. Eight hub genes (RPL27, EEF1B2, PFDN5, RBX1, PSMD14, HINT1, SNRPD2, and RPL26) were finally screened and validated, which were downregulated in the group with poor neurological prognosis. In addition, GSEA identified critical pathways associated with these genes. Finally, a Pearson correlation analysis showed that the mRNA expression of hub genes EEF1B2, PSMD14, RPFDN5, RBX1, and SNRPD2 were significantly and positively correlated with NDS scores in rats. Our work could provide comprehensive insights into understanding pathogenesis and potential new biomarkers for predicting neurological outcomes after cardiac arrest.

CASE REPORTS

1. J Forensic Sci. 2022 Jul 22. doi: 10.1111/1556-4029.15101. Online ahead of print.
Prone restraint cardiac arrest in in-custody and arrest-related deaths.
Weedn V(1)(2)(3), Steinberg A(4), Speth P(5).
ABSTRACT
We postulate that most atraumatic deaths during police restraint of subjects in the prone position are due to prone restraint cardiac arrest (PRCA), rather than from restraint asphyxia or a stress-induced cardiac condition, such as excited delirium. The prone position restricts ventilation and diminishes pulmonary perfusion. In the setting of a police encounter, metabolic demand will be high from anxiety, stress, excitement, physical struggle, and/or stimulant drugs, leading to metabolic acidosis and requiring significant hyperventilation. Although oxygen levels may be maintained, prolonged restraint in the prone position may result in an inability to adequately blow off CO_2 , causing blood pCO_2 levels to rise rapidly. The uncompensated metabolic acidosis (low pH) will eventually result in loss of myocyte contractility. The initial electrocardiogram rhythm will generally be either pulseless electrical activity (PEA) or asystole, indicating a noncardiac etiology, more consistent with PRCA and inconsistent with a primary role of any underlying cardiac pathology or

stress-induced cardiac etiology. We point to two animal models: in one model rats unable to breathe deeply due to an external restraint die when their metabolic demand is increased, and in the other model, pressure on the chest of rats results in decreased venous return and cardiac arrest rather than death from asphyxia. We present two cases of subjects restrained in the prone position who went into cardiac arrest and had low pHs and initial PEA cardiac rhythms. Our cases demonstrate the danger of prone restraint and serve as examples of PRCA.

2. Niger J Clin Pract. 2022 Jul;25(7):1196-1198. doi: 10.4103/njcp.njcp_1941_21.
Post native uvulo-tonsillectomy hemorrhage as a cause of acquired long QT syndrome in a Nigerian girl: A case report.
Okpokowuruk FS(1), Bassey K(1).
ABSTRACT
Long QT syndrome (LQTS) is a rare disease entity which until recently was not readily recognized as one of the causes of sudden cardiac death in children. It is a syndrome which can be congenital or acquired and is characterized by the prolongation of the QTc interval, the presence of some electrocardiographic abnormalities and other clinical parameters together with suggestive or definitive family history (Schwartz criteria). The index case is a 4-year-old female who initially presented for management on account of post native tonsillectomy hemorrhage with secondary severe anemia and associated sepsis who subsequently developed bradycardia and marked prolongation of the QTc interval on electrocardiogram. Possible factors implicated as a cause of the prolongation of the QTc include severe anemia and anesthetic drugs with a probability of an underlying genetic cause. This case highlights a rare cause of sudden cardiac death in children in our environment with the attendant difficulties in making a genetic diagnosis due to inadequate laboratory facilities.

3. Cureus. 2022 Jun 16;14(6):e25985. doi: 10.7759/cureus.25985. eCollection 2022 Jun.
Sudden Cardiac Arrest During a Prolonged Liposuction and Lipofilling Procedure: A Case Report.
Foula AS(1), Ahmed MA(2), Foula MS(3), Nassar MW(4).
ABSTRACT
Liposuction is a popular cosmetic procedure. Recently, there has been an increase in the reported complications. Fat embolism syndrome (FES) is a rare life-threatening condition with challenging diagnosis. A young lady was admitted for liposuction and lipofilling procedure. After 180 minutes, cardiac arrest happened. She was revived after cardiopulmonary resuscitation. She was tachypneic, hypoxic, and feverish. Her chest x-rays were suggestive of acute respiratory distress syndrome. After exclusion of other differential diagnoses, she was diagnosed as post-arrest state on top of FES. Fortunately, she showed a gradual improvement, starting from the fourth day and was discharged to a regular ward on the sixth day. Sudden cardiac arrest during liposuction is a dreadful complication that may occur in healthy persons due to FES. Its diagnosis depends on high index of clinical suspicion and use of special criteria and scoring systems. The management depends on conservative measures with/without steroids administration.

4. Cureus. 2022 Jun 16;14(6):e26011. doi: 10.7759/cureus.26011. eCollection 2022 Jun.
An Unusual Presentation of Type B Aortic Dissection as Out-of-Hospital Cardiac Arrest Complicated by Spinal and Renal Ischaemia Along With Atrial Fibrillation, Stroke, and Severe Stenosis in Obtuse Marginal Branch: A Therapeutic Dilemma.
Khan Z(1)(2)(3), Besis G(3), Yousif Y(4), Gupta A(5)(6).
ABSTRACT

Aortic dissection (AD) is a catastrophic cardiovascular problem that can be challenging to diagnose sometimes. Despite diagnostic challenges, it requires a high degree of suspicion and prompt treatment is vital to its successful management. AD can be divided into type A aortic dissection (TAAD) and type B aortic dissection (TBAD). TAAD is characterised by dissection in the ascending aorta whereas TBAD does not have dissection in the ascending aorta. TBAD is usually managed conservatively, and patients receive medical therapy such as antihypertensive medications, analgesia, and rehabilitation. This, however, is complicated by malperfusion of certain organs, which can be life-threatening. Patients who have malperfusion of certain organs should be managed aggressively and endovascular aortic repair should be considered in such cases. We present a case of a 63-year-old patient who presented with out-of-hospital pulseless electrical activity cardiac arrest and was successfully resuscitated. An electrocardiogram showed new-onset atrial fibrillation with ST-segment depression and a coronary angiogram showed severe stenosis in the obtuse marginal branch of the left circumflex artery. A computed tomography scan of the thorax and abdomen showed TBAD with an occluded right renal artery and the patient was conservatively managed. The patient was discharged home after prolonged hospital admission and was conservatively managed for TBAD. This case was complicated by the fact that the patient had an out-of-hospital cardiac arrest and a coronary angiogram showed severe stenosis in the obtuse marginal branch of the left circumflex artery. The patient also had new-onset atrial fibrillation, which made his clinical management very challenging. It is important to avoid unnecessary coronary intervention that can create more challenges in managing such patients.

5. Am J Emerg Med. 2022 Jul 14:S0735-6757(22)00451-X. doi: 10.1016/j.ajem.2022.07.016. Online ahead of print.

Cardiac arrest in a young woman: A near miss diagnosis.

Carinci V(1), Cardelli LS(2), Gamberini L(3), Gualandi F(4), Tonelli L(4), Dal Passo B(2), Semeraro F(3), Gordini G(3), Casella G(2).

ABSTRACT

Catecholaminergic polymorphic ventricular tachycardia (CPVT) is a rare channelopathy involving cardiac calcium metabolism that often shows up at an early age with misleading clinical symptoms such as emotion or exercise-related syncope with a normal resting ECG, however, if misdiagnosed, CPVT can lead to cardiac arrest in children or young adults. We describe the case of a 27-year-old woman with several misdiagnosed syncopal episodes leading to out-of-hospital cardiac arrest (OHCA). Her previous medical history, combined with automatic external defibrillator records (AED) and clinical data, strongly suggested the diagnosis of CPVT. Thus beta blocker therapy was immediately started and targeted genetic test undertaken, revealing a previously unreported heterozygous variant in the ryanodine receptor-2 (RYR2) gene.

6. Am J Emerg Med. 2022 Jul 16:S0735-6757(22)00457-0. doi: 10.1016/j.ajem.2022.07.019. Online ahead of print.

Cases of prolonged cardiac arrest with preserved gasping successfully resuscitated with ECPR.

Okamoto N(1), Bunya N(2), Kakizaki R(2), Nishikawa R(3), Nagano N(3), Kokubu N(3), Narimatsu E(2), Nara S(4).

ABSTRACT

Longer cardiopulmonary resuscitation (CPR) time is associated with worsened neurological outcomes in out-of-hospital cardiac arrest (OHCA). Gasping during CPR is a favorable neurological predictor for OHCA. Recently, the efficacy of extracorporeal cardiopulmonary resuscitation (ECPR) in refractory cardiac arrest has been reported. However, the significance of gasping in refractory cardiac arrest patients with long CPR durations treated with ECPR is still unclear. We report two cases of cardiac arrest with gasping that were successfully resuscitated by ECPR, despite extremely

long low-flow times. In case 1, a 58-year-old man presented with cardiac arrest and ventricular fibrillation (VF). Gasping was observed when the patient arrived at the hospital. ECPR was initiated 82 min after cardiac arrest. The patient was diagnosed with hypertrophic cardiomyopathy. ECMO was withdrawn on day 4, and the patient was discharged without neurological impairment. In case 2, a 49-year-old man experienced cardiac arrest with VF, and his gasping was preserved during transportation. On arrival, VF persisted, and gasping was observed; therefore, ECMO was initiated 93 min after cardiac arrest. He was diagnosed with acute myocardial infarction. ECMO was withdrawn on day 4 and he was discharged from the hospital without any neurological impairment. Resuscitation and ECPR should not be abandoned in case of preserved gasping, even when the low-flow time is extremely long.

7. Front Med (Lausanne). 2022 Jun 29;9:936721. doi: 10.3389/fmed.2022.936721. eCollection 2022.
Case Report: Extracorporeal Membrane Oxygenation Followed by Intra-Aortic Balloon Counterpulsation Successfully Treated Cardiac Arrest Caused by Anomalous Origin of a Left Coronary Artery From the Right Coronary Sinus.
Xu X(1), Xu P(2), Wu X(1), Lin H(1), Chen Y(3), Hu X(4), Yu J(1), Zheng R(1).
ABSTRACT
BACKGROUND: Anomalous origin of a coronary artery (AOCA) is defined as the failure of the coronary artery to originate from the normal coronary sinus. The anomalous origin of the left coronary artery arising from the right coronary sinus is rare, dangerous and at risk of malignant arrhythmia, sudden death, and high mortality. CASE PRESENTATION: In this study, we present a 14-year-old adolescent male who went to a hospital with transient unconsciousness after exercise, who subsequently developed cardio arrest due to malignant arrhythmia. He was admitted to the intensive care unit, and who subsequently received successful veno-arterial extracorporeal membrane oxygenation (VA ECMO) assisted circulation followed by intra-aortic balloon counterpulsation (IABP). Echocardiography and cardiac CTA were also performed, further confirming that the abnormal left coronary artery originated from the right coronary sinus. The patient subsequently underwent heart surgery. CONCLUSION: The successful treatment of the patient in this report was attributed to the immediately VA ECMO, supplemented by IABP. Establishing clear diagnosis is a process of multidisciplinary joint diagnosis, which provides a reference for clinicians when encountering similar cases.

8. BMJ Case Rep. 2022 Jul 18;15(7):e250557. doi: 10.1136/bcr-2022-250557.
Westermark sign on chest X-ray in a patient following cardiac arrest due to massive pulmonary embolism.
Celi J(1), Berger A(2), Lungu A(3), Grosgurin O(2).
NO ABSTRACT AVAILABLE

9. Clin Exp Emerg Med. 2022 Jul 22. doi: 10.15441/ceem.21.086. Online ahead of print.
Fatal arrhythmia following ingestion of hawthorn root (Crataegus pubescens) extract: a case report.
Villegas-Belman S(1), Esparza-Gallegos TC(1), Lizalde-Moreno JA(1), Marquez-Romero JM(2).
ABSTRACT
The use of extracts from the hawthorn plant as cardiovascular agents dates back to the 1st century; recently, they have also been made available online as weight loss aids. Herein, we present a case of intentional intoxication with hawthorn root extract (HRE) in an adult patient that resulted in death. A 20-year-old female patient, who was clinically diagnosed with depression, developed hypotension, bradycardia, and depressed consciousness after ingestion of this extract. An electrocardiogram recorded a sinus arrest with a slow nodal rhythm, which rapidly deteriorated, leading to cardiac arrest. This case report illustrates the potentially fatal consequences of HRE for which the constituents have not yet been characterized. All physicians, especially those in the emergency

department, should be aware of the dangerous, even potentially fatal interactions of HRE with prescription medications.

10. J Rural Med. 2022 Jul;17(3):181-183. doi: 10.2185/jrm.2022-008. Epub 2022 Jul 1.
Cardiopulmonary arrest due to bronchoscopy-induced Takotsubo syndrome in a patient with antineutrophil cytoplasmic autoantibody-associated lung disease: a case report.
Okano Y(1), Yamasaki T(2), Imai R(3), Okazaki H(4), Higuchi Y(4), Shinohara T(5)(6)(7).
ABSTRACT
Objective: Cardiac arrest (CA) has been observed in some patients with Takotsubo syndrome (TTS), most of whom had CA at the initial presentation of TTS. The objective of this report was to discuss the factors underlying the onset of this syndrome. Case presentation: A 72-year-old woman with refractory antineutrophil cytoplasmic autoantibody-associated lung disease was referred to our hospital. Twenty minutes after bronchoscopic examination, cardiopulmonary arrest suddenly occurred. Resuscitation immediately resumed her heartbeat and spontaneous breathing. Subsequent 12-lead electrocardiography, echocardiography, and left ventricular angiography revealed TTS. Conclusion: This case indicates that bronchoscopy can cause severe TTS, especially in patients with systemic inflammation.

11. Cureus. 2022 Jun 23;14(6):e26228. doi: 10.7759/cureus.26228. eCollection 2022 Jun.
A Case of Compartment Syndrome Due to Out-of-Hospital Intraosseous Misplacement During Cardiopulmonary Resuscitation.
Singh A(1), Singh D(2).
ABSTRACT
Resuscitation relies heavily on gaining access to the circulatory system. During cardiopulmonary resuscitation (CPR), the biggest, most readily accessible vein that does not impede resuscitation is desired. Intraosseous (IO) access is designated for life-threatening emergencies and is a relatively safe procedure with fewer complications. We describe an intriguing and uncommon consequence of out-of-hospital IO placement: compartment syndrome resulting from the displacement of the IO needle by emergency medical services (EMS) workers in a diabetic woman with hypoglycemia. A few hours later, the patient had swelling, discomfort, and loss of motor and sensory sensations at the IO site, necessitating further examinations. The IO needle had traversed both the anterior and posterior cortices of the tibia and was located in the soft tissues along the posterior portion of the tibia as shown by imaging of the afflicted area. Immediate decompression fasciotomy was performed to preserve the patient's limb.

12. Ann Emerg Med. 2022 Aug;80(2):170-177. doi: 10.1016/j.annemergmed.2022.01.037.
Woman With Cardiac Arrest.
Wilson C(1), Mackenzie D(1), Croft P(1), Hansen J(2), Rehberg J(2), Fried A(1).
NO ABSTRACT AVAILABLE