This week's PubMed 26th June – 16th July 2022: articles of interest n = 120

CPR AND COVID-19

1. Pediatrics. 2022 Jul 12. doi: 10.1542/peds.2021-056043. Online ahead of print.

Guidance for Cardiopulmonary Resuscitation of Children With Suspected or Confirmed COVID-19.

Morgan RW(1), Atkins DL(2), Hsu A(3), Kamath-Rayne BD(4), Aziz K(5), Berg RA(1), Bhanji F(6), Chan M(7), Cheng A(8), Chiotos K(1), de Caen A(9), Duff JP(9), Fuchs S(10), Joyner BL Jr(11), Kleinman M(12), Lasa JJ(13), Lee HC(14), Lehotzky RE(15), Levy A(16), McBride ME(17), Meckler G(7), Nadkarni V(1), Raymond T(18), Roberts K(19), Schexnayder SM(20), Sutton RM(21), Terry M(22), Walsh B(23), Zelop CM(24), Sasson C(6), Topjian A(1).

ABSTRACT

This document aims to provide guidance to healthcare workers for the provision of basic and advanced life support to children and neonates with suspected or confirmed COVID-19. It aligns with the 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care while providing strategies for reducing risk of transmission of SARS-CoV-2 to healthcare providers. Patients with suspected or confirmed COVID-19 and cardiac arrest should receive chest compressions and defibrillation, when indicated, as soon as possible. Due to the importance of ventilation during pediatric and neonatal resuscitation, oxygenation and ventilation should be prioritized. All CPR events should therefore be considered aerosol-generating procedures (AGPs). Thus, personal protective equipment (PPE) appropriate for AGPs (including N95 respirators or an equivalent) should be donned prior to resuscitation and high-efficiency particulate air (HEPA) filters should be utilized. Any personnel without appropriate PPE should be immediately excused by providers wearing appropriate PPE. Neonatal resuscitation guidance is unchanged from standard algorithms except for specific attention to infection prevention and control. In summary, healthcare personnel should continue to reduce the risk of SARS-CoV-2 transmission through vaccination and use of appropriate PPE during pediatric resuscitations. Healthcare organizations should ensure the availability and appropriate use of PPE. As delays or withheld CPR increases the risk to patients for poor clinical outcomes, children and neonates with suspected or confirmed COVID-19 should receive prompt, high-quality CPR in accordance with evidence-based guidelines.

CPR/MECHANICAL CHEST COMPRESSION

1. Prehosp Emerg Care. 2022 Jul 14:1-5. doi: 10.1080/10903127.2022.2095066. Online ahead of print.

Effect of Wearing N95 Mask on the Quality of Chest Compressions in Prehospital Emergency Personnel: A Cross-over Study.

Chen L(1), Shen Y(2), Liu S(1), Cao Y(1), Zhu Z(2).

ABSTRACT

OBJECTIVE: To evaluate the effect of wearing an N95 mask on the quality of chest compression and fatigue of prehospital emergency personnel during cardiopulmonary resuscitation (CPR). METHODS: Twenty-four eligible participants were recruited. Participants' age, sex, height, and weight were recorded. After completing the CPR training and examination, participants were tested twice, wearing surgical mask or an N95 mask, while performing chest compressions for 2 minutes. The quality of chest compression (including compression frequency, depth, rebound, and position) was recorded by the simulator. Borg fatigue scores and physiological parameters (including heart rate, mean arterial pressure, pulse oxygen saturation, and respiratory rate) were recorded before and

after chest compressions. RESULTS: Compared to wearing surgical masks, participants wearing N95 masks had significantly lower quality of chest compression, including compression frequency (98.3 ± 4.9 bpm vs 104.0 ± 6.0 bpm, P < 0.001), depth (47.1 ± 4.5 mm vs 50.5 ± 5.4 mm, P < 0.001), and rebound (90.2 ± 2.7% vs 94.3 ± 2.1%, P < 0.001). The compression position was not affected. The period data showed that the difference in compression quality started after 1 minute of compressions. Participants wearing N95 masks had higher Borg fatigue scores [6.1(2) vs 5.1(2), P < 0.001], heart rates (121.2 ± 5.7 bpm vs 109.9 ± 6.0 bpm, P < 0.001), mean arterial pressures (106.3 ± 8.0 mmHg vs 99.0 ± 8.5 mmHg, P = 0.012), and respiratory rates (29.5 ± 2.7 bpm vs 24.7 ± 2.5 bpm, P < 0.001). CONCLUSION: This study showed that the use of an N95 mask by prehospital emergency personnel during the performance of chest compressions resulted in a reduction of compression quality and increased clinician fatigue. There is a need for CPR training for medical personnel wearing personal protective equipment.

2. J Clin Med. 2022 Jul 4;11(13):3872. doi: 10.3390/jcm11133872.

Prognostic Factors in Patients with Sudden Cardiac Arrest and Acute Myocardial Infarction Undergoing Percutaneous Interventions with the LUCAS-2 System for Mechanical Cardiopulmonary Resuscitation.

Chyrchel M(1), Hałubiec P(2), Duchnevič O(2), Łazarczyk A(2), Okarski M(2), Januszek R(3), Rzeszutko Ł(1), Bartuś S(1), Surdacki A(1).

ABSTRACT

Sudden cardiac arrest (SCA) is one of the most perilous complications of acute myocardial infarction (AMI). For years, the return of spontaneous circulation (ROSC) has had to be achieved before the patient could be treated at the catheterization laboratory, as simultaneous manual chest compression and angiography were mutually exclusive. Mechanical chest compression devices enabled simultaneous resuscitation and invasive percutaneous procedures. The aim was to characterize the poorer responders that would allow one to predict the positive outcome of such a treatment. We retrospectively analyzed the medical charts of 94 patients with SCA due to AMI, who underwent mechanical cardiopulmonary resuscitation during angiography. In total, 48 patients, 8 (17%) of which survived the event, were included in the final analysis, which revealed that 83% of the survivors had mild to moderate hyperkalemia (potassium 5.0-6.0 mmol/L), in comparison to 15% of non-survivors (p = 0.002). In the age- and sex-adjusted model, patients with serum potassium > 5.0 mmol/L had 4.61-times higher odds of survival until discharge from the hospital (95% CI: 1.41-15.05, p = 0.01). Using the highest Youden index, we identified the potassium concentration of 5.1 mmol/L to be the optimal cut-off value for prediction of survival until hospital discharge (83.3% sensitivity and 87.9% specificity). The practical implications of these findings are that patients with potassium levels between 5.0 and 6.0 mmol/L may actually benefit most from percutaneous coronary interventions with ongoing mechanical chest compressions and that they do not need immediate correction for this electrolyte abnormality.

3. Aust Crit Care. 2022 Jul 6:S1036-7314(22)00067-4. doi: 10.1016/j.aucc.2022.05.003. Online ahead of print.

The use of a backboard during cardiopulmonary resuscitation and chest compression quality.

Houthoofdt R(1), Cuvelier Z(2), Serraes B(3), Haentjens C(4), Mpotos N(5), Blot S(6).

NO ABSTRACT AVAILABLE

REGISTRIES, REVIEWS AND EDITORIALS

1. Prehosp Emerg Care. 2022 Jul 20:1-8. doi: 10.1080/10903127.2022.2096160. Online ahead of print.

Association of Initial Pulseless Electrical Activity Heart Rate and Clinical Outcomes following Adult Non-Traumatic Out-of-Hospital Cardiac Arrest.

Cournoyer A(1)(2)(3)(4), Cavayas YA(5)(6)(7), Albert M(5)(6)(7), Segal E(2)(4)(8)(9), Lamarche Y(6)(7)(10), Potter BJ(5)(11), de Montigny L(4), Chauny JM(1)(2), Paquet J(2), Marquis M(2), Cossette S(12), Castonguay V(1)(2), Morris J(1)(2), Lessard J(1)(2), Daoust R(1)(2).

ABSTRACT

OBJECTIVE: Studies evaluating the prognostic value of the pulseless electrical activity (PEA) heart rate in out-of-hospital cardiac arrest (OHCA) patients have reported conflicting results. The objective of this study was to evaluate the association between the initial PEA heart rate and favorable clinical outcomes for OHCA patients. METHODS: The present post-hoc cohort study used the Resuscitation Outcomes Consortium Cardiac Epidemiologic Registry Version 3, which included OHCA patients in seven US and three Canadian sites from April 2011 to June 2015. The primary outcome was survival to hospital discharge and the secondary outcome was survival with a good functional outcome. For the primary analysis, the patients were separated into eight groups according to their first rhythms and PEA heart rates: (1) initial PEA heart rate of 1-20 beats per minute (bpm); (2) 21-40 bpm; (3) 41-60 bpm; (4) 61-80 bpm; (5) 81-100 bpm; (6) 101-120 bpm; (7) over 120 bpm; (8) initial shockable rhythm (reference category). Multivariable logistic regression models were used to assess the associations of interest. RESULTS: We identified 17,675 patients (PEA: 7,089 [40.1%]; initial shockable rhythm: 10,797 [59.9%]). Patients with initial PEA electrical frequencies ≤100 bpm were less likely to survive to hospital discharge than patients with initial shockable rhythms (1-20 bpm: adjusted odds ratio [AOR] = 0.15 [95%CI 0.11-0.21]; 21-40 bpm: AOR = 0.21 [0.18-0.25]; 41-60 bpm: AOR = 0.30 [0.25-0.36]; 61-80 bpm: AOR = 0.37 [0.28-0.49]; 81-100 bpm: AOR = 0.55 [0.41-0.65]). However, there were no statistical outcome differences between PEA patients with initial electrical frequencies of >100 bpm and patients with initial shockable rhythms (101-120 bpm: AOR = 0.65 [95%CI 0.42-1.01]; >120 bpm: AOR = 0.72 [95%CI 0.37-1.39]). Similar results were observed for survival with good functional outcomes (101-120 bpm: AOR = 0.60 [95%CI 0.31-1.15]; >120 bpm: AOR = 1.08 [95%CI 0.50-2.28]). CONCLUSIONS: We observed a good association between higher initial PEA electrical frequency and favorable clinical outcomes for OHCA patients. As there is no significant difference in outcomes between patients with initial PEA heart rates of more than 100 bpm and those with initial shockable rhythms, we can hypothesize that these patients could be considered in the same prognostic category.

2. Resuscitation. 2022 Jun 26:S0300-9572(22)00581-0. doi: 10.1016/j.resuscitation.2022.06.016. Online ahead of print.

Out-of-hospital cardiac arrest in pregnant women: A 55-patient French cohort study.

Canon V(1), Recher M(2), Lafrance M(3), Wawrzyniak P(4), Vilhelm C(3), Agostinucci JM(5), Thiriez S(6), Mansouri N(7), Morel-Maréchal E(8), Lagadec S(9), Leroy A(10), Vermersch C(11), Javaudin F(12), Hubert H(3); GR-RéAC.

ABSTRACT

AIM: To describe a cohort of pregnant women having suffered an out-of-hospital cardiac arrest (OHCA) and to compare them with nonpregnant women of childbearing age having suffered OHCA. METHODS: Study data were extracted from the French National OHCA Registry between 2011 and 2021. We compared patients in terms of characteristics, care and survival. RESULTS: We included 3,645 women of childbearing age (15-44) who had suffered an OHCA; 55 of the women were pregnant. Pregnant women were younger than nonpregnant victims (30 vs. 35 years, p = 0.006) and

were more likely to have a medical history (76.4% vs. 50.5%, p < 0.001) and a medical cause of the OHCA (85.5% vs. 57.2%, p < 0.001). Advanced Life Support was more frequently administered to pregnant women (98.2%, vs. 72.0%; p < 0.001). In pregnant women, the median time of MICU arrival was 20 minutes for the Medical Intensive Care Unit with no difference with nonpregnant women. Survival rate on admission to hospital was higher among pregnant women (43.6% vs. 27.3%; p = 0.009). There was no difference in 30-day survival between pregnant and nonpregnant groups (14.5% vs. 7.3%; p = 0.061). Fetal survival was only observed for OHCAs that occurred during the pregnancy second or third trimester (survival rates: 10.0% and 23.5%, respectively). CONCLUSIONS: Our results show that resuscitation performance does not meet European Resuscitation Council's specific guidelines on OHCA in pregnant women. Although OHCA in pregnancy is rare, the associated prognosis is poor for both woman and fetus. Preventive measures should be reinforced, especially when pregnant women have medical history.

3. World J Pediatr Congenit Heart Surg. 2022 Jul;13(4):475-481. doi: 10.1177/21501351221100791.
Cardiac Arrest in Children Following Cardiac Surgery: A Scoping Review of Contributing Factors.
Riley CM(1), Murphy LD(2), Mastropietro CW(2).

ABSTRACT

Nearly half of children experiencing cardiac arrest following cardiac surgery do not survive hospital discharge and patients who survive often experience significant neurological impairment. Additionally, increased resource utilization following cardiac arrest translates into adverse logistical and financial consequences. Although some studies have identified patient characteristics that increase the risk of cardiac arrest after pediatric cardiac surgery, modifiable risk factors, which could provide a foundation for effective prevention strategies, have been elusive. This scoping review explores the current knowledge surrounding risk factors associated with cardiac arrest in children following cardiac surgery and provides recommendations for future research.

4. Eur J Emerg Med. 2022 Jul 5. doi: 10.1097/MEJ.0000000000000958. Online ahead of print.
Outcome differences between PARAMEDIC2 and the German Resuscitation Registry: a secondary analysis of a randomized controlled trial compared with registry data.
Knapp J(1)(2), Huber M(1), Gräsner JT(3), Bernhard M(4), Fischer M(5).

ABSTRACT

BACKGROUND AND IMPORTANCE: There has been much discussion of the results of the PARAMEDIC2 trial, as resuscitation outcome rates are considerably lower in this trial than in country-level registries on out-of-hospital cardiac arrest (OHCA). Here, we developed a statistical framework to investigate this gap and to examine possible sources for observed discrepancies in outcome rates. DESIGN: Summary data from the PARAMEDIC2 trial were used as available in the publication of this study. We developed a modelling framework based on logistic regression to compare data from this randomized controlled trial and registry data from the German Resuscitation Registry (GRR), where we considered 26 019 patients treated with epinephrine for OHCA in the GRR. To account and adjust for differences in patient characteristics and baseline variables predictive for outcomes after OHCA between the GRR cohort and the PARAMEDIC2 study sample, we included all available variables determined at the arrival of EMS personnel in the modelling framework: age, sex, initial cardiac rhythm, cause of cardiac arrest, witness of cardiac arrest, CPR performed by a bystander, and the interval between emergency call and arrival of the ambulance at the scene (baseline model). In order to find possible explanations for the discrepancies in outcome between PARAMEDIC2 and GRR, in a second (baseline plus treatment) model, we additionally included all available variables related to the interventions of the EMS personnel (type of airway management, type of vascular

access, and time to administration of epinephrine). MAIN RESULTS: A patient cohort with baseline variables as in the PARAMEDIC2 trial would have survived to hospital discharge in 7.7% and survived with favourable neurological outcome in 5.0% in an EMS and health care system as in Germany, compared with 3.2 and 2.2%, respectively, in the Epinephrine group of the trial. Adding treatment-related variables to our logistic regression model, the rate of survival to discharge would decrease from 7.7 (for baseline variables only) to 5.6% and the rate of survival with favourable neurological outcome from 5.0 to 3.4%. CONCLUSION: Our framework helps in the medical interpretation of the PARAMEDIC2 trial and the transferability of the trial's results for other EMS systems. Significantly higher rates of survival and favourable neurological outcome than reported in this trial could be possible in other EMS and health care systems.

5. BMC Emerg Med. 2022 Jul 7;22(1):121. doi: 10.1186/s12873-022-00685-7.
Effect of annual hospital admissions of out-of-hospital cardiac arrest patients on prognosis following cardiac arrest.
Tsuchida T(1), Ono K(2), Maekawa K(3), Hayamizu M(3), Hayakawa M(3).
ABSTRACT
BACKGROUND: Although the prognosis of patients treated at specialized facilities has improved, the relationship between the number of patients treated at hospitals and prognosis is controversial and lacks constancy in those with out-of-hospital cardiac arrest (OHCA). This study aimed to clarify the effect of annual hospital admissions on the prognosis of adult patients with OHCA by analyzing a large cohort. METHODS: The effect of annual hospital admissions on patient prognosis was analyzed retrospectively using data from the Japanese Association for Acute Medicine OHCA registry, a nationwide multihospital prospective database. This study analyzed 3632 of 35,754 patients hospitalized for OHCA of cardiac origin at 86 hospitals. The hospitals were divided into tertiles based on the volume of annual admissions. The effect of hospital volume on prognosis was analyzed using logistic regression analysis with multiple imputation. Furthermore, three subgroup analyses were performed for patients with return of spontaneous circulation (ROSC) before arrival at the emergency department, patients admitted to critical care medical centers, and patients admitted to extracorporeal membrane oxygenation-capable hospitals. RESULTS: Favorable neurological outcomes 30 days after OHCA for patients overall showed no advantage for medium- and high-volume centers over low-volume centers; Odds ratio (OR) 0.989, (95% Confidence interval [CI] 0.562-1.741), OR 1.504 (95% CI 0.919-2.463), respectively. However, the frequency of favorable neurological outcomes in OHCA patients with ROSC before arrival at the emergency department at high-volume centers was higher than those at low-volume centers (OR 1.955, 95% CI 1.033-3.851). CONCLUSION: Hospital volume did not significantly affect the prognosis of adult patients with OHCA. However, transport to a high-volume hospital may improve the neurological prognosis in OHCA patients with ROSC before arrival at the emergency department.

6. Resusc Plus. 2022 Jun 28;11:100264. doi: 10.1016/j.resplu.2022.100264. eCollection 2022 Sep.
Emotions in telephone calls to emergency medical services involving out-of-hospital cardiac arrest: A scoping review.
Ngo H(1)(2), Birnie T(1), Finn J(1)(2)(3)(4), Ball S(1)(3), Perera N(1).
ABSTRACT
AIMS: The purpose of this scoping review was to identify and synthesise existing research evidence on emotions in the context of emergency phone calls to emergency medical services (EMS) involving out-of-hospital cardiac arrest (OHCA). The specific objectives were to identify studies that (1) described emotions during emergency OHCA calls; (2) specified an instrument or method for measuring /assessing emotions; and (3) examined the relationship between emotions and call

outcomes or patient outcomes. METHODS/DATA SOURCES: Five databases were searched on 18 November 2021: Medline, Embase, PsycInfo, CINAHL, and the Cochrane Review Database. Included studies required the following three concepts to be addressed: emotions in the context of EMS calls that involved OHCA. Calls also needed to be made by a 'second-party' caller; and each study needed to address at least one of the three specific objectives, as outlined above.The review was conducted in accordance with the Joanna Briggs Institute guidelines for evidence synthesis for scoping reviews. RESULTS: Thirteen eligible studies were included for synthesis. All studies met Objective 1; six studies met Objective 2; and seven met Objective 3. One study reported patient fatality due to heightened emotions and ensuing ineffective communications between callers and call-takers. CONCLUSION: The review highlights a significant gap in the evidence base of emotions in emergency OHCA-related calls, and the need for a more comprehensive and effective method in assessing and measuring emotions in this context. Relationships between emotions (their expressions and perceptions) and call outcomes (including patient outcomes) also need more rigorous investigation.

7. Resuscitation. 2022 Jul 3:S0300-9572(22)00588-3. doi: 10.1016/j.resuscitation.2022.06.023. Online ahead of print.

Lack of early etiologic investigations in young sudden cardiac death.

Sharifzadehgan A(1), Gaye B(2), Bougouin W(3), Narayanan K(4), Dumas F(5), Karam N(6), Rischard J(7), Plu I(8), Waldmann V(6), Algalarrondo V(9), Gandjbakhch E(10), Bruneval P(11), Beganton F(12), Alonso C(13), Moubarak G(13), Piot O(14), Lamhaut L(15), Jost D(16), Sideris G(17), Mansencal N(18), Deye N(19), Voicu S(19), Megarbane B(19), Geri G(20), Vieillard-Baron A(21), Lellouche N(22), Extramiana F(9), Wahbi K(23), Varenne O(23), Cariou A(24), Jouven X(6), Marijon E(25); SDEC investigators.

ABSTRACT

BACKGROUND: Since majority of sudden cardiac arrest (SCA) victims die in the intensive care unit (ICU), early etiologic investigations may improve understanding of SCA and targeted prevention. METHODS: In this prospective, population-based registry all SCA admitted alive across the 48 hospitals of the Paris area were enrolled. We investigated the extent of early etiologic work-up among young SCD cases (<45 years) eventually dying within the ICU. RESULTS: From May 2011 to May 2018, 4,314 SCA patients were admitted alive. Among them, 3,044 died in ICU, including 484 (15.9%) young patients. SCA etiology was established in 233 (48.1%) and remained unexplained in 251 (51.9%). Among unexplained (compared to explained) cases, coronary angiography (17.9 vs. 49.4%, $P < 0.001$), computed tomography scan (24.7 vs. 46.8%, $P < 0.001$) and trans-thoracic echocardiography (31.1 vs. 56.7%, $P < 0.001$) were less frequently performed. Only 22 (8.8%) patients with unexplained SCD underwent all three investigations. SCDs with unexplained status decreased significantly over the 7 years of the study period (from 62.9 to 35.2%, $P = 0.005$). While specialized TTE and CT scan performances have increased significantly, performance of early coronary angiography did not change. Autopsy, genetic analysis and family screening were performed in only 48 (9.9%), 5 (1.0%) and 14 cases (2.9%) respectively. CONCLUSIONS: More than half of young SCD dying in ICU remained etiologically unexplained; this was associated with a lack of early investigations. Improving early diagnosis may enhance both SCA understanding and prevention, including for relatives. Failure to identify familial conditions may result in other preventable deaths within these families.

8. World J Emerg Med. 2022;13(4):290-296. doi: 10.5847/wjem.j.1920-8642.2022.071.

Global research trends in cardiac arrest research: a visual analysis of the literature based on CiteSpace.

Yan SJ(1)(2), Chen M(3), Wen J(4), Fu WN(4)(5), Song XY(6), Chen HJ(1), Wang RX(6), Chen ML(7), Han XT(8), Lyu CZ(5)(9).

ABSTRACT

BACKGROUND: The high morbidity, high mortality and low survival rate of cardiac arrest (CA) cause a heavy global burden. We aimed to analyze the changes in scientific output related to CA over the past two decades. METHODS: We analyzed the scientific output related to CA from 2000 to 2020 via the Web of Science. The data were analyzed using CiteSpace software. RESULTS: In total, 28,312 articles relating to CA were identified in the Web of Science. The volume of scientific research output in the field of global CA research was mainly distributed in the Americas, Europe and Asia, covering a wide range. Of the 28,312 articles, the research content of the highly cited literature mainly focused on CA, mild hypothermia treatment, and prognosis of CA patients. CONCLUSION: Various scientific methods were applied to reveal scientific productivity, collaboration, and research hotspots in the CA research field. Cardiopulmonary resuscitation (CPR), extracorporeal membrane oxygenation (ECMO), survival and target temperature management are research hotspots. Future research on CA will continue to focus on its treatment and prognosis to improve the survival rate of CA patients.

9. Resusc Plus. 2022 Jul 1;11:100266. doi: 10.1016/j.resplu.2022.100266. eCollection 2022 Sep.

Outcomes in adults living with frailty receiving cardiopulmonary resuscitation: A systematic review and meta-analysis.

Hamlyn J(1), Lowry C(1), Jackson TA(1)(2), Welch C(1)(2).

ABSTRACT

BACKGROUND: Frailty is a clinical expression of adverse ageing which could be a valuable predictor of outcomes from cardiac arrest. The aim of this systematic review was to evaluate survival outcomes in adults living with frailty versus adults living without frailty receiving cardiopulmonary resuscitation (CPR) following cardiac arrest. METHODS: A comprehensive search of MEDLINE, EMBASE, CINAHL, and Web of Science databases was performed using pre-defined search terms, with no date or language restrictions applied. Prospective and retrospective observational studies measuring outcomes from CPR in adults assessed for frailty using an accepted clinical definition were selected. RESULTS: Eight eligible studies were included. Seven retrospective observational studies presenting high methodological quality were included in a meta-analysis comprising 1704 participants. Frailty was strongly associated with an increased likelihood of mortality after CPR, with moderate inter-study heterogeneity (OR = 3.56, 95% CI = 2.74-4.63, I2 = 71%). DISCUSSION: This review supports the consideration of frailty status in a holistic approach to CPR. The present findings suggest that frailty status provides valuable prognostic information and could complement other known pre-arrest prognostic factors such as comorbidities in the context of Do Not Attempt CPR consideration. Awareness of the poorer outcomes in those living with frailty could support the identification of individuals less likely to benefit from CPR. Validation of our findings and evaluation of quality-of-life in frail individuals surviving cardiac arrest are prerequisites for the future integration of frailty status into CPR clinical decision-making.

10. BMJ Open. 2022 Jul 12;12(7):e058945. doi: 10.1136/bmjopen-2021-058945.

Differences in self-reported health between cardiac arrest survivors with good cerebral performance and survivors with moderate cerebral disability: a nationwide register study.

Larsson K(1), Hjelm C(2), Lilja G(3), Strömberg A(2)(4), Årestedt K(5)(6).

ABSTRACT

OBJECTIVE: The aim was to compare self-reported health between cardiac arrest survivors with good cerebral performance (CPC 1) and survivors with moderate cerebral disability (CPC 2). METHODS: This comparative register study was based on nationwide data from the Swedish Register of

Cardiopulmonary Resuscitation. The study included 2058 in-hospital and out-of-hospital cardiac arrest survivors with good cerebral performance or survivors with moderate cerebral disability, 3-6 months postcardiac arrest. Survivors completed a questionnaire including the Hospital Anxiety and Depression Scale (HADS) and EQ-5D five-levels (EQ-5D-5L). Data were analysed using ordinal and linear regression models. RESULTS: For all survivors, the prevalence of anxiety and depression symptoms measured by the HADS was 14% and 13%, respectively. Using the EQ-5D-5L, the cardiac arrest survivors reported most health problems relating to pain/discomfort (57%), followed by anxiety/depression (47%), usual activities (46%), mobility (40%) and self-care (18%). Compared with the survivors with good cerebral performance, survivors with moderate cerebral disability reported significantly higher symptom levels of anxiety and depression measured with HADS, and poorer health in all dimensions of the EQ-5D-5L after adjusting for age, sex, place of cardiac arrest, aetiology and initial rhythm ($p<0.001$). CONCLUSIONS: These findings stress the importance of screening for health problems in all cardiac arrest survivors to identify those in need of professional support and rehabilitation, independent on neurological outcome.

11. Am J Emerg Med. 2022 Jul 8;59:118-120. doi: 10.1016/j.ajem.2022.07.006. Online ahead of print.
Sudden cardiac arrest in commercial airports: Incidence, responses, and implications.
Shekhar AC(1), Ruskin KJ(2).
ABSTRACT
Billions of travelers pass through airports around the world every year. Airports are a relatively common location for sudden cardiac arrest when compared with other public venues. An increased incidence of cardiac arrest in airports may be due to the large volume of movement, the stress of travel, or adverse effects related to the physiological environment of airplanes. Having said that, airports are associated with extremely high rates of witnessed arrests, bystander interventions (eg. CPR and AED use), shockable arrest rhythms, and survival to hospital discharge. Large numbers of people, a high density of public-access AEDs, and on-site emergency medical services (EMS) resources are probably the major reasons why cardiac arrest outcomes are so favorable at airports. The success of the chain of survival found at airports may imply that applying similar practices to other public venues will translate to improvements in cardiac arrest survival. Airports might, therefore, be one model of cardiac arrest preparedness that other public areas should emulate.

IN-HOSPITAL CARDIAC ARREST

1. Resuscitation. 2022 Jul;176:1-8. doi: 10.1016/j.resuscitation.2022.04.023. Epub 2022 Apr 28.
In-hospital versus out-of-hospital cardiac arrest: Characteristics and outcomes in patients admitted to intensive care after return of spontaneous circulation.
Andersson A(1), Arctaedius I(2), Cronberg T(3), Levin H(4), Nielsen N(5), Friberg H(6), Lybeck A(7).
ABSTRACT
INTRODUCTION: Cardiac arrest is characterized depending on location as in-hospital cardiac arrest (IHCA) or out-of-hospital cardiac arrest (OHCA). Strategies for Post Cardiac Arrest Care were developed based on evidence from OHCA. The aim of this study was to compare characteristics and outcomes in patients admitted to intensive care after IHCA and OHCA.METHODS: A retrospective multicenter observational study of adult survivors of cardiac arrest admitted to intensive care in southern Sweden between 2014-2018. Data was collected from registries and medical notes. The primary outcome was neurological outcome according to the Cerebral Performance Category (CPC) scale at 2-6 months. RESULTS: 799 patients were included, 245 IHCA and 554 OHCA. IHCA patients were older, less frequently male and less frequently without comorbidity. In IHCA the first recorded rhythm was more often non-shockable, all delay-times (ROSC, no-flow, low-flow, time to advanced life support) were shorter and a cardiac cause of the arrest was less common. Good long-term

neurological outcome was more common after IHCA than OHCA. In multivariable analysis, witnessed arrest, age, shorter arrest duration (no-flow and low-flow times), low lactate, shockable rhythm, and a cardiac cause were all independent predictors of good long-term neurological outcome whereas location of arrest (IHCA vs OHCA) was not. CONCLUSION: In patients admitted to intensive care after cardiac arrest, patients who suffered IHCA vs OHCA differed in demographics, co-morbidities, cardiac arrest characteristics and outcomes. In multivariable analyses, cardiac arrest characteristics were independent predictors of outcome, whereas location of arrest (IHCA vs OHCA) was not.

2. Heart Lung. 2022 Sep-Oct;55:29-33. doi: 10.1016/j.hrtlng.2022.04.007. Epub 2022 Apr 15.
Determining consistency of care after resuscitation from in-hospital cardiac arrest, a retrospective analysis at a tertiary care academic medical center.
Raikhel AV(1), Schulte V(2), Carlbom DJ(3), Town JA(4).
ABSTRACT
BACKGROUND: Few guidelines have focused on the care delivered after return of spontaneous circulation (ROSC). Post ROSC best practice guidelines lack clarity about important tasks to accomplish in the first hours after ROSC. OBJECTIVES AND METHODS: We conducted a retrospective cohort analysis of adults who had suffered an in hospital cardiac arrest (IHCA) with ROSC over a two-year period to determine the completion rate of critical tasks in the immediate post-ROSC period: ECG within one hour, ABG within one hour, physician documentation within six hours, and surrogate communication within six hours. RESULTS: In the 113 reviewed cases, there was significant variance between completion of all four (19.4%), three (35.3%), two (32.7%), one (20.6%) and none (1.7%) of these critical post ROSC tasks. We observed that 62.8% of IHCA with ROSC had an ECG obtained within one hour of ROSC. The rate of obtaining an ABG within one hour of ROSC was 76.9%. 49.5% of cases had physician documentation of the resuscitation within six hours of ROSC. The rate of documenting surrogate communication within six hours of ROSC was 69.9%. CONCLUSIONS: Our study demonstrated that the completion rates of critical tasks in the post ROSC setting were suboptimal within our patient cohort. This provides a baseline for the development of future best practice guidelines and clinical decision-making aids for post ROSC care after IHCA. This can lead to future research in coupling specific care tasks to post ROSC patient outcomes.

3. Resusc Plus. 2022 Jun 23;11:100259. doi: 10.1016/j.resplu.2022.100259. eCollection 2022 Sep.
A national effort to improve outcomes for in-hospital cardiac arrest in China: The BASeline Investigation of Cardiac Arrest (BASIC-IHCA).
Wang C(1), Zheng W(1), Zheng J(1), Shao F(2), Zhu Y(3), Li C(4), Ma Y(5), Tan H(6), Yan S(7), Han X(3), Pan C(1), Li C(1), Bian Y(1), Liu R(1), Cheng K(1), Zhang J(1), Ma J(1), Zhang Y(1), Zhang H(8), Yu X(9), Ong MEH(10), McNally B(11), Lv C(12), Zhang G(7), Chen Y(1), Xu F(1); BASIC-IHCA Coordinators, Investigators.
ABSTRACT
BACKGROUND: In-hospital cardiac arrest (IHCA) is a common clinical event with poor outcomes. Former IHCA registries in China were local, inconsistent in data reporting, and lacked attention to the process of care. Therefore, we designed and implemented the BASeline Investigation of In-hospital Cardiac Arrest (BASIC-IHCA), the first national IHCA registry in China. METHODS: BASIC-IHCA is a prospective, multicenter, observational study with a nationwide surveillance network covering urban and rural hospitals from seven geographic regions of China. IHCA patients were enrolled continuously, and data were collected from medical records by investigators at participating hospitals. Key variables referring to the updated Utstein Template included patient information, event variables, process of care, and outcomes. Follow-up was conducted by telephone interview to obtain details on long-term survival and neurological status. RESULTS: Thirty-two urban hospitals and eight rural hospitals from twenty-nine provinces in seven geographic regions of China participated in BASIC-IHCA. The starting time of enrollment ranged from July 1, 2019, to January 1,

2020. By December 31, 2020, 35,451 IHCAs were enrolled in all participating hospitals, of which 19,493 (55%) received CPR, with a predominance of males (65%) and a median age of 65 years. CONCLUSION: BASIC-IHCA is the first national registry for IHCA in China. It will describe the epidemiology and outcomes of IHCA from a nationwide perspective, with a particular focus on details of the process of care for quality improvement. Meanwhile, it will help to facilitate the standardization of IHCA-related data reporting in China.

4. Resuscitation. 2022 Jul 2;178:1-7. doi: 10.1016/j.resuscitation.2022.06.024. Online ahead of print.
Fatal outcome of isolated patients who suffered an in-hospital cardiac arrest.
Haschemi J(1), Marc Haurand J(1), Oehler D(1), Westenfeld R(1), Kelm M(2), Horn P(3).
ABSTRACT
AIM: Isolation of patients in single-patient rooms for infection control precautions leads to less contact with medical staff. Our objective was to assess whether isolated patients who suffer an in-hospital cardiac arrest (IHCA) have lower survival as non-isolated IHCA patients. METHODS: We screened for IHCA occurrence and the isolation state in 75.987 patients that had been hospitalized from 2016 to 2019 at the university hospital. Primary endpoint was survival to discharge. Neurological outcome was assessed using the cerebral performance category scale. RESULTS: In five consecutive years, 4,249 out of 75,987 patients (5.6%) had to be isolated for infection control precautions. In-hospital cardiac arrest occurred in 32 (0.8%) of these isolated patients and in 410 out of 71,738 non-isolated patients (0.6%) (p = 0.130). Propensity score matching yielded 30 isolated and 30 non-isolated patients who suffered an IHCA, without a difference in baseline characteristics and characteristics of cardiac arrests between the groups. Only one out of 30 isolated patients (3.3%) survived to discharge after IHCA compared to 11 non-isolated patients (36.6%) (risk difference, 33.3% [95% CI, 14.9%-51.7%]. None of the 30 isolated patients were discharged with good neurological outcomes compared to nine out of 30 non-isolated IHCA patients (30%) (risk difference, 30% [95% CI, 13.6%-46.4%]). In the multivariate analysis, patient isolation was an independent predictor of poor survival after IHCA (OR, 18.99; 95% CI, 2.467-133.743). CONCLUSIONS: Isolation of patients for infection control precautions is associated with considerable poorer survival and neurological outcome in case these patients are suffering an IHCA.

5. Resuscitation. 2022 Jul 14;178:45-54. doi: 10.1016/j.resuscitation.2022.07.011. Online ahead of print.
Quality of life and functional outcomes after in-hospital cardiopulmonary resuscitation. A systematic review.
Kobewka D(1), Young T(2), Adewole T(3), Fergusson D(4), Fernando S(5), Ramsay T(4), Kimura M(3), Wegier P(6).
ABSTRACT
AIM: Our aim was to determine the association of cardiopulmonary resuscitation (CPR) for in hospital cardiac arrest (IHCA) with quality of life after discharge. METHODS: We performed a systematic review using available databases for studies that measured any quality-of-life or functional outcome both before and after CPR for IHCA. All screening and data abstraction was performed in duplicate. RESULTS: We screened 10,927 records and included 24 papers representing 20 unique studies. Fifteen studies measured Cerebral Performance Category. Survival ranged from 11.8% to 39.5%. The risk of impaired cerebral function after discharged ranged from -16.1% (lower risk) to 44.7% increased risk of poor cerebral function after surviving to discharge. Four studies measured discharge to an institutional environment finding that the risk was increased by 18.2-72.2% among survivors. One study measured EQ-5D and found no difference pre and post CPR. One study measured performance of activities of daily living finding that survivors needed assistance with more activities after discharge. CONCLUSION: Our review is limited by the lack of adjustment for confounders, including the baseline level of each outcome, in all included studies. Therefore,

although risk for most outcomes was increased after discharge vs pre-admission we cannot be certain if this is a causal relationship.

6. Indian J Crit Care Med. 2022 Jun;26(6):704-709. doi: 10.5005/jp-journals-10071-24201.
Prevalence, Outcomes, and Risk Factors for Cardiorespiratory Arrest in the Intensive Care Unit: An Observational Study.
da Silva Menezes A Jr(1), Braga AL(1), de Souza Cruvinel V(1).
ABSTRACT
BACKGROUND: Cardiorespiratory arrest is defined as an abrupt halt in the cardiac mechanical activity that is accompanied by the loss of a detectable pulse, the cessation of breathing, and the loss of consciousness. The aim of this study is to create a clinical-epidemiological profile of patients who experienced cardiorespiratory arrest and were admitted to the intensive care unit to evaluate the associated factors and their impact on the prognosis of these patients. PATIENTS AND METHODS: From January to December 2019, the medical records of 135 patients who received cardiopulmonary resuscitation were reviewed for this cross-sectional observational study. The information was collected according to the Utstein model. RESULTS: A low return of spontaneous circulation of 22.2% was observed, with a predominance of females (53.3%) and older patients (68.9%), multiple comorbidities at admission (68.4%), and asystole as the predominant rhythm. Female sex and age >60 years were statistically significant ($p = 0.017$), as was the association between sex and comorbidities ($p = 0.036$), with heart disease being the most prevalent in females ($p = 0.036$). CONCLUSION: In this study, even though the resuscitation maneuver time (start of resuscitation following arrest) was very short and the defibrillation was performed promptly, there was a high prevalence of cardiac arrest and low survival rates after cardiopulmonary resuscitation.

7. Crit Care Med. 2022 Jul 15. doi: 10.1097/CCM.0000000000005624. Online ahead of print.
Incidence and Outcomes of Cardiopulmonary Resuscitation in ICUs: Retrospective Cohort Analysis.
Zajic P(1), Hallmann B(1), Honnef G(1), Fellinger T(2)(3), Metnitz B(3), Posch M(2), Rief M(1), Zoidl P(1), Metnitz PGH(1).
ABSTRACT
OBJECTIVES: We aim to describe incidence and outcomes of cardiopulmonary resuscitation (CPR) efforts and their outcomes in ICUs and their changes over time. DESIGN: Retrospective cohort analysis. SETTING: Patient data documented in the Austrian Center for Documentation and Quality Assurance in Intensive Care database. PATIENTS: Adult patients (age ≥ 18 yr) admitted to Austrian ICUs between 2005 and 2019. INTERVENTIONS: None. MEASUREMENTS ANDN MAIN RESULTS: Information on CPR was deduced from the Therapeutic Intervention Scoring System. End points were overall occurrence rate of CPR in the ICU and CPR for unexpected cardiac arrest after the first day of ICU stay as well as survival to discharge from the ICU and the hospital. Incidence and outcomes of ICU-CPR were compared between 2005 and 2009, 2010 and 2014, and 2015 and 2019 using chi-square test. A total of 525,518 first admissions and readmissions to ICU of 494,555 individual patients were included; of these, 72,585 patients (14.7%) died in hospital. ICU-CPR was performed in 20,668 (3.9%) admissions at least once; first events occurred on the first day of ICU admission in 15,266 cases (73.9%). ICU-CPR was first performed later during ICU stay in 5,402 admissions (1.0%). The incidence of ICU-CPR decreased slightly from 4.4% between 2005 and 2009, 3.9% between 2010 and 2014, and 3.7% between 2015 and 2019 ($p < 0.001$). A total of 7,078 (34.5%) of 20,499 patients who received ICU-CPR survived until hospital discharge. Survival rates varied slightly over the observation period; 59,164 (12.0%) of all patients died during hospital stay without ever receiving CPR in the ICU. CONCLUSIONS: The incidence of ICU-CPR is approximately 40 in 1,000 admissions overall and approximately 10 in 1,000 admissions after the day of ICU admission. Short-term survival is approximately four out of 10 patients who receive ICU-CPR.

8. J Intensive Care Med. 2022 Jul 11:8850666221114052. doi: 10.1177/08850666221114052. Online ahead of print.

A Controlled Study in CPR-Survival in Propensity Score Matched Full-Code and Do-Not-Resuscitate ICU Patients.

Baldor DJ(1), Smyrnios NA(2), Faris K(3), Guilarte-Walker Y(4), Celik U(5), Torres U(6).

ABSTRACT

BACKGROUND: Cardiopulmonary Resuscitation (CPR) causes significant injuries and increased cost among transiently resuscitated patients that do not survive their hospitalizations. Descriptive studies show zero and near-zero percent survival for CPR recipients with high Apache II scores. Despite these factors, no controlled studies exist in CPR to guide patient selection for CPR candidacy. Our objective was therefore to perform a controlled study in CPR to inform recommendations for CPR candidacy. We hypothesize that the protective effects of CPR decrease as illness severity increases, and that Full-Code status provides no survival benefit over Do-Not-Resuscitate (DNR) status for patients with the highest predicted mortality by Apache IV score. METHODS: We performed propensity-score matched survival analyses between Full-Code and DNR patients after stratifying by predicted mortality quartiles using Apache IV scores. Primary outcomes were mortality hazard ratios. Secondary outcomes were Median Survival Differences, ICU LOS, and tracheostomy rates. RESULTS: Among 17,710 propensity-score matched ICU encounters, DNR status was associated with greater mortality in the first through third predicted mortality quartiles. There was no difference in survival outcomes in the fourth quartile (HR 0.99, p = .96). There was a stepwise decrease in the mortality hazard ratio for DNR patients as quartiles increased. CONCLUSION: Full-Code status provides no survival benefit over DNR status in individuals with greater than 75% predicted mortality by Apache IV score. There is a stepwise decrease in survival benefit for Full-Code patients as predicted mortality increases. We propose that it is reasonable to consider a very high predicted mortality by Apache IV score a contraindication to CPR given the lack of survival benefit seen in these patients. Larger studies with similar methods should be performed to reinforce or refute these findings.

9. Intern Emerg Med. 2022 Jul 12. doi: 10.1007/s11739-022-03050-5. Online ahead of print.

Some concerts about incidence and outcomes of in-hospital cardiac arrest in obstetric setting.

Compagnone C(1), Calabrese A(2), Trombi G(2), Bellini V(2), Bignami E(2).

NO ABSTRACT AVAILABLE

INJURIES AND CPR

1. Resusc Plus. 2022 Jul 1;11:100267. doi: 10.1016/j.resplu.2022.100267. eCollection 2022 Sep.

Association of multiple rib fractures with the frequency of pneumonia in the post-resuscitation period.

Kawai Y(1), Takano K(1), Miyazaki K(1), Yamamoto K(1), Tada Y(1), Asai H(1), Maegawa N(1), Urisono Y(1), Saeki K(2), Fukushima H(1).

ABSTRACT

PURPOSE: Successful cardiopulmonary resuscitation is associated with a high incidence of chest wall injuries. However, few studies have examined chest wall injury as a risk factor for respiratory complications after cardiopulmonary resuscitation. Therefore, herein, we investigated the association of multiple rib fractures on the incidence of post-resuscitation pneumonia. METHODS: This single-centre retrospective cohort study enrolled adult, nontraumatic, out-of-hospital cardiac arrest patients who maintained circulation for more than 48 h between June 2015 and May 2019. Rib fractures were evaluated by computed tomography on the day of hospital admission. The association with newly developed pneumonia within 7 days of hospitalisation was analysed using a Fine-Gray proportional hazards regression model adjusted for the propensity score of multiple rib

fractures estimated from age, sex, presence of witnessed status, bystander CPR, initial rhythm, and total CPR time and for previously reported risk factors for pneumonia (therapeutic hypothermia and prophylactic antibiotics). RESULTS: Overall, 683 patients with out-of-hospital cardiac arrest were treated; 87 eligible cases were enrolled for analysis. Thirty-two (36.8%) patients had multiple rib fractures identified on computed tomography, and 35 (40.2%) patients developed pneumonia. The presence of multiple rib fractures was significantly associated with a higher incidence of pneumonia, consistently both with and without adjustment for background factors (unadjusted hazard ratio 4.63, 95% confidence interval: 2.35-9.13, $p < 0.001$; adjusted hazard ratio 4.03, 95% confidence interval: 2.08-7.82, $p < 0.001$). CONCLUSIONS: Multiple rib fractures are independently associated with the development of pneumonia after successful resuscitation.

CAUSE OF THE ARREST

1. Resuscitation. 2022 Jul;176:136-149. doi: 10.1016/j.resuscitation.2022.05.001. Epub 2022 May 10.
Prevalence of intracranial hemorrhage amongst patients presenting with out-of-hospital cardiac arrest: A systematic review and meta-analysis.
Lee KY(1), So WZ(2), Ho JSY(3), Guo L(4), Shi L(5), Zhu Y(4), Tiah L(6), Ho AFW(7).
ABSTRACT
INTRODUCTION: An unknown proportion of out-of-hospital cardiac arrest (OHCA) is caused by intracranial hemorrhage (ICH). There is uncertainty over the role of early head computed tomography (CT) in non-traumatic OHCA due to uncertain diagnostic yield and ways to identify high-risk patients. This study aimed to identify the prevalence of ICH in non-traumatic OHCA and possible predictors. METHODS: PubMed, EMBASE, and the Cochrane library were searched from inception to January 2022. Data extraction and quality assessment were independently reviewed by two authors. Meta-analyses estimated the prevalence of ICH amongst OHCA patients and pre-specified subgroups and geographical settings. Subgroup analysis were used to explore potential clinical predictors. RESULTS: 23 studies involving 54,349 patients were included. The pooled ICH prevalence was 4.28% (95%CI: 3.31-5.24). Asia had a significantly larger risk ratio (RR = 3.93, P value < 0.0001) than Europe. The ICH subgroup was significantly more likely to be female (OR: 2.16; 95%CI: 1.10-4.26), and less likely to experience shockable rhythms compared with non-shockable rhythms (OR: 0.22; 95% CI: 0.04-1.22), achieve ROSC prior to arrival (OR: 0.27; 95%CI: 0.10-0.77), and survive to discharge compared to those without ICH (OR: 0.26; 95%CI: 0.11-0.59). CONCLUSIONS: One in twenty OHCA have ICH at the time of presentation. An early head CT scan should be strongly considered after return of spontaneous circulation (ROSC), especially in patients who are female, with non-shockable rhythm and did not attain ROSC prior to arrival. These finding should influence clinical protocols to favor routine scans especially in Asia where prevalence is higher.

2. Clin Pharmacol Ther. 2022 Jun 29. doi: 10.1002/cpt.2696. Online ahead of print.
Development of a Translational Model to Assess the Impact of Opioid Overdose and Naloxone Dosing on Respiratory Depression and Cardiac Arrest.
Mann J(1), Samieegohar M(1), Chaturbedi A(1), Zirkle J(1), Han X(1), Ahmadi SF(1), Eshleman A(2), Janowsky A(2), Wolfrum K(2), Swanson T(2), Bloom S(2), Dahan A(3), Olofsen E(3), Florian J(1), Strauss DG(1), Li Z(1).
ABSTRACT
In response to a surge of deaths from synthetic opioid overdoses, there have been increased efforts to distribute naloxone products in community settings. Prior research has assessed the effectiveness of naloxone in the hospital setting; however, it is challenging to assess naloxone dosing regimens in the community/first-responder setting, including reversal of respiratory depression effects of

fentanyl and its derivatives (fentanyls). Here, we describe the development and validation of a mechanistic model that combines opioid mu receptor binding kinetics, opioid agonist and antagonist pharmacokinetics, and human respiratory and circulatory physiology, to evaluate naloxone dosing to reverse respiratory depression. Validation supports our model, which can quantitatively predict displacement of opioids by naloxone from opioid mu receptors in vitro, hypoxia-induced cardiac arrest in vivo, and opioid-induced respiratory depression in humans from different fentanyls. After validation, overdose simulations were performed with fentanyl and carfentanil followed by administration of different intramuscular naloxone products. Carfentanil induced more cardiac arrest events and was more difficult to reverse than fentanyl. Opioid receptor binding data indicated that carfentanil has substantially slower dissociation kinetics from the opioid receptor compared with nine other fentanyls tested, which likely contributes to the difficulty in reversing carfentanil. Administration of the same dose of naloxone intramuscularly from two different naloxone products with different formulations resulted in differences in the number of virtual patients experiencing cardiac arrest. This work provides a robust framework to evaluate dosing regimens of opioid receptor antagonists to reverse opioid-induced respiratory depression, including those caused by newly emerging synthetic opioids.

3. Clin Auton Res. 2022 Jun;32(3):167-173. doi: 10.1007/s10286-022-00864-3. Epub 2022 May 6.
Cardioinhibitory syncope with asystole during nitroglycerin potentiated head up tilt test: prevalence and clinical predictors.
Russo V(1), Parente E(2), Rago A(2), Comune A(2), Laezza N(2), Papa AA(2), Chamberland C(3), Huynh T(4), Golino P(2), Brignole M(#)(5), Nigro G(#)(2).
ABSTRACT
AIMS: The aim of our study was to evaluate the prevalence and clinical predictors of cardioinhibitory (CI) responses with asystole at the nitroglycerin (NTG)-potentiated head-up tilt test (HUTT) in patients with a history of syncope admitted to a tertiary referral syncope unit. METHODS: We retrospectively evaluated all consecutive patients who underwent NTG-potentiated HUTT for suspected reflex syncope at our institution from March 1 2017 to May 1 2020. The prevalence of HUTT-induced CI syncope was assessed. Univariate and multivariate analyses were performed to test the association of asystolic response to HUTT with a set of clinical covariates. RESULTS: We enrolled 1285 patients (45 ± 19.1 years; 49.6% male); 368 (28.6%) showed HUTT-induced CI response with asystole. A multivariate analysis revealed that the following factors were independently associated with HUTT-induced CI syncope: male sex (OR 1.48; ConInt 1.14-1.92; P = 0.003), smoking (OR 2.22; ConInt 1.56-3.115; P < 0.001), traumatic syncope (OR: 2.81; ConInt 1.79-4.42; P < 0.001), situational syncope (OR 0.45; ConInt 0.27-0.73; P = 0.002), and the use of diuretics (OR 9.94; ConInt 3.83-25.76; P < 0.001). CONCLUSIONS: The cardioinhibitory syncope with asystole induced by NTG-potentiated HUTT is more frequent than previously reported. The male gender, smoking habit, history of traumatic syncope, and use of diuretics were independent predictors of HUTT-induced CI responses. Conversely, the history of situational syncope seems to reduce this probability.

4. BMC Emerg Med. 2022 Jul 6;22(1):120. doi: 10.1186/s12873-022-00676-8.
Long-term prognosis and clinical course of choking-induced cardiac arrest in patients without the return of spontaneous circulation at hospital arrival: a population-based community study from the Shizuoka Kokuho Database.
Miyoshi T(1)(2), Endo H(2), Yamamoto H(3)(4), Shimada K(2), Kumamaru H(1)(5), Ichihara N(1)(5), Miyachi Y(1), Miyata H(1)(2)(5).
ABSTRACT

BACKGROUND: The risk of choking increases with aging, and the number of cases of choking-induced cardiac arrest is increasing. However, few studies have examined the prognosis of choking-induced cardiac arrest. The aim of this study was to reveal the rates of survival and dependence on devices in the long term after choking-induced cardiac arrest. METHODS: We analyzed data from the Shizuoka Kokuho Database, which consists of claims data of approximately 2.2 million people, from April 2012 to September 2018. We selected patients with choking-induced cardiac arrest who received cardiopulmonary resuscitation in the hospital. Patients were excluded if they were less than 20 years old, had an upper airway tumor, received ventilation assistance, or received enteral nutrition in the month prior to cardiac arrest. The primary outcome was death, and the secondary outcomes were the rates of survival at 3-months and independence on devices. Descriptive statistics are presented and compared among age groups (20-64 years, 65-74 years, 75-84 years, 85 years and older), and survival time analysis (Kaplan-Meier method) was performed. RESULTS: In total, 268 patients were analyzed, including 26 patients in the 20-64 age group, 33 patients in the 65-74 age group, 70 patients in the 75-84 age group, and 139 patients in the ≥85 age group. The overall 3-month survival rate was 5.6% (15/268). The 3-month survival rates were 3.8% (1/26) in the 20-64 age group, 15.2% (5/33) in the 65-74 age group, 8.6% (6/70) in the 75-84 age group, and 2.2% (3/139) in the ≥85 age group. The overall 12-month survival rate was 2.6% (7/268). Of the 7 patients who survived for 12 months, 3 received ventilation management and 5 received tube or intravenous feedings at 3 months. These survivors were still receiving ventilation assistance and tube feedings in the hospital and had not been discharged at 12 months. CONCLUSIONS: The prognosis of choking-induced cardiac arrest was extremely poor when patients were not resuscitated before hospital arrival. Those who survived were mostly dependent on assistive devices. Additionally, none of the survivors dependent on assistive devices had discontinued the use of the devices at the long-term follow-up.

5. Subst Abuse. 2022 Jun 30;16:11782218221103582. doi: 10.1177/11782218221103582. eCollection 2022.

Association of Cardiac Arrest With Opioid Overdose in Transport.

Ritter ML(1), Bohr AD(2), McQueen MB(2).

ABSTRACT

INTRODUCTION: Drug overdose is the leading cause of injury-related death in the United States. It has been linked to respiratory depression and cardiac toxicity, both of which can lead to cardiac arrest. Despite this potential association, few studies have examined this relationship, particularly in transport to the hospital. The purpose of this research was to determine if there was a relationship between opioid overdose and cardiac arrest in transport. METHODS: A sample (n = 1 000 000) was utilized from the National EMS Information System (NEMSIS) from the year 2019. A logistic regression model was used to predict cardiac arrest from dispatch reason with gender, race, and age included as controls. RESULTS: Overdose-related dispatch reason was associated with an increased likelihood of cardiac arrest in transport (Odds Ratio = 1.65, 95% Confidence Interval: [1.22, 2.22]). CONCLUSIONS: Opioid overdose is associated with an increased incidence of cardiac arrest in transport in the United States.

6. J Intensive Care Med. 2022 Jul 3:8850666221111776. doi: 10.1177/08850666221111776. Online ahead of print.

Pre-Existing Right Ventricular Dysfunction as an Independent Risk Factor for Post Intubation Cardiac Arrest and Hemodynamic Instability in Critically Ill Patients: A Retrospective Observational Study.

Al-Saadi MA(1), Heidari B(1), Donahue KR(2), Shipman EM(1), Kinariwala KN(1), Masud FN(3).

ABSTRACT

BACKGROUND: Post intubation cardiac arrest and hemodynamic instability are serious adverse events encountered in critically ill patients. The association of pre-existing right ventricular (RV) dysfunction with post intubation cardiac arrest and hemodynamic instability in critically ill patients is unknown. METHODS: This is a retrospective matched cohort study of adult critically ill patients who underwent intubation from July 2016 to December 2019. The study was conducted at a quaternary medical center in Houston, Texas. A total of 340 critically ill patients who underwent intubation in the intensive care units, wards, and the emergency room were included. The study cohort was categorized into 4 groups based on the pre-existing RV function: normal function, mild dysfunction, moderate dysfunction, and severe dysfunction. Cardiac arrest and/or hemodynamic instability within one hour post intubation were the primary study outcomes. Secondary outcomes included in hospital and 60-day mortality. RESULTS: Study patients were of mean age of 61.95 ± 14.28 years, including 132 (39%) females and 208 (61%) males. The primary outcomes were significantly worse in mild, moderate, and severe RV dysfunction groups compared to the normal RV function group (34.12%-P = 0.014, 47.06%-P < 0.001, 51.67%-P < 0.001, vs. 17.56%). In a multivariable logistic regression analysis, pre-existing moderate (OR = 2.65, P = 0.013) and severe RV dysfunction groups (OR = 2.66, P = 0.015) were associated with statistically significant higher cardiac arrest and hemodynamic instability post intubation. Pre-existing severe RV dysfunction was associated with statistically significant higher in hospital mortality (62.35%-P < 0.001). The multivariable Cox-regression analysis showed that pre-existing severe RV dysfunction was associated with a statistically significant higher 60-day mortality (HR = 2.57, P = 0.001). CONCLUSIONS: Pre-existing moderate and severe RV dysfunctions were independently associated with significantly higher cardiac arrest and/or hemodynamic instability post intubation in critically ill patients. Pre-existing RV function may serve as a mortality predictor in critically ill patients undergoing endotracheal intubation.

7. Rev Esp Salud Publica. 2022 Jun 22;96:e202206048.
[Descriptive analysis of triggers, outcomes and the response of the health systems of child drowning in Galicia (Spain). A 17-year retrospective study.].
[Article in Spanish; Abstract available in Spanish from the publisher]
Sánchez-Lloria P(1)(2), Barcala-Furelos R(2)(3), Otero-Agra M(2)(4), Aranda-García S(5), Cosido-Cobos Ó(6), Blanco-Prieto J(6), Muñoz-Barús I(7)(8), Rodríguez-Núñez A(3)(9)(10).
ABSTRACT
OBJECTIVE: Drowning is one of major public health problem in childhood. The aim of this paper was to describe the characteristics, locations, interventions and outcomes of child drowning in Galicia over 17 years. METHODS: Retrospective study of 100% of data of drowning amongst children aged 0-14 in the 2004-2020 period who were attended by the 061 emergency services in Galicia (Spain) was made. The characteristics of the incident, the victim's profile, location, type of medical care given and whether the victim survived or died were analysed using the Chi Square test to compare relative frequencies, and Odds Ratio to estimate the risk. RESULTS: During the period under study, 100 child drownings were recorded. In 55%, the main cause was lack of supervision. Young children (aged 0-4) primarily drowned in pools, and pre-teens and teenagers (aged 10-14) in the sea. In 42% of the incidents, bystanders performed CPR (37% included ventilation). Emergency services took 12 minutes on average to arrive at the scene. 6% died in situ and of the rest, were taken to hospital and admitted in 47% PICU, 26% ward, 8% discharged from Accident and Emergency (43% with pulmonary oedema, 41% with supplemental oxygen, 13% with IMV/NIMV [invasive mechanical ventilation/non-invasive]). Pneumonia was the most common complication and survival to discharge was 77%. CONCLUSIONS: Small children usually drown in pools and water facilities because of lack of supervision, whereas adolescents usually drown in the sea. CPR started by bystanders and the fast

response of emergency services contributed to a high rate of survival. A large amount of data was lost during the process: accurate, standardized coding of drowning is necessary.

8. Am J Cardiol. 2022 Jul 10:S0002-9149(22)00587-2. doi: 10.1016/j.amjcard.2022.05.024. Online ahead of print.

Trends in Sudden Death Following Admission for Acute Heart Failure.

Nishigoori S(1), Shirakabe A(2), Okazaki H(1), Matsushita M(1), Shibata Y(1), Shighihara S(1), Sawatani T(1), Kiuchi K(1), Sasamoto N(1), Kobayashi N(1), Shimizu W(3), Asai K(1).

ABSTRACT

Few studies on sudden death (SD) after admission for acute heart failure (AHF) have been published. A total of 1,664 patients with AHF were enrolled in this study, and 1,261 patients who were successfully followed up during the first year after admission were analyzed. The primary end point was SD, which was defined as out-of-hospital cardiac arrest. The median follow-up period from admission was 1,008 days (range 408 to 2,132). In total, 505 patients (40.0%) died: 341 (67.5%) died of cardiovascular causes and 55 (10.9%) died of other causes. Of the 505 who died, 80 (15.8%) experienced SD. The proportion of SDs increased in the later phases of follow-up (0 to 1 year, 10.3%; 1 to 2 years, 18.0%; 2 to 5 years, 18.8%; ≥5 years, 28.2%; p <0.001). A multivariate logistic regression model showed that younger age was independently associated with SD (60 to 69 years: odds ratio 2.249, 95% confidence interval 1.060 to 4.722; <60 years: odds ratio 3.863, 95% confidence interval 1.676 to 8.905). Kaplan-Meier curves showed that the incidence of cardiovascular death was highest during the acute phase, whereas the incidence of SD increased gradually over the entire follow-up period. In conclusion, the incidence of SD was surprisingly high in patients with AHF, accounting for 16% of long-term mortality. The proportion of SDs increased during the very late follow-up phases.

END-TIDAL CO_2

1. Resuscitation. 2022 Jul 11:S0300-9572(22)00599-8. doi: 10.1016/j.resuscitation.2022.07.009. Online ahead of print.

Contribution of chest compressions to end-tidal carbon dioxide levels generated during out-of-hospital cardiopulmonary resuscitation.

Gutiérrez JJ(1), Sandoval CL(2), Leturiondo M(1), Russell JK(3), Redondo K(1), Daya MR(3), Ruiz de Gauna S(4).

ABSTRACT

AIM: Characterise how changes in chest compression depth and rate affect variations in end-tidal CO2 (ETCO2) during manual cardiopulmonary resuscitation (CPR) in out-of-hospital cardiac arrest (OHCA). METHODS: Retrospective analysis of adult OHCA monitor-defibrillator recordings having concurrent capnogram, compression depth, transthoracic impedance and ECG, and with atleast 1,000 compressions. Within each patient, during no spontaneous circulation, nearby segments with changes in chest compression depth and rate were identified. Average ETCO2 within each segment was standardised to compensate for ventilation rate variability. Contributions of relative variations in depth and rate to relative variations in standardised ETCO2 were characterised using linear and non-linear models. Normalisation between paired segments removed intra and inter-patient variation and made coefficients of the model independent of the scale of measurement and therefore directly comparable. RESULTS: A total of 394 pairs of segments from 221 patients were analysed (33% female, median (IQR) age 66 (55-74) years). Chest compression depth and rate were 50.4 (43.2-57.0)mm and 111.1 (106.5-116.1)compressions per minute. ETCO2 before and after standardization was 32.1 (23.0-41.4)mmHg and 28.5 (19.4-38.7)mmHg. Linear model coefficient of determination was 0.89. Variation in compression depth mainly explained ETCO2 variation

(coefficient 0.95, 95% confidence interval (CI): 0.93-0.98) while changes in compression rate did not (coefficient 0.04, 95% CI: 0.01-0.07). Non-linear trend analysis confirmed the results. CONCLUSION: This study quantified the relative importance of chest compression characteristics in terms of their impact on CO2 production during CPR. With ventilation rate standardised, variation in chest compression depth explained variations in ETCO2 better than variation in chest compression rate.

ORGAN DONATION

1. Korean J Transplant. 2021 Jun 30;35(2):71-76. doi: 10.4285/kjt.21.0004.

Organ donation after controlled circulatory death (Maastricht classification III) following the withdrawal of life-sustaining treatment in Korea: a suggested guideline.

Park H(1), Jung ES(2), Oh JS(3), Lee YM(3), Lee JM(4).

ABSTRACT

The "Act on hospice and palliative care and decisions on life-sustaining treatment for patients at the end of life" was enacted in February 2018 in Korea. Therefore, we suggest a Korean guideline for organ donation after circulatory death (DCD) category III after the withdrawal of life-sustaining treatment (WLST). Implementation of WLST includes stopping ventilation, extubation, discontinuation of inotropics and vasoconstrictors, cessation of continuous renal replacement therapy, and cessation of extracorporeal membrane oxygenation. Medical staff involved in organ procurement or transplantation surgery cannot participate in the WLST process. Following cardiac arrest, 5 minutes of "no touch time" should pass, after which circulatory death can be declared. The procurement team can enter the room after the declaration of death. The final procurement decision is made after the surgeon visually checks the organ condition. DCD category III activation in Korea will help increase organ donation and reduce the demand-supply mismatch of organ transplantation.

2. J Clin Med. 2022 Jul 3;11(13):3853. doi: 10.3390/jcm11133853.

Impact of Cardiopulmonary Resuscitation of Donors on Days Alive and Out of Hospital after Orthotopic Heart Transplantation.

Roth S(1), M'Pembele R(1), Nucaro A(1), Stroda A(1), Tenge T(1), Lurati Buse G(1), Sixt SU(1), Westenfeld R(2), Rellecke P(3), Tudorache I(3), Hollmann MW(4), Aubin H(3), Akhyari P(3), Lichtenberg A(3), Huhn R(1)(5), Boeken U(3).

ABSTRACT

BACKGROUND: The number of patients waiting for heart transplantation (HTX) is increasing. Optimizing the use of all available donor hearts is crucial. While mortality seems not to be affected by donor cardiopulmonary resuscitation (CPR), the impact of donor CPR on days alive and out of hospital (DAOH) is unclear. METHODS: This retrospective study included adults who underwent HTX at the University Hospital Duesseldorf, Germany from 2010-2020. Main exposure was donor-CPR. Secondary exposure was the length of CPR. The primary endpoint was DAOH at one year. RESULTS: A total of 187 patients were screened and 171 patients remained for statistical analysis. One-year mortality was 18.7%. The median DAOH at one year was 295 days (interquartile range 206-322 days). Forty-two patients (24.6%) received donor-CPR hearts. The median length of CPR was 15 (9-21) minutes. There was no significant difference in DAOH between patients with donor-CPR hearts versus patients with no-CPR hearts (CPR: 291 days (211-318 days) vs. no-CPR: 295 days (215-324 days); p = 0.619). Multivariate linear regression revealed that there was no association between length of CPR and DAOH (unstandardized coefficients B: -0.06, standard error: 0.81, 95% CI -1.65-1.53, p = 0.943). CONCLUSIONS: Donor CPR status and length of CPR are not associated with reduced DAOH at one year after HTX.

FEEDBACK

No articles identified.

DRUGS

1. Res Pract Thromb Haemost. 2022 Jun 17;6(4):e12745. doi: 10.1002/rth2.12745. eCollection 2022 May.

Thrombolytic therapy in cardiac arrest caused by cardiac etiologies or presumed pulmonary embolism: An updated systematic review and meta-analysis.

Alshaya OA(1)(2)(3), Alshaya AI(1)(2)(3), Badreldin HA(1)(2)(3), Albalawi ST(1), Alghonaim ST(1), Al Yami MS(1)(2)(3).

ABSTRACT

BACKGROUND: Many cardiac arrest cases are encountered annually worldwide, with poor survival. The use of systemic thrombolysis during cardiopulmonary resuscitation for the treatment of cardiac arrest remains controversial. OBJECTIVES: Evaluate the safety and efficacy of systemic thrombolysis in patients with cardiac arrest due to presumed or confirmed pulmonary embolism or cardiac etiology. METHODS: We searched the PubMed and Cochrane databases from inception through April 2021 to identify relevant randomized controlled trials and observational studies. The primary efficacy and safety outcomes were survival to hospital discharge and reported bleeding, respectively. Sensitivity analysis was performed on the basis of study design and etiology of cardiac arrest. RESULTS: Eleven studies were included, with 4696 patients (1178 patients received systemic thrombolysis, and 3518 patients received traditional therapy). There was a higher rate of survival to hospital discharge in patients who received systemic thrombolysis versus no systemic thrombolysis (risk ratio [RR], 1.35; 95% confidence interval [CI], 0.95-1.91). There were also higher rates of survival at 24 hours (RR, 1.24; 95% CI, 0.97-1.59) and hospital admission (RR, 1.53; 95% CI, 1.04-2.24), and return of spontaneous circulation (ROSC) (RR, 1.34; 95% CI, 1.05-1.71) with the use of systemic thrombolysis. Impacts on survival to discharge and survival at 24 hours were not statistically significant. Patients receiving systemic thrombolysis had a 65% increase in bleeding events compared with no systemic thrombolysis (RR, 1.65; 95% CI, 1.20-2.27). CONCLUSION: Systemic thrombolysis in cardiac arrest did not improve survival to hospital discharge and led to more bleeding events. However, it increased the rates of hospital admission and ROSC achievement.

TRAUMA

1. Int J Surg. 2022 Jun 27;104:106731. doi: 10.1016/j.ijsu.2022.106731. Online ahead of print.

A novel scoring system using easily assessible predictors of return of spontaneous circulation and mortality in traumatic out-of-hospital cardiac arrest patients: A retrospective cohort study.

Kuo IM(1), Chen YF(2), Chien CY(3), Hong YW(4), Kang SC(5), Fu CY(5), Hsu CP(5), Liao CH(5), Hsieh CH(5).

ABSTRACT

BACKGROUND: An accident event may necessitate triage of multiple cases of traumatic out-of-hospital cardiac arrest (TOHCA). However, factors for prioritizing treatment among multiple TOHCA patients have not been established. This study aims to use easily assessible predictors of TOHCA outcomes to develop a triage scoring system. METHODS: Patients with TOHCA brought to our hospital by emergency medical services (EMS) were included for analysis to identify independent risk factors for poor outcomes. A scoring system was developed and validated internally and externally.

RESULTS: Of the 401 included patients, 86 (21.4%) had return of spontaneous circulation (ROSC) after cardiopulmonary resuscitation (CPR) for 30 min (81 patients, 94.2%) or 45 min (86 patients, 100%). The emergency department (ED) mortality rate was 89.3% and overall in-hospital mortality rate was 99%. Univariate and multivariate analyses identified body temperature <33 °C (OR, 4.65; 95% CI, 1.37-15.86), obvious chest injury (OR, 2.11; 95% CI, 1.03-4.34), and presumable etiology of out-of-hospital cardiac arrest (OR, 1.73; 95% CI, 1.01-2.98) as significant independent risk factors for non-ROSC. The TOHCA score, calculated as 1 point per risk factor, correlated significantly with the rate of non-ROSC and ED mortality (TOHCA score 0, 1, 2, 3: non-ROSC rate, 63.0%, 80.4%, 90.8%, 100%, respectively; ED mortality rate, 79.5%, 91.5%, 96.1%, and 100% respectively). The results of internal and external validations show a similar trend in both non-ROSC and mortality in the ED with increasing score. CONCLUSIONS: Termination of CPR for TOHCA after 45 min is reasonable; a 30-min resuscitation is acceptable in case of insufficient medical staff or resources. The TOHCA score may be able to be used with caution for triage.

2. Front Med (Lausanne). 2022 Jun 16;9:888225. doi: 10.3389/fmed.2022.888225. eCollection 2022.
Traumatic Cardiac Arrest: Scoping Review of Utilization of Resuscitative Endovascular Balloon Occlusion of the Aorta.
Aoki M(1), Abe T(2)(3).
ABSTRACT
Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) is increasingly used in trauma resuscitation for patients with life-threatening hemorrhage below the diaphragm and may also be used for patients with traumatic cardiac arrest (TCA). Resuscitative thoracotomy with aortic cross clamping (RT-ACC) maneuver was traditionally performed for patients with TCA due to hemorrhagic shock; however, REBOA has been substituted for RT-ACC in selected TCA cases. During cardiopulmonary resuscitation (CPR) in TCA, REBOA increases cerebral and coronary perfusion, and temporary bleeding control. Both animal and clinical studies have reported the efficacy of REBOA for TCA, and a recent observational study suggested that REBOA may contribute to the return of spontaneous circulation after TCA. Although multiple questions remain unanswered, REBOA has been applied to trauma fields as a novel technology.

VENTILATION

1. Acad Emerg Med. 2022 Jun;29(6):765-771. doi: 10.1111/acem.14410. Epub 2021 Dec 9.
Prehospital airway management in the pediatric patient: A systematic review.
Weihing VK(1), Crowe EH(1), Wang HE(2), Ugalde IT(3).
ABSTRACT
BACKGROUND: Critically ill children may require airway management to optimize delivery of oxygen and ventilation during resuscitation. We performed a systematic review of studies comparing the use of bag-valve-mask ventilation (BVM), supraglottic airway devices (SGA), and endotracheal intubation (ETI) in pediatric patients requiring prehospital airway management. METHODS: We searched Ovid MEDLINE, EMBASE, and Cochrane databases for papers that compared SGA or ETI to BVM use in children, including studies that reported survival outcomes. We followed the Preferred Reporting Items in Systematic Reviews and Meta-Analyses (PRISMA) guidelines and assessed study quality using the Newcastle-Ottawa Scale. We compared key characteristics of the candidate papers, including inclusion criteria, definitions of airway interventions, and association with outcomes. RESULTS: Of 773 studies, eight met criteria for inclusion. Only one study was a randomized controlled trial; the other seven studies were observational. Four studies compared ETI to BVM, two studies compared SGA to BVM, one study compared ETI to SGA, and two studies compared

advanced airway management (AAM) to BVM. Primary outcomes varied, ranging from overall mortality and 24-h mortality to 1-month survival, hospital survival, and neurologically favorable survival. Four of the studies found no difference in survival with the use of ETI, and four found increased mortality with the use of ETI. Associations with outcomes could not be assessed by meta-analysis due to limited number of studies and the wide variation in the design, population, interventions, and outcome measures of the included studies. CONCLUSIONS: In this systematic review, studies of prehospital pediatric airway management varied in scope, design, and conclusions. There was insufficient evidence to evaluate efficacy of pediatric prehospital airway management; however, the current research suggests that there are equal or worse outcomes with the use of ETI compared to other airway techniques. Additional clinical trials are needed to assess the merits of this practice.

2. Resusc Plus. 2022 Jun 24;11:100260. doi: 10.1016/j.resplu.2022.100260. eCollection 2022 Sep.
Association between time to advanced airway management and survival during pediatric out-of-hospital cardiac arrest.
Ohashi-Fukuda N(1), Fukuda T(2)(3), Doi K(1).
ABSTRACT
BACKGROUND: Respiratory care, including advanced airway management (AAM), is an important part of pediatric resuscitation. This study aimed to determine whether time to AAM is associated with outcomes after out-of-hospital cardiac arrest (OHCA) in children. METHODS: This was a nationwide population-based observational study using the Japanese government-led registry of OHCA patients. Children (aged 1-17 years) who experienced OHCA and received AAM by emergency medical service (EMS) personnel in the prehospital setting from 2014 to 2019 were included. Multivariable logistic regression models were used to assess the associations between time to AAM (defined as time in minutes from emergency call to the first successful AAM) and outcomes after OHCA. The primary outcome was one-month overall survival. The secondary outcomes were prehospital return of spontaneous circulation (ROSC) and one-month neurologically favorable survival. RESULTS: A total of 761 patients (mean [SD] age, 12.7 [4.8] years) were included. The mean time to AAM was 18.9 min (SD, 7.9). Overall, 77 (10.1%) patients survived one month after OHCA. After adjusting for potential confounders, longer time to AAM was significantly associated with a decreased chance of one-month survival (multivariable adjusted OR per minute delay, 0.93 [95% CI, 0.89-0.97]; P = 0.001). Similar association was observed for prehospital ROSC (adjusted OR, 0.94 [95% CI, 0.90-0.99]; P = 0.01) and neurologically favorable survival (adjusted OR, 0.83 [95% CI, 0.72-0.95]; P = 0.006). This association between time to AAM and survival was consistent across a variety of sensitivity and subgroup analyses. CONCLUSIONS: Among pediatric OHCA patients, delayed AAM was associated with a decreased chance of survival, although the influence of resuscitation time bias might remain.

CERERBRAL MONITORING

1. Am J Emerg Med. 2022 Jun 20;59:30-36. doi: 10.1016/j.ajem.2022.06.014. Online ahead of print.
Hypernatremia is associated with poor long-term neurological outcomes in out-of-hospital cardiac arrest survivors.
Cho EJ(1), Lee MS(2), Kwon WY(3), Shin J(4), Suh GJ(3), Jung YS(1), Song WJ(5), Yeo G(6), Jo YH(7); SNU CARE Investigators.
ABSTRACT
BACKGROUND: Brain oedema after cardiac arrest is strongly associated with poor neurological outcomes. Excessive sodium supplementation may increase serum osmolarity and facilitate brain oedema development in cardiac arrest survivors. We aimed to investigate the association of serum

sodium levels with long-term neurological outcomes in out-of-hospital cardiac arrest (OHCA) survivors. METHODS: This retrospective observational study used a multicentre prospective cohort registry of OHCA survivors collected between December 2013 and February 2018. We analyzed the association of serum sodium levels at the return of spontaneous circulation (ROSC) (Sodium 0H) and at 24 h after ROSC (Sodium 24H) with 1-year neurological outcomes in OHCA survivors. Patients with 1-year cerebral performance categories (CPC) 1 and 2 were included in the good outcome group while those with CPC 3, 4, and 5 were included in the poor outcome group. RESULTS: Among 277 patients, 84 (30.3%) and 193 (69.7%) were in the good and poor outcome groups, respectively. Compared with the good outcome group, the poor outcome group showed significantly higher Sodium 24H levels (140 mEq/L vs. 137.4 mEq/L, $p < 0.001$). Increased serum sodium levels per 1 mEq/L increased the risk of poor 1-year CPC by 13% (adjusted odds ratio = 1.13; 95% CI, 1.04–1.23; $p = 0.004$). CONCLUSIONS: Relatively high Sodium 24H levels showed a strong and independent association with poor long-term neurological outcomes in OHCA survivors. These findings may be applied in therapeutic strategies for improving neurological outcomes in OHCA survivors.

2. Resuscitation. 2022 Jul;176:42-50. doi: 10.1016/j.resuscitation.2022.04.028. Epub 2022 May 6.
Validation of the CaRdiac Arrest Survival Score (CRASS) for predicting good neurological outcome after out-of-hospital cardiac arrest in an Asian emergency medical service system.
Liu N(1), Wnent J(2), Lee JW(3), Ning Y(3), Ho AFW(4), Siddiqui FJ(5), Lim SL(6), Chia MY(7), Tiah L(8), Mao DR(9), Gräsner JT(10), Ong MEH(11); PAROS Singapore Investigators, Gan HN(12), Cheah SO(13), Ng WM(14), Tay WL(14), Leong BSH(15), Nadarajan G(16), Doctor NE(17), Tham LP(18), Arulanandam S(19).
ABSTRACT
BACKGROUND: Survival with favorable neurological outcomes is an important indicator of successful resuscitation in out-of-hospital cardiac arrest (OHCA). We sought to validate the CaRdiac Arrest Survival Score (CRASS), derived using data from the German Resuscitation Registry, in predicting the likelihood of good neurological outcomes after OHCA in Singapore. METHODS: We conducted a retrospective population-based validation study among EMS-attended OHCA patients (≥18 years) in Singapore, using data from the prospective Pan-Asian Resuscitation Outcomes Study registry. Good neurological outcome was defined as a cerebral performance category of 1 or 2. To evaluate the CRASS score in light of the difference in patient characteristics, we used the default constant coefficient (0.8) and the adjusted coefficient (0.2) to calculate the probability of good neurological outcomes. RESULTS: Out of 11,404 analyzed patients recruited between April 2010 and December 2018, 260 had good and 11,144 had poor neurological function. The CRASS score demonstrated good discrimination, with an area under the curve of 0.963 (95% confidence interval: 0.952-0.974). Using the default constant coefficient of 0.8, the CRASS score consistently overestimated the predicted probability of a good outcome. Following adjustment of the coefficient to 0.2, the CRASS score showed improved calibration. CONCLUSION: CRASS demonstrated good discrimination and moderate calibration in predicting favorable neurological outcomes in the validation Singapore cohort. Our study established a good foundation for future large-scale, cross-country validations of the CRASS score in diverse sociocultural, geographical, and clinical settings.

3. Prehosp Emerg Care. 2022 Jul-Aug;26(4):519-523. doi: 10.1080/10903127.2021.1948647. Epub 2021 Jul 27.
Cerebral Oximetry during Out-of-Hospital Resuscitation: Pilot Study of First Responder Implementation.
Shin J(1), Walker R(1), Blackwood J(1), Chapman F(1), Crackel J(1), Kudenchuk P(1), Rea T(1).
ABSTRACT

Background: Anoxic brain injury is a common mode of death following out-of-hospital cardiac arrest (OHCA). We assessed the course of regional cerebral oxygen saturation (rSO2) at the outset and during first responder resuscitation to understand its relationship with return of spontaneous circulation (ROSC) and functional survival. Methods: We undertook a prospective observational investigation of adult OHCA patients treated by a first-responder EMS agency in King County, WA. Cerebral oximetry was performed using the SenSmart® Model X-100 Universal Oximetry System (Nonin Medical, Inc). We determined cerebral oximetry rSO2 overall and stratified according to ROSC and favorable survival status defined by Cerebral Performance Category (CPC) of 1-2. Results: Among the 59 OHCA cases enrolled, 47% (n = 28) achieved ROSC and 14% (n = 8) survived with CPC 1-2. On average, initial rSO2 cerebral oximetry was 41% and was not different at the outset according to return of spontaneous circulation (ROSC) or survival status. Within 5 minutes of first responder resuscitation, those who would subsequently achieve ROSC had a higher rSO2 than those who would not achieve ROSC (51% vs. 43%, p = 0.03). Among patients who achieved ROSC, those who would survive with CPC 1-2 had a higher rSO2 cerebral oximetry following ROSC than nonsurvivors (74% vs. 60%, p = 0.04 at 5 minutes post ROSC), a difference that was not evident in the minutes prior to ROSC (55% vs. 51% at 3 minutes prior to ROSC, p = 0.5). Conclusion: In this observational study, where first responders applied cerebral oximetry, higher rSO2 during the course of care predicted ROSC among all patients and predicted favorable survival among those who achieved ROSC. Future investigation should evaluate whether and how treatments might modify rSO2 and in turn may influence prognosis.

4. J Clin Med. 2022 Jun 28;11(13):3738. doi: 10.3390/jcm11133738.

One-Year Follow-Up of Patients Admitted for Emergency Coronary Angiography after Resuscitated Cardiac Arrest.

Delbaere Q(1), Akodad M(1), Roubille F(1), Lattuca B(2), Cayla G(2), Leclercq F(1).

ABSTRACT

(1) Background: Despite the improvement of the in-hospital survival rate after aborted sudden cardiac death (SCD), cerebral anoxia may have severe neurologic consequences and may impair long-term outcome and quality of life of surviving patients. The aim of this study was to assess neurological outcomes at one year after resuscitated cardiac arrest; (2) Methods: This prospective, observational, and multicentre study included patients >18 yo admitted in the catheterisation laboratory for coronary angiography after aborted SCD between 1 May 2018 and 31 May 2020. Only patients who were discharged alive from hospital were evaluated. The primary endpoint was survival without neurological sequelae at one-year follow-up defined by a cerebral performance category (CPC) of one or two. Secondary end points included all-cause mortality, New York Heart Association (NYHA) functional class, neurologic evaluation at discharge, three-month and one-year follow-up using the CPC scale, and quality of life at 1 year using the Quality of Life after Brain Injury (QOLIBRI) questionnaire; (3) Results: Among 143 patients admitted for SCD within the study period, 61 (42.7%) were discharged alive from hospital, among whom 55 (90.1%) completed the one-year follow-up. No flow and low flow times were 1.9 ± 2.4 min and 16.5 ± 10.4 min, respectively. For 93.4% of the surviving patients, an initial shockable rhythm (n = 57) was observed and acute coronary syndrome was diagnosed in 75.4% of them (n = 46). At 1 year, survival rate without neurologic sequelae was 87.2% (n = 48). Patients with poor outcome were older (69.3 vs. 57.4 yo; p = 0.04) and had lower body mass index (22.4 vs. 26.7; p = 0.013) and a lower initial Left Ventricle Ejection Fraction (LVEF) (32.1% vs. 40.3%; p = 0.046). During follow-up, neurological status improved in 36.8% of patients presenting sequelae at discharge, and overall quality of life was satisfying for 66.7% of patients according to the QOLIBRI questionnaire; (4) Conclusions: Among patients admitted to the catheterisation laboratory for aborted SCD, mainly related to Acute Coronary Syndrom (ACS), less

than a half of them were alive at discharge. However, the one-year survival rate without neurological sequelae was high and overall quality of life was good.

5. J Clin Med. 2022 Jun 26;11(13):3677. doi: 10.3390/jcm11133677.
Can Optic Nerve Sheath Images on a Thin-Slice Brain Computed Tomography Reconstruction Predict the Neurological Outcomes in Cardiac Arrest Survivors?
Kwon SH(1), Oh SH(1), Jang J(2), Kim SH(3), Park KN(1), Youn CS(1), Kim HJ(1), Lim JY(1), Kim HJ(1), Bang HJ(1).
ABSTRACT
We analyzed the prognostic performance of optic nerve sheath diameter (ONSD) on thin-slice (0.6 mm) brain computed tomography (CT) reconstruction images as compared to routine-slice (4 mm) images. We conducted a retrospective analysis of brain CT images taken within 2 h after cardiac arrest. The maximal ONSD (mONSD) and optic nerve sheath area (ONSA) were measured on thin-slice images, and the routine ONSD (rONSD) and gray-to-white matter ratio (GWR) were measured on routine-slice images. We analyzed their area under the receiver operator characteristic curve (AUC) and the cutoff values for predicting a poor 6-month neurological outcome (a cerebral performance category score of 3-5). Of the 159 patients analyzed, 113 patients had a poor outcome. There was no significant difference in rONSD between the outcome groups ($p = 0.116$). Compared to rONSD, mONSD (AUC 0.62, 95% CI: 0.54-0.70) and the ONSA (AUC 0.63, 95% CI: 0.55-0.70) showed better prognostic performance and had higher sensitivities to determine a poor outcome (mONSD, 20.4% [95% CI, 13.4-29.0]; ONSA, 16.8% [95% CI, 10.4-25.0]; rONSD, 7.1% [95% CI, 3.1-13.5]), with specificity of 95.7% (95% CI, 85.2-99.5). A combined cutoff value obtained by both the mONSD and GWR improved the sensitivity (31.0% [95% CI, 22.6-40.4]) of determining a poor outcome, while maintaining a high specificity. In conclusion, rONSD was clinically irrelevant, but the mONSD had an increased sensitivity in cutoff having acceptable specificity. Combination of the mONSD and GWR had an improved prognostic performance in these patients.

6. Rev Esp Cardiol (Engl Ed). 2022 Jul 3:S1885-5857(22)00175-X. doi: 10.1016/j.rec.2022.05.027. Online ahead of print.
Optimizing early assessment of neurological prognosis after cardiac arrest.
[Article in English, Spanish]
Ariza-Solé A(1), Barrionuevo-Sánchez MI(2).
NO ABSTRACT AVAILABLE

7. Resuscitation. 2022 Jul 8;178:12-18. doi: 10.1016/j.resuscitation.2022.07.004. Online ahead of print.
Low frequency power in cerebral blood flow is a biomarker of neurologic injury in the acute period after cardiac arrest.
White BR(1), Ko TS(2), Morgan RW(3), Baker WB(2), Benson EJ(4), Lafontant A(2), Starr JP(3), Landis WP(3), Andersen K(2), Jahnavi J(2), Breimann J(2), Delso N(3), Morton S(3), Roberts AL(3), Lin Y(3), Graham K(3), Berg RA(3), Yodh AG(4), Licht DJ(2), Kilbaugh TJ(3).
ABSTRACT
AIM: Cardiac arrest often results in severe neurologic injury. Improving care for these patients is difficult as few noninvasive biomarkers exist that allow physicians to monitor neurologic health. The amount of low-frequency power (LFP, 0.01-0.1 Hz) in cerebral haemodynamics has been used in functional magnetic resonance imaging as a marker of neuronal activity. Our hypothesis was that increased LFP in cerebral blood flow (CBF) would be correlated with improvements in invasive measures of neurologic health. METHODS: We adapted the use of LFP for to monitoring of CBF with

diffuse correlation spectroscopy. We asked whether LFP (or other optical biomarkers) correlated with invasive microdialysis biomarkers (lactate-pyruvate ratio - LPR - and glycerol concentration) of neuronal injury in the 4 h after return of spontaneous circulation in a swine model of paediatric cardiac arrest (Sus scrofa domestica, 8-11 kg, 51% female). Associations were tested using a mixed linear effects model. RESULTS: We found that higher LFP was associated with higher LPR and higher glycerol concentration. No other biomarkers were associated with LPR; cerebral haemoglobin concentration, oxygen extraction fraction, and one EEG metric were associated with glycerol concentration. CONCLUSION: Contrary to expectations, higher LFP in CBF was correlated with worse invasive biomarkers. Higher LFP may represent higher neurologic activity, or disruptions in neurovascular coupling. Either effect may be harmful in the acute period after cardiac arrest. Thus, these results suggest our methodology holds promise for development of new, clinically relevant biomarkers than can guide resuscitation and post-resuscitation care.

ULTRASOUND AND CPR

1. Resuscitation. 2022 Jul 2:S0300-9572(22)00590-1. doi: 10.1016/j.resuscitation.2022.06.025. Online ahead of print.

Point-of-care ultrasound compression of the carotid artery for pulse determination in cardiopulmonary resuscitation.

Kang SY(1), Jo IJ(2), Lee G(2), Park JE(2), Kim T(2), Lee SU(2), Hwang SY(2), Shin TG(2), Kim K(3), Shim JS(4), Yoon H(5).

ABSTRACT

AIM: To identify whether a novel pulse check technique, carotid artery compression using an ultrasound probe, can reduce pulse check times compared to manual palpation (MP). METHODS: This prospective study was conducted in an emergency department between February and December 2021. A physician applied point-of-care ultrasound-carotid artery compression (POCUS-CAC) and assessed the carotid artery compressibility and pulsatility by probe compression during rhythm check time. Another clinician performed MP of the femoral artery. The primary outcome was the difference in the average time for pulse assessment between POCUS-CAC and MP. The secondary outcomes included the time difference in each pulse check between methods, the proportion of times greater than 5 s and 10 s, and the prediction of return of spontaneous circulation (ROSC) during ongoing chest compression. RESULTS: 25 cardiac arrest patients and 155 pulse checks were analyzed. The median (interquartile range) average time to carotid pulse identification per patient using POCUS-CAC was 1.62 (1.14-2.14) s compared to 3.50 (2.99-4.99) s with MP. In all 155 pulse checks, the POCUS-CAC time to determine ROSC was significantly shortened to 0.44 times the MP time ($P < 0.001$). The POCUS-CAC approach never exceeded 10 s, and the number of patients who required more than 5 s was significantly lower (5 vs. 37, $P < 0.001$). Under continuous chest compression, six pulse checks predicted the ROSC. CONCLUSIONS: We found that emergency physicians could quickly determine pulses by applying simple POCUS compression of the carotid artery in cardiac arrest patients.

ORGANISATION AND TRAINING

1. BMJ Open. 2022 Jun 29;12(6):e062908. doi: 10.1136/bmjopen-2022-062908.

Objective performance of emergency medical technicians in the use of mechanical cardiopulmonary resuscitation compared with subjective self-evaluation: a cross-sectional, simulation-based study.

Yang WS(#)(1)(2), Yen P(#)(3), Wang YC(4), Chien YC(5), Chie WC(6), Ma MH(7)(8), Chiang WC(7)(8).
ABSTRACT

OBJECTIVE: To evaluate the subjective and objective resuscitation performance of emergency medical technicians (EMTs) using mechanical cardiopulmonary resuscitation (MCPR) devices. DESIGN AND SETTING: This was a cross-sectional simulation-based study where participants installed the MCPR device on a training manikin. PARTICIPANTS: We assessed EMT-Intermediates (EMT-Is) and EMT-Paramedics (EMT-Ps) of the Emergency Medical Services (Ambulance) Division of the Taipei City Fire Department. PRIMARY AND SECONDARY OUTCOME MEASURES: The primary outcome was the gap between self-perceived (subjective) and actual (objective) no-flow time during resuscitation, which we hypothesised as statistically insignificant. The secondary outcome was the association between resuscitation performance and personal attributes like knowledge, attitude and self-confidence. RESULTS: Among 210 participants between 21 and 45 years old, only six were female. There were 144 EMT-Is and 66 EMT-Ps. During a simulated resuscitation lasting between four and a half and 5 min, EMTs had longer actual no-flow time compared with self-perceived no-flow time (subjective, 38 s; objective, 57.5 s; p value<0.001). This discrepancy could cause a 6.5% drop of the chest compression fraction in a resuscitation period of 5 min. Among the EMT personal factors, self-confidence was negatively associated with objective MCPR deployment performance (adjusted OR (aOR) 0.66, 95% CI 0.45 to 0.97, p=0.033) and objective teamwork performance (aOR 0.57, 95% CI 0.34 to 0.97, p=0.037) for EMT-Ps, whereas knowledge was positively associated with objective MCPR deployment performance (aOR 2.15, 95% CI 1.31 to 3.52, p=0.002) and objective teamwork performance (aOR 1.77, 95% CI 1.02 to 3.08, p=0.043) for EMT-Is. Moreover, regarding the self-evaluation of no-flow time, both self-satisfaction and self-abasement were associated with objectively poor teamwork performance. CONCLUSIONS: EMTs' subjective and objective performance was inconsistent during the MCPR simulation. Self-confidence and knowledge were personal factors associated with MCPR deployment and teamwork performance. Both self-satisfaction and self-abasement were detrimental to teamwork during resuscitation.

2. J Surg Educ. 2022 Jun 24:S1931-7204(22)00141-6. doi: 10.1016/j.jsurg.2022.05.017. Online ahead of print.

Use of a Structured Observation Tool to Promote Medical Student Engagement in Trauma Resuscitations.

Thornton SW(1), Schaps D(2), Leraas HJ(2), Gordon DC(3), Ginsberg Z(3), Vatsaas CJ(2), Greenwald E(4), Tracy ET(5).

ABSTRACT

OBJECTIVE: We describe a novel approach to promoting medical student learning and engagement during trauma resuscitation with implementation of a structured observation and debriefing tool. DESIGN: In the context of a multifaceted quality improvement effort in our emergency room, we implemented a structured trauma observation tool (SOT) for medical students based on ATLS trauma guidelines. The SOT reflects the American College of Surgeons and Association for Surgical Education (ACS/ASE) trauma evaluation module for medical students. Two medical students from our quality improvement working group undertook a proof-of-concept study to determine whether the SOT facilitated accurate observations of trauma resuscitations and promoted educational debriefs with precepting providers. Results were encouraging, so the tool was implemented for elective use on surgical clerkships. Clerkship students who used the SOT were given the opportunity to share its impact on their experience. Institutional Review Board approval was obtained under Pro00109569. SETTING: A large level 1 trauma center at an academic hospital in the southeastern United States. PARTICIPANTS: An interdisciplinary working group including surgeons, emergency medicine physicians, nurses, and students developed the observation tool. Two medical students

from this team showed that the tool was effective at guiding observations and facilitating debriefs prior to its broader implementation on the general surgery clerkship. RESULTS: A total of 630 resuscitation tasks were observed during 15 trauma activations prior to implementation on the surgery clerkship. There was over 97% agreement between students observations and evaluating physicians self-reporting on which tasks were completed. Tasks on which there was disagreement were discussed to aid student learning. The tool was implemented for elective use on the surgery clerkship where students reported positive experiences. CONCLUSIONS: Early data suggest that this structured observation tool facilitates accurate trauma assessment observations and provides an opportunity for high-yield debriefs with the evaluating physician. This promotes student comprehension of ATLS principles. The SOT is being implemented as a pedagogic tool for students on the surgery clerkship to guide their observations, improve comprehension of decisions made in a hyperacute setting, and offer real time feedback as part of their learning in the trauma bay. The tool appears to be a valuable supplement which supports the ACS/ASE curriculum.

3. J Epidemiol Community Health. 2022 Jul 1:jech-2021-218329. doi: 10.1136/jech-2021-218329. Online ahead of print.

Gender-related factors and out-of-hospital cardiac arrest incidence in women and men: analysis of a population-based cohort study in the Netherlands.

Smits RLA(1), van Dongen LH(2), Blom MT(2), Tan HL(2)(3), van Valkengoed IGM(4).

ABSTRACT

BACKGROUND: The incidence of out-of-hospital cardiac arrest (OHCA) differs consistently between women and men. Besides sex-related (biological) factors, OHCA risk may relate to gender-related (sociocultural) factors. We explored the association of selected gender-related factors with OHCA incidence in women and men. METHODS: We combined data on emergency medical services-attended OHCA with individual-level data from all women and men aged ≥25 years living in North Holland, the Netherlands. We estimated the associations between employment status, primary earner status, living with children and marital status and the OHCA incidence with Cox proportional hazards models stratified by sex and adjusted for age and socioeconomic status. To determine if metabolic factors explain the associations, we added hypertension, diabetes mellitus and dyslipidaemia to the models. Population attributable fractions (PAF) for all gender-related factors were calculated. RESULTS: All four gender-related factors were associated with OHCA incidence (eg, unemployed vs employed; HR 1.98, 95% CI 1.67 to 2.35 in women; HR 1.60, 95% CI 1.44 to 1.79 in men). In both sexes, those unemployed, those who are not primary earners, those living without children, and married or divorced individuals had an increased OHCA risk. The PAF ranged from 4.9 to 40.3 in women and from 4.4 to 15.5 in men, with the highest PAF for employment status in both sexes. Metabolic risk factors did not explain the observed associations. CONCLUSION: Gender-related factors were associated with risk of OHCA and contributed substantially to the OHCA burden at the population level, particularly in women. Employment status contributed most to the OHCA burden.

4. Resuscitation. 2022 Jul;176:51-52. doi: 10.1016/j.resuscitation.2022.05.007. Epub 2022 May 17.

Deployment of "super lay-rescuers" equipped with AED to improve OHCA survival: An innovative partnership between emergency medical service, city hall and a mobile application in France.

Morin F(1), Douillet D(2), Lamhaut L(3), Fadel M(4), Savary D(5).

NO ABSTRACT AVAILABLE

5. Resuscitation. 2022 Jun 30;178:26-35. doi: 10.1016/j.resuscitation.2022.06.020. Online ahead of print.

Implementation of ReSPECT in acute hospitals: A retrospective observational study.
Hawkes CA(1), Griffin J(2), Eli K(3), Griffiths F(4), Slowther AM(3), Fritz Z(5), Underwood M(6), Baldock C(7), Gould D(8), Lilford R(9), Jacques C(2), Warwick J(2), Perkins GD(2).
ABSTRACT
AIMS: To evaluate, in UK acute hospitals, the early implementation of the Recommended Summary Plan for Emergency Care and Treatment (ReSPECT), which embeds cardiopulmonary resuscitation (CPR) recommendations within wider emergency treatment plans. To understand for whom and how the process was being used and the quality of form completion. METHODS: A retrospective observational study evaluating emergency care and treatment planning approaches used in acute UK hospitals (2015-2019), and in six English hospital trusts the extent of ReSPECT use, patient characteristics and completion quality in a sample 3000 patient case notes. RESULTS: The use of stand-alone Do Not Attempt Cardiopulmonary Resuscitation forms fell from 133/186 hospitals in 2015 to 64/186 in 2019 (a 38% absolute reduction). ReSPECT accounted for 52% (36/69) of changes. In the six sites, ReSPECT was used for approximately 20% of patients (range 6%-41%). They tended to be older, to have had an emergency medical admission, to have cognitive impairment and a lower predicted 10 year survival. Most (653/706 (92%)) included a 'not for attempted resuscitation' recommendation 551/706 (78%) had at least one other treatment recommendation. Capacity was not recorded on 13% (95/706) of forms; 11% (79/706) did not record patient/family involvement. CONCLUSIONS: ReSPECT use accounts for 52% of the change, observed between 2015 and 2019, from using standalone DNACPR forms to approaches embedding DNACPR decisions within in wider emergency care plans in NHS hospitals in the UK. Whilst recommendations include other emergencies most still tend to focus on recommendations relating to CPR. Completion of ReSPECT forms requires improvement.

6. Resuscitation. 2022 Jun 25;178:10-11. doi: 10.1016/j.resuscitation.2022.06.017. Online ahead of print.
Assessing the learning impact of a self-directed hands only cardiopulmonary resuscitation exhibit at a science museum.
Moskalyk M(1), Ohle R(2), Henson A(3), Pisani K(4), McIsaac S(5).
NO ABSTRACT AVAILABLE

7. ASAIO J. 2022 Jul 1;68(7):e130. doi: 10.1097/MAT.0000000000001728. Epub 2022 Jun 24.
Pediatric Extracorporeal Cardiopulmonary Resuscitation ELSO Guidelines: Erratum.
[No authors listed]
NO ABSTRACT AVAILABLE

8. BJA Educ. 2022 Jul;22(7):265-272. doi: 10.1016/j.bjae.2022.02.004. Epub 2022 Apr 20.
Changes to the European Resuscitation Council guidelines for adult resuscitation.
Kane AD(1), Nolan JP(2)(3).
NO ABSTRACT AVAILABLE

9. J Am Coll Emerg Physicians Open. 2022 Jun 20;3(3):e12752. doi: 10.1002/emp2.12752. eCollection 2022 Jun.
An emergency medicine based model for community-engaged learning.
Knapp BJ(1), Stoner J(2), Lang J(1), Johnson R(1), Flenner R(2), Gathambo M(2).
ABSTRACT
Community-engaged learning (CEL) integrates community service with structured learning to strengthen the knowledge and skills of future physicians while still in medical school. A national

model forCEL during medical school does not currently exist. Emergency physicians have the opportunity to play a vital role in medical student education using CEL as a platform. This article elucidates the structure of a bystander cardiopulmonary resuscitation (B-CPR) CEL program developed by emergency physicians that could serve as a national model for community engagement. As B-CPR is a well-known evidence-based community intervention that can be taught by students and implemented by the community, it represents an ideal CEL that can also have a measurable impact on local B-CPR rates. The development and structure of a B-CPR CEL program, lessons learned, and impact on B-CPR in a local area are reported.

10. Pediatr Emerg Care. 2022 Aug 1;38(8):353-357. doi: 10.1097/PEC.0000000000002776. Epub 2022 Jul 4.

Who Trains the Trainers?: Development of a Faculty Bootcamp for Pediatric Emergency Medicine Resuscitation Procedures.

Lavoie ME(1), Tay KY, Nadel F.

ABSTRACT

OBJECTIVES: Attending physicians in pediatric emergency medicine (PEM) must be able to perform lifesaving procedures, yet guidelines for maintaining procedural competency do not exist. We implemented a biannual 2-hour "bootcamp" designed to help PEM faculty maintain procedural competency. METHODS: A survey-based needs assessment was used to create a set of goals and objectives for the session and determine which procedural skills to include. Sessions of 4 simulated skills were held twice a year and limited to 12 faculty. Post-bootcamp evaluations were administered at the 1-year and 6-year marks to evaluate the usefulness of the training. RESULTS: Twenty-eight of our 55 current faculty members (50%) responded to the 6-year follow-up evaluation. Overall, the bootcamp was felt to be beneficial, with 64% of faculty rating it "great" (5) or "highly useful" (6) on a 6-point Likert scale. The majority of participants also rated the airway, vascular access, and cardiopulmonary resuscitation/defibrillator training favorably. Faculty who later had the opportunity to perform specific resuscitation procedures clinically felt that the circulation (cardiopulmonary resuscitation/defibrillator) and airway stations contributed to the success of their procedure performance. CONCLUSIONS: The clinical setting alone may be insufficient in maintaining procedural competency in lifesaving skills in PEM. Giving faculty the opportunity to practice these skills is feasible and can be effective in increasing confidence. Future training sessions should aim toward practicing to a defined mastery level.

11. Acta Med Okayama. 2022 Jun;76(3):265-271. doi: 10.18926/AMO/63720.

The Impact of Medical Students Teaching Basic Life Support to Laypersons.

Kosaki Y(1), Naito H(1), Iida A(2), Ihoriya H(3), Nojima T(1), Yamada T(1), Yamamoto H(1), Nakamura S(1), Mandai Y(4), Nakao A(1).

ABSTRACT

Basic life support (BLS) courses for laypersons, including cardiopulmonary resuscitation (CPR) training, is known to improve outcomes of out-of-hospital cardiac events. We asked medical students to provide BLS training for laypersons as a part of their emergency medicine education and evaluated the effects of training on the BLS skills of laypersons. We also used a questionnaire to determine whether the medical students who provided the BLS training were themselves more confident and motivated to perform BLS compared to students who did not provide BLS training. The proportions of laypersons who reported confidence in checking for a response, performing chest compressions, and automated external defibrillator (AED) use were significantly increased after the BLS training. The proportions of medical students who reported increased confidence/ motivation in terms of understanding BLS, checking for a response, chest compression, use of AED, and willingness

to perform BLS were significantly greater among medical students who provided BLS instructions compared to those who did not. BLS instruction by medical students was associated with an improvement in laypersons' CPR accuracy and confidence in responding to cardiac arrest. The results indicate that medical students could gain understanding, confidence, and motivation in regard to their BLS skills by teaching BLS to laypersons.

12. Rev Esc Enferm USP. 2022 Jul 4;56(spe):e20210459. doi: 10.1590/1980-220X-REEUSP-2021-0459en. eCollection 2022.
Effectiveness of cardiopulmonary resuscitation training in the teaching of family members of cardiac patients.
[Article in English, Portuguese]
Citolino Filho CM(1), Nogueira LS(1), Gomes VM(1), Polastri TF(2), Timerman S(2).
ABSTRACT
OBJECTIVE: To evaluate the effectiveness of a cardiopulmonary resuscitation training in the skill acquisition of family members of heart disease patients. METHOD: A quasi-experimental study, conducted in a hospital in São Paulo, Brazil. The study participants were one or more relatives of patients with heart disease that were hospitalized at the institution. In the first phase, the participant's skills and theoretical knowledge on cardiopulmonary resuscitation were evaluated before and immediately after the training. The second phase took place one month after the training, in which the same evaluations were applied. The McNemar's and Stuart-Maxwell tests were adopted (5% significance level). RESULTS: The theoretical knowledge of family members before and after training increased and a great retention of this knowledge after 30 days of training was observed. Immediately after training, the family members showed significant improvement of skills in the 15 analyzed actions and, after one month of training, they maintained most of the acquired practices on cardiopulmonary resuscitation, except for chest compressions frequency and the time between turning on the defibrillator and delivering the shock. CONCLUSION: Cardiopulmonary resuscitation training was effective in the acquisition of theoretical and practical knowledge of the family members.

13. Rev Med Suisse. 2022 Jul 6;18(789):1370-1372. doi: 10.53738/REVMED.2022.18.789.1370.
[Kids save lives, also in western Switzerland ?].
[Article in French; Abstract available in French from the publisher]
Csakodi J(1).
ABSTRACT
In order to increase the chances of survival of victims of out-of--hospital cardiac arrest, rapid response is essential. The vast majority of sudden cardiac arrests (SCA) do not occur in hospital. Raising public awareness of cardiopulmonary resuscitation (CPR) is a principle that has been in place for the last ten years. The creation and development of a network of first responders in French-speaking Switzerland is an illustration of this. The Kids save lives project promotes the training of children in CPR so that they too can recognize, call emergency services and provide first aid in an SCA situation.

14. Eur Heart J Acute Cardiovasc Care. 2022 Jul 9:zuac083. doi: 10.1093/ehjacc/zuac083. Online ahead of print.
Performance of CASS, PHR-RS, and SARICA scores to predict survival in acute coronary syndromes complicated by out-of-hospital cardiac arrest.
Pham V(1), Varenne O(1)(2), Cariou A(2)(3)(4), Picard F(1)(2)(4).
NO ABSTRACT AVAILABLE

15. Eur J Cardiovasc Nurs. 2022 Jul 8:zvac056. doi: 10.1093/eurjcn/zvac056. Online ahead of print.
Caught between competing emotions and tensions while adjusting to a new everyday life: a focus group study with family caregivers of out-of-hospital cardiac arrest survivors.
Rosenkilde S(1), Missel M(2), Wagner MK(3), Dichman C(3), Hermansen AS(1), Larsen MK(4)(5), Joshi VL(6), Zwisler AD(1)(6), Borregaard B(1)(4)(7).
ABSTRACT
AIMS: Caring for an out-of-hospital cardiac arrest (OHCA) survivor may impact family caregivers' lives due to the sudden onset of the illness and possible secondary cognitive, emotional, and physical challenges. However, experiences of caring for an OHCA survivor are sparsely described. Thus, this study aimed to explore how family caregivers of OHCA survivors experience the potential burden.
METHODS AND RESULTS: Using an explorative qualitative approach, six focus group interviews were conducted with a sample of 25 family caregivers of OHCA survivors and analysed using a phenomenological hermeneutic approach inspired by the philosophy of Ricoeur. The OHCA survivors attended a rehabilitation course, and the family caregivers were interviewed as part of the course.Based on the analysis, three themes emerged: (i) feeling unexpectedly alone and invisible; the family caregivers experienced an emotional burden that could not be shared-leading to caregiving being a lonely experience, (ii) fear of loss; the fear of losing a loved one was a constant companion contributing to the burden, and (iii) adjusting to a new everyday life; the family caregivers had difficulties adjusting to living their lives on the premise of the survivors' needs.
CONCLUSION: The findings of this study emphasize the burden experienced by family caregivers and how they can be trapped in competing emotions and tensions. The possible caregiver burden following OHCA should be acknowledged. Interventions to reduce the burden should be tested and implemented as part of the clinical care of OHCA survivors and their families.

16. SSM Popul Health. 2022 Jun 22;19:101151. doi: 10.1016/j.ssmph.2022.101151. eCollection 2022 Sep.
Are there socioeconomic disparities in geographic accessibility to community first responders to out-of-hospital cardiac arrest in Ireland?
Masterson S(1), Teljeur C(2), Cullinan J(3).
ABSTRACT
Out-of-hospital cardiac arrest (OHCA) is a leading cause of death worldwide. Without appropriate early resuscitation interventions, the prospect of survival is limited. This means that an effective community response is a critical enabler of increasing the number of people who survive. However, while OHCA incidence is higher in more deprived areas, propensity to volunteer is, in general, associated with higher socioeconomic status. In this context, we consider whether there are socioeconomic disparities in geographic accessibility to volunteer community first responders (CFRs) in Ireland, where CFR groups have developed organically and communities self-select to participate. We use geographic information systems and propensity score matching to generate a set of control areas with which to compare established CFR catchment areas. Differences between CFRs and controls in terms of the distribution of catchment deprivation and social fragmentation scores are assessed using two-sided Kolmogorov-Smirnov tests. Overall we find that while CFR schemes are centred in more deprived and socially fragmented areas, beyond a catchment of 4 min there is no evidence of differences in area-level deprivation or social fragmentation. Our findings show that self-selection as a model of CFR recruitment does not lead to more deprived areas being disadvantaged in terms of access to CFR schemes. This means that community-led health interventions can develop to the benefit of community members across the socioeconomic spectrum and may be relevant for other countries and jurisdictions looking to support similar models within communities.

17. Cardiology. 2022;147(3):328-331. doi: 10.1159/000522554. Epub 2022 Feb 11.
Temporal Trends in the Incidence and Characteristics of Sudden Cardiac Death among Subjects under 40 Years of Age in Northern Finland during 1998-2017.
Vähätalo J(1), Holmström L(1), Pakanen L(2)(3), Kaikkonen K(1), Perkiömäki J(1), Huikuri H(1), Junttila J(1)(4).
ABSTRACT
BACKGROUND: Although the mean age of sudden cardiac death (SCD) victims has increased during recent decades, overall incidence has remained relatively stable. Small but very important proportion of SCDs occur in subjects under 40 years of age and temporal trends in the incidence and characteristics of SCD in this age-group are not well known. METHODS: The Fingesture study has prospectively gathered data from 5,869 consecutive autopsy verified SCD victims in Northern Finland during 1998-2017. On the basis of Finnish law, all who die unexpectedly undergo autopsy. RESULTS: Out of total 5,869 SCDs, 160 occurred in subjects under 40 years of age (3%) indicating a total incidence of 2.9/100,000/year. Incidence decreased during the study period: 4.0/100,000/year (n = 50) in 1998-2002, 3.7/100,000/year (n = 45) in 2003-2007, 2.5/100,000/year (n = 36) in 2008-2012, and 1.5/100,000/year (n = 29) in 2013-2017. Coronary artery disease (CAD) was the cause of death in 46 SCD victims (29%). Among nonischemic causes, most common were obesity-related hypertrophic myocardial disease (24%), primary myocardial fibrosis (19%), and hypertensive myocardial disease (6%). The incidence of SCD caused by CAD decreased as follows: 1.5/100,000/year in 1998-2002, 1.2/100,000/year in 2003-2007, 0.6/100,000/year in 2008-2012, and 0.2/100,000/year in 2013-2017. Proportion of male gender (81%) and obesity as a comorbidity (body mass index >30 kg/m2, 40%) remained relatively stable during the period (p = 0.58 and p = 0.79, respectively). CONCLUSIONS: The incidence of SCD in subjects under 40 years of age has decreased in Northern Finland during 1998-2017. According to autopsy data, most of the deaths are due to nonischemic myocardial diseases and relative proportion of CAD has decreased.

18. Med Klin Intensivmed Notfmed. 2022 Jul 12. doi: 10.1007/s00063-022-00939-z. Online ahead of print.
[Cardiac arrest centers-certification fosters inflow of patients by emergency medical services].
[Article in German; Abstract available in German from the publisher]
Rott N(1)(2), Wingen S(3)(4)(5), Müller D(6), Böttiger BW(3)(4).
ABSTRACT
BACKGROUND: Since 2015, the international resuscitation guidelines recommend the implementation of specialized hospitals (so-called cardiac arrest centers, CAC) for patients with out-of-hospital cardiac arrest (OHCA). OBJECTIVES: The aim was to investigate the potential influence of hospital certification as a CAC on the decision of emergency medical service staff (EMS, including out-of-hospital emergency physicians and paramedics) when transporting OHCA patients to a hospital. MATERIALS AND METHODS: A web-based, anonymous questionnaire with 20 items was performed from 15 May 2018 to 15 June 2018 in Germany. Target groups were out-of-hospital emergency physicians and paramedics. RESULTS: Of 437 respondents, 378 responses (n = 292 emergency physicians, n = 86 paramedics) were included in the statistical analysis. In all, 75.1% (n = 284) indicated that CAC certification of hospitals would matter in their own transportation decisions for OHCA patients in future transportations, 78.3% (n = 296) expected that CAC certification will result in an improvement in patient care, and 78.8% (n = 298) were in favor of implementing the CAC certification. Respondents would accept an additional 16.3 min (95% confidence interval 15.2-17.3) of transportation time to reach a CAC. CONCLUSIONS: Certification of hospitals as CAC has the potential to influence emergency medical personnel decisions about which

hospital to transport OHCA patients to. Due to the limited additional acceptable transport time to reach a CAC, a close network of certified hospitals is needed nationwide.

19. Actas Dermosifiliogr. 2022 Jul 7:S0001-7310(22)00614-7. doi: 10.1016/j.ad.2022.07.008. Online ahead of print.
Safety in Dermatologic Procedures: Basic and Advanced Cardiopulmonary Resuscitation.
[Article in English, Spanish]
Lobo-Valbuena B(1), Martin-Gorgojo A(2).
ABSTRACT
This article in the series on safety in dermatologic procedures covers the delivery of cardiopulmonary resuscitation through basic life support (using no devices), advanced life support (using an automated external defibrillator), and injecting adrenaline. We provide a brief overview of the updated 2021 European Resuscitation Council guidelines and offer an algorithm and visual aids to support recommended practices.

20. Resuscitation. 2022 Jul 13;178:36-37. doi: 10.1016/j.resuscitation.2022.07.014. Online ahead of print.
Israeli dispatchers' response time to out-of-hospital cardiac arrest emergency calls.
Jaffe E(1), Bitan Y(2).
NO ABSTRACT AVAILABLE

21. Resuscitation. 2022 Jul 8:S0300-9572(22)00596-2. doi: 10.1016/j.resuscitation.2022.07.006. Online ahead of print.
Utilizing Community Level Factors to Improve Prediction of Out of Hospital Cardiac Arrest Outcome using Machine Learning.
Harford S(1), Darabi H(1), Heinert S(2), Weber J(3), Campbell T(4), Kotini-Shah P(5), Markul E(6), Tataris K(4), Vanden Hoek T(5), Del Rios M(7).
ABSTRACT
OBJECTIVES: To evaluate the impact of community level information on the predictability of out-of-hospital cardiac arrest (OHCA) survival. METHODS: We used the Cardiac Arrest Registry to Enhance Survival (CARES) to geocode 9,595 Chicago incidents from 2014-2019 into community areas. Community variables including crime, healthcare, and economic factors from public data were merged with CARES. The merged data were used to develop ML models for OHCA survival. Models were evaluated using Area Under the Receiver Operating Characteristic curve (AUROC) and features were analyzed using SHapley Additive exPansion (SHAP) values. RESULTS: Baseline results using CARES data achieved an AUROC of 84%. The final model utilizing community variables increased the AUROC to 88%. A SHAP analysis between high and low performing community area clusters showed the high performing cluster is positively impacted by good health related features and good community safety features positively impact the low performing cluster. CONCLUSION: Utilizing community variables helps predict neurologic outcomes with better performance than only CARES data. Future studies will use this model to perform simulations to identify interventions to improve OHCA survival.

22. Prehosp Emerg Care. 2022 Jul 29:1-8. doi: 10.1080/10903127.2022.2099601. Online ahead of print.
Effects of a Designated Ambulance Team Response on Prehospital Return of Spontaneous Circulation and Advanced Cardiac Life Support of Out-of-Hospital Cardiac Arrest: A Nationwide Natural Experimental Study.

Lee SH(1)(2), Lee SY(3)(4)(5), Park JH(2)(5)(6), Song KJ(5)(6)(7), Shin SD(2)(5)(6).
ABSTRACT
OBJECTIVES: This study aimed to investigate the effects of adding advanced cardiac life support (ACLS) training to an existing basic life support program and the operation of a designated team response for patients with out-of-hospital cardiac arrest (OHCA) on prehospital return of spontaneous circulation (ROSC) and ACLS management. METHODS: A natural experimental study was conducted for emergency medical service (EMS)-treated adult patients with OHCA in 2020. In 2019, a quarter of the EMS clinicians were trained in a 3-day ACLS courses, and they were designated to be dispatched first in suspected OHCA. Some were dispatched only to major emergencies, such as OHCA and myocardial infarction (dedicated team), while others were dispatched to all emergencies with priority to major ones (non-dedicated team). The exposure was the ambulance response type: dedicated, non-dedicated, and basic teams (others). The primary outcome was prehospital ROSC. The secondary outcomes were prehospital ACLS (advanced airway management and intravenous access). A multivariable logistic regression analysis was conducted to investigate the effect of ambulance response type on study outcomes. RESULTS: Among 23,512 eligible patients with OHCA, 54.8% (12,874) were treated by the basic team, 36.5% (8,580) by the non-dedicated ACLS team, and 8.8% (2,058) were treated by the dedicated ACLS team. Prehospital ROSC was greater for the designated team than for the basic team (dedicated ACLS team 13.8%, non-dedicated ACLS team 11.3%, and basic team 6.7%) ($p < 0.01$). In the final logistic regression analysis, compared with the basic team, the designated ACLS team was associated with a higher probability of prehospital ROSC (AOR (95% CIs), 1.88 (1.68-2.09) compared to the non-dedicated ACLS team, and 2.46 (2.09-2.90) compared to the dedicated ACLS team), prehospital advanced airway management (1.72 (1.57-1.87) and 1.73 (1.48-2.03), respectively), and intravenous access (2.29 (2.16-2.43) and 2.76 (2.50-3.04), respectively). CONCLUSION: Additional ACLS training and operation of a designated OHCA team response were associated with higher rates of prehospital ROSC and prehospital ACLS provision. However, further research is needed to find the optimal operation for EMS to improve survival outcomes.

23. Resusc Plus. 2022 Jul 1;11:100268. doi: 10.1016/j.resplu.2022.100268. eCollection 2022 Sep.
Contemporary levels of cardiopulmonary resuscitation training in Denmark.
Juul Grabmayr A(1)(2), Andelius L(1), Bo Christensen N(1)(2), Folke F(1)(2)(3), Bundgaard Ringgren K(4), Torp-Pedersen C(5)(6), Gislason G(2)(3), Jensen TW(1)(2), Rolin Kragh A(1)(2), Tofte Gregers MC(1)(2), Samsoee Kjoelbye J(1)(2), Malta Hansen C(1)(7).
ABSTRACT
AIM: Many efforts have been made to train the Danish population in cardiopulmonary resuscitation (CPR) and automated external defibrillator (AED) use. We assessed CPR and AED training levels among the broad Danish population and volunteer responders. METHODS: In November 2018, an electronic cross-sectional survey was sent to (1) a representative sample of the general Danish population (by YouGov) and (2) all volunteer responders in the Capital Region of Denmark. RESULTS: A total of 2,085 people from the general population and 7,768 volunteer responders (response rate 36%) completed the survey. Comparing the general Danish population with volunteer responders, 81.0% (95% CI 79.2-82.7%) vs. 99.2% (95% CI 99.0-99.4%) $p < 0.001$ reported CPR training, and 54.0% (95% CI 51.8; 56.2) vs. 89.5% (95% CI 88.9-90.2) $p < 0.001$ reported AED training, at some point in life.In the general population, the unemployed and the self-employed had the lowest proportion of training with CPR training at 71.9% (95% CI 68.3-75.4%) and 65.4% (95% CI 53.8-75.8%) and AED training at 39.0% (95% CI 35.2-42.9%) and 34.6% (95% CI 24.2-46.2%), respectively.Applicable to both populations, the workplace was the most frequent training provider. Among 18-29-year-olds in the general population, most reported training when acquiring a driver's license. CONCLUSIONS: A

large majority of the Danish population and volunteer responders reported previous CPR/AED training. Mandatory training when acquiring a driver's license and training through the workplace seems to disseminate CPR/AED training effectively. However, new strategies reaching the unemployed and self-employed are warranted to ensure equal access.

24. Heart Lung. 2022 Jul 7;56:96-104. doi: 10.1016/j.hrtlng.2022.06.019. Online ahead of print.
Withdrawal of life-sustaining therapy in intensive care unit patients following out-of-hospital cardiac arrest: An Australian metropolitan ICU experience.
Devanand NA(1), Ruknuddeen MI(2), Soar N(2), Edwards S(3).
ABSTRACT
BACKGROUND: Withdrawal of life-sustaining therapy is a common phenomenon following out-of-hospital cardiac arrest. The clinical practices surrounding withdrawal of life-sustaining therapy remain unclear and warrant further inspection due to their reported impact on post-cardiac arrest mortality. OBJECTIVES: To determine factors associated with withdrawal of life-sustaining therapy (WLST) in intensive care unit (ICU) patients following out-of-hospital cardiac arrest (OHCA). METHODS: A retrospective review of ICU patients' clinical records following OHCA was conducted from January 2010 to December 2015. Demographic features, cardiac arrest characteristics, and targeted temperature management practices were compared between patients with and without WLST. We dichotomised WLST into early (ICU length of stay <72 h) and late (ICU length of stay ≥72 h). Factors independently associated with WLST were determined by multivariable binary logistic regression. RESULTS: The study cohort included 260 post-OHCA ICU patients. The mean age was 58 years, and majority were males (178, 68%); 145 (56%) underwent WLST, with the majority undergoing early WLST (89, 61%). Status myoclonus was the strongest independent factor associated with early WLST (OR 42.53, 95% CI 4.97-363.60; $p < 0.001$). Glasgow Coma Scale (GCS) motor response of <4 on day three post-OHCA was the strongest factor associated with delayed WLST (OR 48.76, 95% CI 11.87-200.27; $p < 0.0001$). CONCLUSION: The majority of deaths in ICU patients post-OHCA occurred following early WLST. Status myoclonus and a GCS motor response of <4 on day three post-OHCA are independently associated with WLST.

25. Curr Probl Cardiol. 2022 Jul 12:101312. doi: 10.1016/j.cpcardiol.2022.101312. Online ahead of print.
Cardiac Arrest in Young Adults with Ischemic Heart Disease in the United States, 2004-2018.
Jain V(1), Minhas AMK(2), Kleiman NS(3), Arshad HB(3), Saleh Y(3), Pandat SS(3), Dani SS(4), Goel SS(3), Faza N(3), Butt SA(5), Blankstein R(6), Cainzos-Achirica M(7), Nasir K(7), Khan SU(8).
ABSTRACT
BACKGROUND: Cardiac arrest (CA) among young adults (<45 y) with ischemic heart disease (IHD) remained understudied. OBJECTIVE: To evaluate the trends in clinical profile, in-hospital mortality, and health care resource utilization in CA-related hospitalizations among young adults with IHD. METHODS: National Inpatient Sample (2004-2018) was used to identify adults aged 18- 45 years. RESULTS: Of 77,359 weighted CA-related hospitalizations (mean age: 39 [0.05] y; 34.3% women), 65% had a myocardial infarction (MI), and 58% had a shockable rhythm. Between 2004 and 2018, CA-related hospitalizations among young adults with IHD increased from 1.8% to 2.4%. Overall, in-hospital mortality was 36.4%, which was higher for women vs. men (40.4% vs. 34.2%; $p<0.001$) and Black vs. White adults (43.9% vs. 33.3%; $p<0.001$). In-hospital mortality increased from 33.5% to 38.1%, with a consistent upward trend in men, White adults, and both MI and non-MI cases. However, in STEMI (40%), in-hospital mortality decreased from 34.6% to 20.2% (p-trend <0.001), while it increased in NSTEMI (14.8%) from 34.3% to 47.5% (p-trend <0.001). Overall mean length of stay (LOS) (7 to 9 days) and mean inflation-adjusted care cost ($34,431 to $44,646) increased over

the study duration. CONCLUSION: CA-related hospitalizations and associated LOS and inflation-adjusted care costs have increased in the last 15 years. In-hospital mortality increased by ∼5% during the study period with a higher mortality in women and among black adults. While increased CA-related hospitalizations may reflect improved pre-hospital care, greater efforts are needed to address improve in-hospital survival in CA among young adults with IHD.

26. Scott Med J. 2022 Jul 12:369330221112186. doi: 10.1177/00369330221112186. Online ahead of print.
Design and testing of the safety of the SARUS-CPR hood for novice resuscitators.
Wasik P(1), McLeod GA(2)(3), Mountain R(4), Watts S(1), Briggs H(1), Maini N(2), Belford I(1), McGuire B(2), Brown W(5), Clark R(5), Eley I(5), Richardson E(6), Stonebridge P(3)(7).
ABSTRACT
BACKGROUND AND AIMS: Bystanders should be protected against aerosols, droplets, saliva, blood and vomitus during resuscitation after cardiac arrest The SARUS (safer - airway - resuscitation) CPR airway hood™ is a clear plastic cover and integrated mask that envelopes the head and torso. Our objectives were to test leakage using saline aerosol generation tests, then assess the performance of the hood during mock cardio-pulmonary resuscitation on a manikin. METHODS: A checklist was validated by comparing the performance of 10 novices against 10 experts during mock resuscitation. Thereafter, 15 novices were tested with and without the hood, in a randomised cross-over study, one week apart. RESULTS: Laboratory analysis showed a > 99% reduction of saline particles detected 5 cm, 75 cm and 165 cm above volunteers wearing the hood. On manikins, experts scored better compared to novices, 8.5 (0.7) vs 7.6 (1.2), difference (95%CI) 0.9 (0.4-1.3), P = 0.0004. Novice performance was equivalent using the hood and standard equipment, 7.3 (1.4) vs 7.3 (1.1) respectively, difference (90%CI) 0.0 (-0.3 - 0.3), P = 0.90. CONCLUSION: Aerosol transmission reduced in the breathing zone. Simulated resuscitation by novices was equivalent with and without the hood.

POST-CARDIAC ARREST TREATMENTS

1. Eur J Cardiovasc Nurs. 2022 Jun 29:zvac039. doi: 10.1093/eurjcn/zvac039. Online ahead of print.
Return-to-work and rehabilitation needs in cardiac arrest survivors: an exploratory cross-sectional study.
Christensen J(1), Winkel BG(2), Eskildsen SJ(1), Gottlieb R(1), Hassager C(2), Wagner MK(2).
ABSTRACT
Patient-reported return-to-work and job functioning 6 and 12 months after hospital discharge and received rehabilitation interventions and unmet rehabilitation needs were explored in a consecutive population of out-of-hospital cardiac arrest survivors. Patients working prior to cardiac arrest were invited to participate in a telephone administered survey. Thirty-eight surveys were conducted and included for analysis, equivalent to a minimum response rate of 95%. Survivors of out-of-hospital cardiac arrest had extensive challenges returning to work. Six- and 12-months post-arrest, 58% and 45% were respectively on full time sick leave or working notably less (>10 h/week) and with extensive unmet rehabilitation needs.

2. Catheter Cardiovasc Interv. 2022 Jun 29. doi: 10.1002/ccd.30316. Online ahead of print.
Variation in practice for out-of-hospital cardiac arrest treated with percutaneous coronary intervention in England and Wales.
Rashid M(1)(2), Kinnaird T(3), Ludman P(4), Keeble TR(5)(6), Mamas M(1)(2), Curzen N(7)(8).
ABSTRACT
OBJECTIVES: We assessed the association between total center volume, operator volume, and out-of-hospital cardiac arrest (OHCA) percutaneous coronary intervention (PCI) volume. BACKGROUND:

Variations between OHCA PCI volume, hospital total PCI, and primary PCI volume are not well studied and are unlikely to be clinically justifiable. METHODS: Patients undergoing PCI for the acute coronary syndrome (ACS) between January 1, 2014, and March 31, 2019, in England and Wales were grouped as OHCA PCI and non-OHCA PCI. Spearman's correlation was used to determine the degree of correlation between each hospital PCI volume and OHCA PCI volume. RESULTS: Out of 250,088 PCI procedures undertaken for ACS, 12,016 (4.8%) were performed for OHCA, and 238,072 (95.2%) were non-OHCA PCI procedures. The OHCA PCI group were younger [mean age (SD) 63.2 (12.3) and 65.6 (12.5, $p < 0.001$)], less likely to be female (20.2% vs. 26.9%, $p < 0.001$) or Black, Asian, and Minority Ethnicity (11.5% vs. 14.8%, $p < 0.001$) compared to the non-OHCA PCI group. Although there was a degree of correlation between total PCI and OHCA PCI, there was wide variation for both ACS cohort (Spearman correlation $R2 = 0.50$) and total PCI volume (Spearman correlation $R2 = 0.60$). Furthermore, the correlation between primary PCI volume and OHCA PCI within centers was weak ($R2 = 0.10$). Similarly, wide variations between operator PCI volume and OHCA PCI volume were observed. CONCLUSION: These national data demonstrate wide variation in the practice of OHCA PCI both between centers and individuals. These variations are not expected according to clinical factors and require further investigation.

3. Resuscitation. 2022 Jun 23:S0300-9572(22)00573-1. doi: 10.1016/j.resuscitation.2022.06.010. Online ahead of print.

Targeted plasma metabolomics in resuscitated comatose out-of-hospital cardiac arrest patients.

Paulin Beske R(1), Henriksen HH(2), Obling L(1), Kjærgaard J(1), Bro-Jeppesen J(3), Nielsen N(4), Johanson PI(5), Hassager C(6).

ABSTRACT

BACKGROUND: Out-of-hospital cardiac arrest (OHCA) is a leading cause of death. Even if successfully resuscitated, mortality remains high due to ischemic and reperfusion injury (I/R). The oxygen deprivation leads to a metabolic derangement amplified upon reperfusion resulting in an uncontrolled generation of reactive oxygen species in the mitochondria triggering cell death mechanisms. The understanding of I/R injury in humans following OHCA remains sparse, with no existing treatment to attenuate the reperfusion injury. AIM: To describe metabolic derangement in patients following resuscitated OHCA. METHODS: Plasma from consecutive resuscitated unconscious OHCA patients drawn at hospital admission were analyzed using ultra-performance-liquid-mass-spectrometry. Sixty-one metabolites were prespecified for quantification and studied. RESULTS: In total, 163 patients were included, of which 143 (88%) were men, and the median age was 62 years (53-68). All measured metabolites from the tricarboxylic acid (TCA) cycle were significantly higher in non-survivors vs. survivors (180-days survival). Hierarchical clustering identified four clusters (A-D) of patients with distinct metabolic profiles. Cluster A and B had higher levels of TCA metabolites, amino acids and acylcarnitine species compared to C and D. The mortality was significantly higher in cluster A and B (A:62% and B:59% vs. C:21 % and D:24%, $p < 0.001$). Cluster A and B had longer time to return of spontaneous circulation (A:33 min (21-43), B:27 min (24-35), C:18 min (13-28), and D:18 min (12-25), $p < 0.001$). CONCLUSION: Circulating levels of metabolites from the TCA cycle best described the variance between survivors and non-survivors. Four different metabolic phenotypes with significantly different mortality were identified.

4. Resuscitation. 2022 Jul;176:107-116. doi: 10.1016/j.resuscitation.2022.03.036. Epub 2022 Apr 16.

Socioeconomic status and post-arrest care after out-of-hospital cardiac arrest in Texas.

Huebinger R(1), Abella BS(2), Chavez S(3), Luber S(4), Al-Araji R(5), Panczyk M(6), Waller-Delarosa J(7), Villa N(8), Bobrow B(9).

ABSTRACT

INTRODUCTION: Post-arrest care after out-of-hospital cardiac arrest (OHCA) is critical to optimizing outcomes, but little is known about socioeconomic disparities in post-arrest care. We evaluated the association of socioeconomic status (SES) with post-arrest care and outcomes. METHODS: We

included adult OHCAs surviving to hospital admission from the 2014-2020 Texas Cardiac Arrest Registry to Enhance Survival (CARES) and stratified cases into SES quartiles based on census tract data. Outcomes were targeted temperature management (TTM), percutaneous coronary intervention (PCI), survival to discharge, and survival with a Cerebral Performance Category (CPC) 1-2. We applied both a multivariable logistic regression and a mixed effects logistic regression, comparing lower quartiles to top quartile for outcomes. We modeled receiving hospital as a random intercept. RESULTS: We included 9,936 OHCAs. Using multivariable logistic regression and ignoring the receiving hospital, lower income had lower TTM (Q3 aOR 0.6, 95% CI 0.5-0.7; Q4 aOR 0.5, 95% CI 0.5-0.6), lower PCI (Q4 aOR 0.6, 95% CI 0.4-0.8), and lower survival with good CPC. Lower education had lower TTM (Q2 aOR 0.7, 95% CI 0.7-0.8; Q3 aOR, 0.6 95% CI 0.5-0.7; Q4 aOR 0.6, 95% CI 0.5-0.7), lower survival, and lower survival with good CPC. Lower employment had lower TTM (Q3 aOR 0.7, 95% CI 0.6-0.9; Q4 aOR 0.7, 95% CI 0.6-0.9) and survival with good CPC. These relationships for post-arrest care were not significant on mixed model analyses though. CONCLUSION: Lower SES was linked to lower rates of post-arrest care and outcomes, but many of the associations diminished when adjusting for receiving hospital random effect. Further study is needed to evaluate for inter-hospital disparities in care.

5. Cardiovasc Revasc Med. 2022 Jul;40:92-98. doi: 10.1016/j.carrev.2021.11.026. Epub 2021 Nov 26.
Timing of Coronary Angiography in Patients Following Out-of-Hospital Cardiac Arrest Without ST-Segment Elevation: A Systematic Review and Meta-Analysis of Randomized Trials.
Abusnina W(1), Al-Abdouh A(2), Latif A(1), Alkhouli M(3), Alraies MC(4), Daggubati R(5), Alasnag M(6), Kerrigan J(7), Paul TK(8).
ABSTRACT
INTRODUCTION: Out-of-hospital cardiac arrest (OHCA) has a poor prognosis. The timing and role of early coronary angiography (CAG) in OHCA patients without ST elevation remains unclear. OBJECTIVE: We performed a meta-analysis of randomized controlled trials (RCTs) that compared early CAG to delayed CAG in OHCA patients without ST elevation. METHODS: We searched PubMed, Cochrane, and ClinicalTrials.gov databases (from inception to September 2021) for studies comparing early CAG to delayed CAG in OHCA patients without ST elevation. We used a random-effect model to calculate relative ratio (RR) with 95% confidence interval (CI). The primary outcome was all-cause mortality at 30 days. Secondary outcomes included neurological status with cerebral performance category ≤2 (CPC) and the rate of percutaneous coronary intervention (PCI) following CAG. RESULTS: A total of 6 RCTs including 1822 patients, of whom 895 underwent early CAG, and 927 underwent delayed CAG, were included in this meta-analysis. There was no statistically significant difference between the 2 groups in terms of 30-day all-cause mortality (Relative risk [RR] 1.06; 95%CI 0.94-1.20; P = 0.32; I2 = 13%), neurological status (CPC ≤2) (RR 1.01; 95%CI 0.90-1.13; P = 0.85, I2 = 37%), and rates of PCI following CAG (RR 1.08; 95%CI 0.84-1.39; P = 0.56; I2 = 49%). CONCLUSION: In patients suffering OHCA without ST-elevation, early CAG is not associated with reduced 30-day mortality when compared to patients who underwent delayed CAG. Given our meta-analysis results including multiple trials that have not shown a benefit, it is likely that updated guidelines will not support early angiography in patients suffering OHCA without ST-elevation.

6. Ann Acad Med Singap. 2022 Jun;51(6):341-350. doi: 10.47102/annals-acadmedsg.2021498.
Inter-hospital trends of post-resuscitation interventions and outcomes of out-of-hospital cardiac arrest in Singapore.
Jaffar JLY(1), Fook-Chong S, Shahidah N, Ho AFW, Ng YY, Arulanandam S, White A, Liew LX, Asyikin N, Leong BSH, Gan HN, Mao D, Chia MYC, Cheah SO, Ong MEH(#); for Singapore PAROS investigators.
ABSTRACT
INTRODUCTION: Hospital-based resuscitation interventions, such as therapeutic temperature management (TTM), emergency percutaneous coronary intervention (PCI) and extracorporeal membrane oxygenation (ECMO) can improve outcomes in out-of-hospital cardiac arrest (OHCA). We

investigated post-resuscitation interventions and hospital characteristics on OHCA outcomes across public hospitals in Singapore over a 9-year period. METHODS: This was a prospective cohort study of all OHCA cases that presented to 6 hospitals in Singapore from 2010 to 2018. Data were extracted from the Pan-Asian Resuscitation Outcomes Study Clinical Research Network (PAROS CRN) registry. We excluded patients younger than 18 years or were dead on arrival at the emergency department. The outcomes were 30-day survival post-arrest, survival to admission, and neurological outcome. RESULTS: The study analysed 17,735 cases. There was an increasing rate of Provision of TTM, emergency PCI and ECMO (P<0.001) in hospitals, and a positive trend of survival outcomes (P<0.001). Relative to hospital F, hospitals B and C had lower provision rates of TTM (≤5.2%). ECMO rate was consistently <1% in all hospitals except hospital F. Hospitals A, B, C, E had <6.5% rates of provision of emergency PCI. Relative to hospital F, OHCA cases from hospitals A, B and C had lower odds of 30-day survival (adjusted odds ratio [aOR]<1; P<0.05 for hospitals A-C) and lower odds of good neurological outcomes (aOR<1; P<0.05 for hospitals A-C). OHCA cases from academic hospitals had higher odds ratio (OR) of 30-day survival (OR 1.3, 95% CI 1.1-1.5) than cases from hospitals without an academic status. CONCLUSION: Post-resuscitation interventions for OHCA increased across all hospitals in Singapore from 2010 to 2018, correlating with survival rates. The academic status of hospitals was associated with improved survival.

7. JAMA Cardiol. 2022 Jul 1;7(7):700-707. doi: 10.1001/jamacardio.2022.1416.
Emergency vs Delayed Coronary Angiogram in Survivors of Out-of-Hospital Cardiac Arrest: Results of the Randomized, Multicentric EMERGE Trial.
Hauw-Berlemont C(1), Lamhaut L(2)(3)(4), Diehl JL(1)(5), Andreotti C(6), Varenne O(7), Leroux P(8), Lascarrou JB(9), Guerin P(10), Loeb T(11), Roupie E(12), Daubin C(13), Beygui F(14), Boissier F(15), Marjanovic N(16), Christiaens L(17), Vilfaillot A(18), Glippa S(18), Prat JD(18), Chatellier G(18), Cariou A(19), Spaulding C(20); EMERGE Investigators.
ABSTRACT
IMPORTANCE: Although an emergency coronary angiogram (CAG) is recommended for patients who experience an out-of-hospital cardiac arrest (OHCA) with ST-segment elevation on the postresuscitation electrocardiogram (ECG), this strategy is still debated in patients without ST-segment elevation. OBJECTIVE: To assess the 180-day survival rate with Cerebral Performance Category (CPC) 1 or 2 of patients who experience an OHCA without ST-segment elevation on ECG and undergo emergency CAG vs delayed CAG. DESIGN, SETTING, AND PARTICIPANTS: The Emergency vs Delayed Coronary Angiogram in Survivors of Out-of-Hospital Cardiac Arrest (EMERGE) trial randomly assigned survivors of an OHCA without ST-segment elevation on ECG to either emergency or delayed (48 to 96 hours) CAG in 22 French centers. The trial took place from January 19, 2017, to November 23, 2020. Data were analyzed from November 24, 2020, to July 30, 2021. MAIN OUTCOMES AND MEASURES: The primary outcome was the 180-day survival rate with CPC of 2 or less. The secondary end points were occurrence of shock, ventricular tachycardia, and/or fibrillation within 48 hours, change in left ventricular ejection fraction between baseline and 180 days, CPC scale at intensive care unit discharge and day 90, survival rate, and hospital length of stay. RESULTS: A total of 279 patients (mean [SD] age, 64.7 [14.6] years; 195 men [69.9%]) were enrolled, with 141 (50.5%) in the emergency CAG group and 138 (49.5%) in the delayed CAG group. The study was underpowered. The mean (SD) time delay between randomization and CAG was 0.6 (3.7) hours in the emergency CAG group and 55.1 (37.2) hours in the delayed CAG group. The 180-day survival rates among patients with a CPC of 2 or less were 34.1% (47 of 141) in the emergency CAG group and 30.7% (42 of 138) in the delayed CAG group (hazard ratio [HR], 0.87; 95% CI, 0.65-1.15; P = .32). There was no difference in the overall survival rate at 180 days (emergency CAG, 36.2% [51 of 141] vs delayed CAG, 33.3% [46 of 138]; HR, 0.86; 95% CI, 0.64-1.15; P = .31) and in secondary outcomes between the 2 groups. CONCLUSIONS AND RELEVANCE: In this randomized clinical trial, for patients who experience an OHCA without ST-segment elevation on ECG, a strategy of emergency CAG was

not better than a strategy of delayed CAG with respect to 180-day survival rate and minimal neurologic sequelae.

8. Front Cardiovasc Med. 2022 Jun 28;9:885406. doi: 10.3389/fcvm.2022.885406. eCollection 2022.
Association of Histones With Coagulofibrinolytic Responses and Organ Dysfunction in Adult Post-cardiac Arrest Syndrome.
Mizugaki A(1), Wada T(1), Tsuchida T(1), Gando S(1)(2).
ABSTRACT
BACKGROUND: Patients successfully resuscitated from cardiac arrest often develop organ dysfunction caused by systemic inflammation and increased coagulation, leading to disseminated intravascular coagulation (DIC). The involvement of histones in DIC and organ dysfunction in patients with sepsis and trauma has been previously reported, raising the probability that histones may also be associated with pathophysiology in patients after cardiac arrest and resuscitation. This study evaluated the relationship between histones and organ dysfunction related to coagulofibrinolytic changes in patients with post-cardiac arrest syndrome (PCAS). METHODS: This prospective single-center observational study assessed 35 adult patients with PCAS who were divided into two groups, i.e., 15 patients with multiple organ dysfunction syndrome (MODS) and 20 patients without MODS. MODS was defined as a sequential organ failure assessment score of ≥12. The plasma levels of histones and coagulofibrinolytic markers, including soluble fibrin, tissue-type plasminogen activator, plasminogen activator inhibitor-1, plasmin-alpha 2-plasmin inhibitor complex (PIC), and soluble thrombomodulin, were measured in patients with PCAS immediately after admission to the emergency department, and 3 and 24 h after arriving at the hospital. RESULTS: PCAS patients with MODS had higher DIC scores [4 (3.0-5.0) vs. 1 (0.0-3.0), p = 0.012] and higher mortality rates (66.7% vs. 20.0%, p = 0.013) than those without MODS. Moreover, patients with MODS exhibited higher histone levels than those without MODS during the early phase of the post-resuscitation period. Severe endothelial injury and higher thrombin and plasmin generation were observed in the MODS group. Plasma levels of histones were positively correlated with those of soluble fibrin immediately after resuscitation (rho = 0.367, p = 0.030) and PIC 3 h after arriving at the hospital (rho = 0.480, p = 0.005). This correlation was prominent in the patient population with MODS (soluble fibrin: rho = 0.681, p = 0.005, PIC: rho = 0.742, p = 0.002). CONCLUSIONS: This study demonstrated that elevated histone levels were associated with increased levels of thrombin, and subsequent plasmin generation in PCAS patients, especially those with MODS. Further studies are required to elucidate the causal relationship between histones and organ dysfunction related to DIC in PCAS.

TARGETED TEMPERATURE MANAGEMENT

1. Biomech Model Mechanobiol. 2022 Jun 28. doi: 10.1007/s10237-022-01598-x. Online ahead of print.
Computational modeling of targeted temperature management in post-cardiac arrest patients.
Duh M(1), Skok K(2)(3), Perc M(1)(4)(5)(6), Markota A(2)(7), Gosak M(8)(9).
ABSTRACT
Our core body temperature is held around [Formula: see text]C by an effective internal thermoregulatory system. However, various clinical scenarios have a more favorable outcome under external temperature regulation. Therapeutic hypothermia, for example, was found beneficial for the outcome of resuscitated cardiac arrest patients due to its protection against cerebral ischemia. Nonetheless, practice shows that outcomes of targeted temperature management vary considerably in dependence on individual tissue damage levels and differences in therapeutic strategies and protocols. Here, we address these differences in detail by means of computational modeling. We develop a multi-segment and multi-node thermoregulatory model that takes into account details related to specific post-cardiac arrest-related conditions, such as thermal imbalances due to

sedation and anesthesia, increased metabolic rates induced by inflammatory processes, and various external cooling techniques. In our simulations, we track the evolution of the body temperature in patients subjected to post-resuscitation care, with particular emphasis on temperature regulation via an esophageal heat transfer device, on the examination of the alternative gastric cooling with ice slurry, and on how anesthesia and the level of inflammatory response influence thermal behavior. Our research provides a better understanding of the heat transfer processes and therapies used in post-cardiac arrest patients.

2. Front Physiol. 2022 Jun 9;13:925292. doi: 10.3389/fphys.2022.925292. eCollection 2022.
Autoregulation of Cerebral Blood Flow During 3-h Continuous Cardiopulmonary Resuscitation at 27°C.
Valkov S(1), Nilsen JH(1)(2)(3), Mohyuddin R(1), Schanche T(1)(4), Kondratiev T(1), Sieck GC(4), Tveita T(1)(2)(4).
ABSTRACT
Introduction: Victims of accidental hypothermia in hypothermic cardiac arrest (HCA) may survive with favorable neurologic outcome if early and continuous prehospital cardiopulmonary resuscitation (CPR) is started and continued during evacuation and transport. The efficacy of cerebral autoregulation during hypothermic CPR is largely unknown and is aim of the present experiment. Methods: Anesthetized pigs (n = 8) were surface cooled to HCA at 27°C before 3 h continuous CPR. Central hemodynamics, cerebral O2 delivery (DO2) and uptake (VO2), cerebral blood flow (CBF), and cerebral perfusion pressure (CPP) were determined before cooling, at 32°C and at 27°C, then at 15 min after the start of CPR, and hourly thereafter. To estimate cerebral autoregulation, the static autoregulatory index (sARI), and the CBF/VO2 ratio were determined. Results: After the initial 15-min period of CPR at 27°C, cardiac output (CO) and mean arterial pressure (MAP) were reduced significantly when compared to corresponding values during spontaneous circulation at 27°C (-66.7% and -44.4%, respectively), and remained reduced during the subsequent 3-h period of CPR. During the first 2-h period of CPR at 27°C, blood flow in five different brain areas remained unchanged when compared to the level during spontaneous circulation at 27°C, but after 3 h of CPR blood flow in 2 of the 5 areas was significantly reduced. Cooling to 27°C reduced cerebral DO2 by 67.3% and VO2 by 84.4%. Cerebral VO2 was significantly reduced first after 3 h of CPR. Cerebral DO2 remained unaltered compared to corresponding levels measured during spontaneous circulation at 27°C. Cerebral autoregulation was preserved (sARI > 0.4), at least during the first 2 h of CPR. Interestingly, the CBF/VO2 ratio during spontaneous circulation at 27°C indicated the presence of an affluent cerebral DO2, whereas after CPR, the CBF/VO2 ratio returned to the level of spontaneous circulation at 38°C. Conclusion: Despite a reduced CO, continuous CPR for 3 h at 27°C provided sufficient cerebral DO2 to maintain aerobic metabolism and to preserve cerebral autoregulation during the first 2-h period of CPR. This new information supports early start and continued CPR in accidental hypothermia patients during rescue and transportation for in hospital rewarming.

3. Acad Emerg Med. 2022 Jun;29(6):729-735. doi: 10.1111/acem.14440. Epub 2022 Mar 7.
Relationship between cooling time and neurological outcomes in targeted temperature management.
Ahn SJ(1), Kim YH(1), Lee JH(1), Lee DW(1), Hwang SY(1), Lee BK(2), Cho IS(3), Oh SH(4), Cha KC(5); KORHN investigators.
ABSTRACT
OBJECTIVES: The relationship between cooling time (CT) variables and neurological outcomes is controversial. We evaluated the relationship between CT and neurological outcomes in out-of-

hospital cardiac arrest (OHCA) patients treated with targeted temperature management (TTM). METHODS: We conducted a multicenter, prospective, and registry-based study of OHCA survivors treated with TTM. CT was defined as the time from restoration of spontaneous circulation to achievement of the target temperature. The primary outcome was a favorable neurological outcome at 6 months. Multilevel logistic regression analysis was performed to test the relationship between CT and the primary outcome. RESULTS: Overall, the favorable neurological outcome rates at 6 months were 29.8% in 937 patients. When CT was stratified into categories of 0-3, 3.1-6, 6.1-9, 9.1-12, and >12 h, according to 3-h intervals, the primary outcome rates were 8.2%, 22.7%, 35.5%, 44.7%, and 44.5%, respectively ($p < 0.001$). Significant differences were not found in multilevel logistic regression analysis; the adjusted odds ratios (95% confidence interval) of each category for the primary outcome compared to the 0-3-h group were 0.81 (0.32 to 2.04), 0.77 (0.30 to 2.01), 1.26 (0.43 to 3.68), and 1.06 (0.37 to 3.06). CONCLUSIONS: We did not find a relationship between CT and neurological outcomes at 6 months.

4. Front Neurol. 2022 Jun 20;13:873165. doi: 10.3389/fneur.2022.873165. eCollection 2022.
Selective Brain Cooling: A New Horizon of Neuroprotection.
Hong JM(1)(2), Choi ES(2), Park SY(1).
ABSTRACT
Therapeutic hypothermia (TH), which prevents irreversible neuronal necrosis and ischemic brain damage, has been proven effective for preventing ischemia-reperfusion injury in post-cardiac arrest syndrome and neonatal encephalopathy in both animal studies and clinical trials. However, lowering the whole-body temperature below 34°C can lead to severe systemic complications such as cardiac, hematologic, immunologic, and metabolic side effects. Although the brain accounts for only 2% of the total body weight, it consumes 20% of the body's total energy at rest and requires a continuous supply of glucose and oxygen to maintain function and structural integrity. As such, theoretically, temperature-controlled selective brain cooling (SBC) may be more beneficial for brain ischemia than systemic pan-ischemia. Various SBC methods have been introduced to selectively cool the brain while minimizing systemic TH-related complications. However, technical setbacks of conventional SBCs, such as insufficient cooling power and relatively expensive coolant and/or irritating effects on skin or mucosal interfaces, limit its application to various clinical settings. This review aimed to integrate current literature on SBC modalities with promising therapeutic potential. Further, future directions were discussed by exploring studies on interesting coping skills in response to environmental or stress-induced hyperthermia among wild animals, including mammals and birds.

5. J Clin Monit Comput. 2022 Jul 8. doi: 10.1007/s10877-022-00887-1. Online ahead of print.
Outcomes after decrease in hypothermia usage for out of Hospital Cardiac arrest after targeted temperature management study.
Slagle DL(1)(2), Caplan RJ(3), Deitchman AR(4).
ABSTRACT
OBJECTIVE: Evaluate trends in targeted temperature management with regards to temperature selection, its effect on neurologic outcomes at discharge, and compare this with recent large randomized controlled trial outcomes. DESIGN: Retrospective cohort study between January 2010 and December 2019. SETTING: Single large tertiary academic community hospital. PATIENTS: 634 adult non-traumatic patients presenting with out of hospital cardiac arrest with persistent comatose state treated with active targeted temperature management. INTERVENTIONS, MEASUREMENTS, AND MAIN RESULTS: 473 patients received hypothermia of 33 °C and were compared to 161 patients who received targeted normothermia of 36.5 °C. The primary outcome was Cerebral Performance Category (CPC) at hospital discharge, with levels 1 or 2 considered good outcomes. Mortality, ICU

days, ventilator days, and overall hospital stay length were secondary outcomes. Patients receiving T33 had more favorable CPC outcomes when compared to patients receiving T36.5 (OR = 2.4 [1.3, 4.6], p = 0.006). Subgroup analysis of initial non-shockable rhythms demonstrated improved CPC scores (OR = 2.5, p = 0.04), however this was not maintained in the shockable rhythm group. T33 patients had a shorter length of stay. Mortality, ICU days, and ventilator days did not differ between the groups. CONCLUSIONS: Out of hospital cardiac arrest patients with persistent comatose state treated with hypothermia of 33 °C had improved odds of discharge with good neurologic outcomes when compared to those treated with targeted normothermia. This improvement of outcomes appears to have been driven by the improved outcomes in the patients who had presented with non-shockable rhythm.

6. Appl Bionics Biomech. 2022 Jun 30;2022:2220487. doi: 10.1155/2022/2220487. eCollection 2022.
Evidence Summary of Temperature Management for Comatose Patients after Cardiopulmonary Resuscitation in ICUs.
Yang Z(1), Ni T(1), Yang Y(1), Zhang H(1), Chi H(1).
ABSTRACT
OBJECTIVE: This study aims to select and summarize the best evidence of temperature management for comatose patients after cardiopulmonary resuscitation in intensive care units (ICUs) at home and abroad. METHOD: Some well-known databases at home and abroad have been searched to find the guidelines, expert consensus, original documents, evidence summaries, and systematic evaluation about temperature management for comatose patients after cardiopulmonary resuscitation in ICUs. The databases included PubMed, Up to Date, Cochrane Library, the website of Registered Nurses' Association of Ontario, the Guideline Library of National Institute for Health and Clinical Excellence of the UK, China National Knowledge Infrastructure (CNKI), Wanfang Database, and VIP. The period for search is from the establishment of each database to the present. Two researchers who have received evidence-based nursing training and passed the examination evaluated, extracted, and integrated the literature quality with a blind method to summarize the best evidence. RESULTS: A total of 10 pieces of literature were included in this study, including 4 in Chinese and 6 in English. Specifically, there were 4 guidelines, 1 expert consensus, 2 evidence summaries, 1 systematic evaluation, 1 literature review, and 1 comparative experiment, accounting for 40.0%, 10.0%, 20.0%, 10.0%, 10.0%, and 10.0%, respectively. The literature and materials were all qualified, and there was no heterogeneity and no significant publication bias in the included literature. The best evidence involved mild hypothermia therapy, rewarming, prevention of mild hypothermia-related complications, and nutritional support, with a total of 21 pieces of evidence (including 11, 3, 5, and 2 pieces of evidence, respectively). In terms of the recommendation grade, 7 pieces of evidence were at Grade A and 14 at Grade B. CONCLUSION: Health care providers should implement hypothermia management in comatose patients after cardiopulmonary resuscitation in ICUs, pay attention to the prevention of related complications, and provide enteral nutrition support.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

1. Sci Rep. 2022 Jun 28;12(1):10907. doi: 10.1038/s41598-022-15144-3.
Alpha-power in electroencephalography as good outcome predictor for out-of-hospital cardiac arrest survivors.
Kim MJ(#)(1), Kim YJ(#)(2), Yum MS(3), Kim WY(4).
ABSTRACT
This study aimed to investigate the utility of quantitative EEG biomarkers for predicting good neurologic outcomes in OHCA survivors treated with targeted temperature management (TTM)

using power spectral density (PSD), event-related spectral perturbation (ERSP), and spectral entropy (SE). This observational registry-based study was conducted at a tertiary care hospital in Korea using data of adult nontraumatic comatose OHCA survivors who underwent standard EEG and treated with TTM between 2010 and 2018. Good neurological outcome at 1 month (Cerebral Performance Category scores 1 and 2) was the primary outcome. The linear mixed model analysis was performed for PSD, ESRP, and SE values of all and each frequency band. Thirteen of the 54 comatose OHCA survivors with TTM and EEG were excluded due to poor EEG quality or periodic/rhythmic pattern, and EEG data of 41 patients were used for analysis. The median time to EEG was 21 h, and the rate of the good neurologic outcome at 1 month was 52.5%. The good neurologic outcome group was significantly younger and showed higher PSD and ERSP and lower SE features for each frequency than the poor outcome group. After age adjustment, only the alpha-PSD was significantly higher in the good neurologic outcome group (1.13 ± 1.11 vs. 0.09 ± 0.09, p = 0.031) and had best performance with 0.903 of the area under the curve for predicting good neurologic outcome. Alpha-PSD best predicts good neurologic outcome in OHCA survivors and is an early biomarker for prognostication. Larger studies are needed to conclusively confirm these findings.

2. Int J Cardiol. 2022 Jun 30:S0167-5273(22)01017-8. doi: 10.1016/j.ijcard.2022.06.066. Online ahead of print.

Relation of delayed intrinsicoid deflection of the QRS complex to sudden cardiac death in patients with hypertrophic cardiomyopathy.

Francia P(1), Silvetti G(1), Cosentino P(1), Cristiano E(1), Adduci C(1), Tini G(1), Musumeci MB(1), Volpe M(1), Autore C(2).

ABSTRACT

AIMS: Predictors of sudden cardiac death (SCD) in patients with hypertrophic cardiomyopathy (HCM) do not include ECG variables. Intrinsicoid deflection (ID) represents the early ventricular depolarization on surface ECG. Delayed ID (DID) has been associated with sudden cardiac arrest (SCA) in the community. In a cohort of consecutive patients with HCM, we assessed whether DID predicts SCA or its surrogates. METHODS: We reviewed ECG, clinical and follow-up data of 344 consecutive HCM patients. DID (ID ≥50 ms) was classified as lateral (leads I or aVL), inferior (leads II, III or aVF), and precordial (leads V5 or V6). The endpoint was a combination of SCD, resuscitated SCA or appropriate ICD intervention. RESULTS: The SCA group was composed by 2 secondary prevention ICD recipients and 23 patients that reached the endpoint during follow-up (108 ± 73 months). SCA patients had more frequently massive LV hypertrophy (LVH) or end-stage HCM. ECG indexes of LVH were comparable between SCA and controls. SCA patients were more likely to have DID on ECG lateral leads I/aVL (72% vs 44%; p = 0.008). A non significant trend was observed for inferior and V5/V6 leads. DID I/aVL was associated with SCA in multivariate analysis after correction for massive LVH and end-stage disease (HR: 2.86; 95%CI: 1.14-7.13; p = 0.02). CONCLUSIONS: In HCM patients DID is associated with increased risk of SCA. Its prognostic value extends beyond that of LVH. If confirmed in prospective studies, the prognostic power of this ECG marker could be used to refine risk prediction.

3. Notf Rett Med. 2022 Jul 5:1-8. doi: 10.1007/s10049-022-01059-z. Online ahead of print.

[Effects of automated external defibrillators on hands-off intervals in lay rescuers].

[Article in German]

Schäfer V(1), Witwer P(1), Schwingshackl L(1), Salchner H(1), Gasteiger L(1), Schabauer W(1), Lederer W(1).

ABSTRACT

BACKGROUND: Survival chances after out-of-hospital cardiac arrests caused by hyperdynamic electric cardiac rhythms can be significantly improved by early defibrillation with automated external defibrillators (AEDs). As postulated in international guidelines, the resulting hands-off intervals should not exceed 10 s. OBJECTIVES: We investigated delay in onset of chest compressions and the length of hands-off intervals during defibrillation associated with the application of AEDs. MATERIALS AND METHODS: In a prospective, randomized, single-blinded observational study, the resuscitation efforts by first year medical students were analyzed in different emergency scenarios on manikins. Delay in onset of chest compressions and the length of hands-off intervals between voice prompts from four conventional devices were compared during shockable and nonshockable rhythms. Satisfaction with the device, difficulties with the application, and suggested improvements were assessed by questionnaire. RESULTS: In a total of 70 applications, the start with thoracic compressions was delayed by a mean of 115 s. On average, the first shock was administered after 125 s in shockable heart rhythms. Perishock pauses of less than 10 s were achieved with none of the tested devices. Hands-off intervals during defibrillation differed significantly between the devices ($p < 0.001$). Improvements were suggested regarding marking, voice prompts, and electrodes. CONCLUSIONS: Perishock pause of less than 10 s was not achieved with any of the tested devices. Shortened and more precise voice prompts as well as more clearly arranged labeling and layout of pads are needed to simplify application, reduce delayed onset of chest compressions and shorten hands-off intervals.

PEDIATRICS AND CHILDREN

1. Am J Emerg Med. 2022 Jun 26;59:24-29. doi: 10.1016/j.ajem.2022.06.044. Online ahead of print.
Effects of vertical compression during pediatric cardiopulmonary resuscitation using the one-handed chest compression technique.
Oh JH(1), Noh H(2), Lee JG(3), Kim DK(4).
ABSTRACT
OBJECTIVE: The posture of the rescuer while performing the one-handed chest compression (OHCC) has not yet been evaluated. This study aimed to investigate the effect of vertical compression during pediatric cardiopulmonary resuscitation (CPR) using the OHCC technique. METHODS: This was a prospective randomized crossover simulation trial. A total of 42 medical doctors conducted a 2-min single-rescuer CPR using the conventional OHCC (Test 1) or vertical OHCC (Test 2) technique on a pediatric manikin. The chest compression and ventilation parameters were measured in real time during the experiments using sensors embedded in the manikin. In addition, the compression force of each technique was measured using a force plate. RESULTS: The average and adequate chest compression depth (CCD) were significantly higher in Test 2 than in Test 1 (average depth: 54.0 mm (interquartile range [IQR]: 48.5-56.0) in Test 2 vs. 49.0 mm (IQR: 40.0-54.0) in Test 1, $P < 0.001$; adequate depth: 99.0% (IQR: 36.3-100.0) in Test 2 vs. 52.0% (IQR: 0.0-98.0) in Test 1, $P < 0.001$). The average force of compression was also significantly higher in vertical OHCC than that in conventional OHCC (25.7 kg ± 4.4 in vertical OHCC vs. 24.5 kg ± 4.2 in conventional OHCC, $P < 0.001$). The ventilation parameters were not significantly different between Tests 1 and 2. CONCLUSIONS: The vertical OHCC could provide a deeper and more adequate CCD compared with the conventional OHCC, and the advantages of the vertical OHCC originate from the superiority of the compression force.

2. Prehosp Emerg Care. 2022 Jul 22:1-10. doi: 10.1080/10903127.2022.2096159. Online ahead of print.
Pediatric Out-of-Hospital Cardiac Arrests: An Epidemiological Study.

Irvine R(1), Doan T(2), Bosley E(2), Colbeck M(3), Bowles KA(1).

ABSTRACT

OBJECTIVE: To identify the epidemiological patterns of pediatric out-of-hospital cardiac arrests (OHCA) in Queensland, Australia and to investigate associations between patient variables and prehospital outcome. METHODS: Included were pediatric (>4 days-18 years) OHCA patients attended by paramedics in the state of Queensland (Australia) between January 2009 and December 2019. Patient and arrest characteristics were described. Factors associated with return of spontaneous circulation (ROSC) on hospital arrival were investigated. RESULTS: A total of 1,612 pediatric patients were included; 611 were deceased prior to paramedic arrival and 1,001 received resuscitation attempts by paramedics. Approximately one quarter (26.8%) of resuscitation-attempted patients achieved ROSC on hospital arrival. Most arrests (49.7%) were due to medical causes. Arrests due to trauma had the lowest rate of ROSC on hospital arrival (9.6%), whereas those due to drug overdose had the highest rate (40%). Patients in rural areas had a lower rate of ROSC on hospital arrival than those in metropolitan areas (20.7% vs 32.5%, $p < 0.001$). The median response interval to all OHCA patients was 8 minutes. Trauma was considerably more prevalent in rural areas than in metropolitan areas, while all other etiologies were comparable. Older pediatric age groups had higher rates of ROSC on hospital arrival than infants, particularly early adolescents (39.4% vs. 14.9%, $p = 0.001$). Etiology, age, bystander witness, shockable initial rhythm, and geographic locality factors were independently associated with ROSC on hospital arrival. CONCLUSIONS: Approximately a quarter of pediatric prehospital OHCA achieved ROSC on hospital arrival. Prehospital outcome differs according to patient cohort and is associated with diverse patient demographic variables.

3. Resusc Plus. 2022 Jun 29;11:100262. doi: 10.1016/j.resplu.2022.100262. eCollection 2022 Sep.

Do paediatric early warning systems reduce mortality and critical deterioration events among children? A systematic review and meta-analysis.

Chong SL(1)(2), Goh MSL(3), Ong GY(1)(2), Acworth J(4)(5), Sultana R(6), Yao SHW(1), Ng KC(1)(2); International Liaison Committee on Resuscitation (ILCOR) and ILCOR Pediatric Life Support Task Force.

ABSTRACT

AIM: We conducted a systematic review and meta-analysis to answer the question: Does the implementation of Paediatric Early Warning Systems (PEWS) in the hospital setting reduce mortality, cardiopulmonary arrests, unplanned codes and critical deterioration events among children, as compared to usual care without PEWS? METHODS: We conducted a comprehensive search using Medline, EMBASE, Cochrane Central Register of Controlled Trials, Cumulative Index to Nursing and Allied Health Literature and Web of Science. We included studies published between January 2006 and April 2022 on children <18 years old performed in inpatient units and emergency departments, and compared patient populations with PEWS to those without PEWS. We excluded studies without a comparator, case control studies, systematic reviews, and studies published in non-English languages. We employed a random effects meta-analysis and synthesised the risk and rate ratios from individual studies. We used the Scottish Intercollegiate Guidelines Network (SIGN) to appraise the risk of bias. RESULTS: Among 911 articles screened, 15 were included for descriptive analysis. Fourteen of the 15 studies were pre- versus post-implementation studies and one was a multi-centre cluster randomised controlled trial (RCT). Among 10 studies (580,604 hospital admissions) analysed for mortality, we found an increased risk (pooled RR 1.18, 95% CI 1.01-1.38, $p = 0.036$) in the group without PEWS compared to the group with PEWS. The sensitivity analysis performed without the RCT (436,065 hospital admissions) showed a non-significant relationship (pooled RR 1.17, 95% CI 0.98-1.40, $p = 0.087$). Among four studies (168,544 hospital admissions) analysed for unplanned code events, there was an increased risk in the group without PEWS (pooled RR 1.73,

95%CI 1.01-2.96, p = 0.046) There were no differences in the rate of cardiopulmonary arrests or critical deterioration events between groups. Our findings were limited by potential confounders and imprecision among included studies. CONCLUSIONS: Healthcare systems that implemented PEWS were associated with reduced mortality and code rates. We recognise that these gains vary depending on resource availability and efferent response systems.

4. Front Pediatr. 2022 Jun 21;10:883320. doi: 10.3389/fped.2022.883320. eCollection 2022.
Chest Compressions in Pediatric Patients With Continuous-Flow Ventricular Assist Devices: Case Series and Proposed Algorithm.
Esangbedo ID(1), Yu P(2).
ABSTRACT
Patients with continuous flow ventricular assist devices (CF-VAD's) in the systemic ventricle (left ventricle or single ventricle) often have no palpable pulses, unreliable pulse oximetry waveforms and non-pulsatile arterial waveforms despite hemodynamic stability. When circulatory decompensation occurs, standard indicators to begin cardiopulmonary resuscitation (CPR) which are used in other pediatric patients (i.e., significant bradycardia or loss of pulse) cannot be applied in the same fashion. In this population, there may already be pulselessness and development of bradycardia in and of itself would not trigger chest compressions. There are no universal guidelines to dictate when to consider chest compressions in this population. As such, there may be a delay in decision-making or in recognizing the need for chest compressions, even in patients hospitalized in intensive care units (ICU) and cared for by experienced staff who perform CPR regularly. We present four examples of pediatric cardiac ICU patients from a single center who underwent CPR between 2018 and 2019. Based on this case series, we propose a decision-making algorithm for chest compressions in pediatric patients with CF-VADs in the systemic ventricle.

5. Eur J Emerg Med. 2022 Aug 1;29(4):271-278. doi: 10.1097/MEJ.0000000000000923. Epub 2022 Mar 29.
Adherence to guideline recommendations in the management of pediatric cardiac arrest: a multicentre observational simulation-based study.
Corazza F(1), Stritoni V(2), Martinolli F(1), Daverio M(2), Binotti M(3), Genoni G(3), Ingrassia PL(4), De Luca M(5), Palmas G(6), Maccora I(6), Frigo AC(7), Da Dalt L(1), Bressan S(1).
ABSTRACT
BACKGROUND AND IMPORTANCE: Pediatric cardiac arrest is a rare emergency with associated high mortality. Its management is challenging and deviations from guidelines can affect clinical outcomes. OBJECTIVES: To evaluate the adherence to guideline recommendations in the management of a pediatric cardiac arrest scenario by teams of pediatric residents. Secondarily, the association between the use of the Pediatric Advanced Life Support-2015 (PALS-2015) pocket card, and the teams' adherence to international guidelines, were explored. DESIGN, SETTINGS AND PARTICIPANTS: Multicentre observational simulation-based study at three Italian University Hospitals in 2018, including PALS-2015 certified pediatric residents in their 3rd-5th year of residency program, divided in teams of three. INTERVENTION OR EXPOSURE: Each team conducted a standard nonshockable pediatric cardiac arrest scenario and independently decided whether to use the PALS-2015 pocket card. OUTCOME MEASURE AND ANALYSIS: The primary outcome was the overall number and frequency of individual deviations from the PALS-2015 guidelines, measured by the novel c-DEV15plus score (range 0-15). Secondarily, the performance on the validated Clinical Performance Tool for asystole scenarios, the time to perform resuscitation tasks and cardiopulmonary resuscitation (CPR) quality metrics were compared between the teams that used and did not use the PALS-2015 pocket card. MAIN RESULTS: Twenty-seven teams (81 residents) were included. Overall,

the median number of deviations per scenario was 7 out of 15 [interquartile range (IQR), 6-8]. The most frequent deviations were delays in positioning of a CPR board (92.6%), calling for adrenaline (92.6%), calling for help (88.9%) and incorrect/delayed administration of adrenaline (88.9%). The median Clinical Performance Tool score was 9 out of 13 (IQR, 7-10). The comparison between teams that used (n = 13) and did not use (n = 14) the PALS-2015 pocket card showed only significantly higher Clinical Performance Tool scores in the former group [9 (IQR 9-10) vs. 7 (IQR 6-8); P = 0.002]. CONCLUSIONS: Deviations from guidelines, although measured by means of a nonvalidated tool, were frequent in the management of a pediatric cardiac arrest scenario by pediatric residents. The use of the PALS-2015 pocket card was associated with better Clinical Performance Tool scores but was not associated with less deviations or shorter times to resuscitation tasks.

6. Pediatr Neurol. 2022 Jun 14;134:25-30. doi: 10.1016/j.pediatrneurol.2022.06.005. Online ahead of print.

Association of EEG and Blood-Based Brain Injury Biomarker Accuracy to Prognosticate Mortality After Pediatric Cardiac Arrest: An Exploratory Study.

Anetakis KM(1), Gedela S(2), Kochanek PM(3), Clark RSB(4), Berger RP(5), Fabio A(6), Angus DC(7), Watson RS(8), Callaway CW(9), Bell MJ(10), Sogawa Y(11), Fink EL(12).

ABSTRACT

BACKGROUND: Evaluate the accuracy of brain-based blood biomarkers neuron-specific enolase (NSE) and S100b and electroencephalography (EEG) features alone and in combination with prognosticate 6-month mortality after pediatric cardiac arrest. We hypothesized that the combination of blood brain-based biomarkers and EEG features would have superior classification accuracy of outcome versus either alone. METHODS: Children (n = 58) aged between 1 week and 17 years admitted to the ICU following cardiac arrest at a tertiary care children's hopital were eligible for this secondary study. Blood NSE and S100b were measured closest to 24 hours after return of spontaneous circulation (ROSC). EEGs closest to 24 hours (median 11, interquartile range [IQR] 6 to 16 h) post-ROSC were evaluated by two epileptologists. EEG grade was informed by background frequency, amplitude, and continuity. Sleep spindles were present or absent. Mortality was assessed at six months post-ROSC. Area under the receiver operator curve (AUC) was performed for individual and combined brain-based biomarkers and EEG features. RESULTS: Children were aged 2.6 (IQR 0.6 to 10.4) years, and 25 (43%) died. Children who died had increased blood NSE (49.7 [28.0 to 63.1] vs 18.2 [9.8 to 31.8] ng/mL) and S100b (0.118 [0.036 to 0.296] vs 0.012 [0.003 to 0.021] ng/mL) and poor (discontinuous or isoelectric) EEG grade (76% vs 33%) more frequently than survivors ($P < 0.05$). AUC for NSE to predict mortality was 0.789, and was 0.841 when combined with EEG grade and spindles. S100b AUC for mortality was 0.856 and was optimal alone. CONCLUSIONS: In this exploratory study, the combination of brain-based biomarkers and EEG features may provide more accurate prognostication than either test alone after pediatric cardiac arrest.

7. Am J Perinatol. 2022 Jun;39(8):878-882. doi: 10.1055/s-0040-1719116. Epub 2020 Nov 3.

Code Blue Events in the Neonatal and Pediatric Intensive Care Units at a Tertiary Care Children's Hospital.

Groden CM(1), Cabacungan ET(2), Gupta R(2).

ABSTRACT

OBJECTIVE: The authors aim to compare all code blue events, regardless of the need for chest compressions, in the neonatal intensive care unit (NICU) versus the pediatric intensive care unit (PICU). We hypothesize that code events in the two units differ, reflecting different disease processes. STUDY DESIGN: This is a retrospective analysis of 107 code events using the code narrator, which is an electronic medical record of real-time code documentation, from April 2018 to

March 2019. Events were divided into two groups, NICU and PICU. Neonatal resuscitation program algorithm was used for NICU events and a pediatric advanced life-support algorithm was used for PICU events. Events and outcomes were compared using univariate analysis. The Mann-Whitney test and linear regressions were done to compare the total code duration, time from the start of code to airway insertion, and time from airway insertion to end of code event. RESULTS: In the PICU, there were almost four times more code blue events per month and more likely to involve patients with seizures and no chronic condition. NICU events more often involved ventilated patients and those under 2 months of age. The median code duration for NICU events was 2.5 times shorter than for PICU events (11.5 vs. 29 minutes), even when adjusted for patient characteristics. Survival to discharge was not different in the two groups. CONCLUSION: Our study suggests that NICU code events as compared with PICU code events are more likely to be driven by airway problems, involve patients <2 months of age, and resolve quickly once airway is taken care of. This supports the use of a ventilation-focused neonatal resuscitation program for patients in the NICU. KEY POINTS: · Code blue events are four times more common in PICU.. · NICU code events are 2.5 times shorter in duration compared with PICU events.. · NICU code events are more likely to be attributed to a problem with an airway..

8. Pediatr Neurol. 2022 Jun 20;134:45-51. doi: 10.1016/j.pediatrneurol.2022.06.011. Online ahead of print.

Use of Magnetic Resonance Imaging in Neuroprognostication After Pediatric Cardiac Arrest: Survey of Current Practices.

Piantino JA(1), Ruzas CM(2), Press CA(3), Subramanian S(4), Balakrishnan B(5), Panigrahy A(4), Pettersson D(6), Maloney JA(7), Vossough A(8), Topjian A(9), Kirschen MP(9), Doughty L(10), Chung MG(11), Maloney D(12), Haller T(13), Fabio A(13), Fink EL(14); POCCA Investigators.

ABSTRACT

BACKGROUND: Use of magnetic resonance imaging (MRI) as a tool to aid in neuroprognostication after cardiac arrest (CA) has been described, yet details of specific indications, timing, and sequences are unknown. We aim to define the current practices in use of brain MRI in prognostication after pediatric CA. METHODS: A survey was distributed to pediatric institutions participating in three international studies. Survey questions related to center demographics, clinical practice patterns of MRI after CA, neuroimaging resources, and details regarding MRI decision support. RESULTS: Response rate was 31% (44 of 143). Thirty-four percent (15 of 44) of centers have a clinical pathway informing the use of MRI after CA. Fifty percent (22 of 44) of respondents reported that an MRI is obtained in nearly all patients with CA, and 32% (14 of 44) obtain an MRI in those who do not return to baseline neurological status. Poor neurological examination was reported as the most common factor (91% [40 of 44]) determining the timing of the MRI. Conventional sequences (T1, T2, fluid-attenuated inversion recovery, and diffusion-weighted imaging/apparent diffusion coefficient) are routinely used at greater than 97% of centers. Use of advanced imaging techniques (magnetic resonance spectroscopy, diffusion tensor imaging, and functional MRI) were reported by less than half of centers. CONCLUSIONS: Conventional brain MRI is a common practice for prognostication after CA. Advanced imaging techniques are used infrequently. The lack of standardized clinical pathways and variability in reported practices support a need for higher-quality evidence regarding the indications, timing, and acquisition protocols of clinical MRI studies.

9. BMC Emerg Med. 2022 Jul 12;22(1):126. doi: 10.1186/s12873-022-00679-5.

Predictors and outcome of cardiac arrest in paediatric patients presenting to emergency medicine department of tertiary hospitals in Tanzania.

Yussuf AO(1), Kilindimo SS(2)(3), Sawe HR(1)(4), Premji EN(1), Manji HK(1), Simbila AN(1), Mfinanga JA(1)(4), Weber EJ(4)(5).

ABSTRACT

BACKGROUND: The survival of children who suffer cardiac arrest is poor. This study aimed to determine the predictors and outcome of cardiac arrest in paediatric patients presenting to an emergency department of a tertiary hospital in Tanzania. METHODOLOGY: This was a prospective cohort study of paediatric patients > 1 month to ≤ 14 years presenting to Emergency Medicine Department of Muhimbili National Hospital (EMD) in Tanzania from September 2019 to January 2020 and triaged as Emergency and Priority. We enrolled consecutive patients during study periods where patients' demographic and clinical presentation, emergency interventions and outcome were recorded. Logistic regression analysis was performed to identify the predictors of cardiac arrest. RESULTS: We enrolled 481 patients, 294 (61.1%) were males, and the median age was 2 years [IQR 1-5 years]. Among studied patients, 38 (7.9%) developed cardiac arrest in the EMD, of whom 84.2% were ≤ 5 years. Referred patients were over-represented among those who had an arrest (84.2%). The majority 33 (86.8%) of those who developed cardiac arrest died. Compromised circulation on primary survey (OR 5.9 (95% CI 2.1-16.6)), bradycardia for age on arrival (OR 20.0 (CI 1.6-249.3)), hyperkalemia (OR 8.2 (95% CI 1.4-47.7)), elevated lactate levels > 2 mmol/L (OR 5.2 (95% CI 1.4-19.7)), oxygen therapy requirement (OR 5.9 (95% CI 1.3-26.1)) and intubation within the EMD (OR 4.8 (95% CI 1.3-17.6)) were independent predictors of cardiac arrest. CONCLUSION: Thirty-eight children developed cardiac arrest in the EMD, with a very high mortality. Those who arrested were more likely to present with signs of hypoxia, shock and acidosis, which suggest they were at later stage in their illness. Outcomes can be improved by strengthening the pre-referral care and providing timely critical management to prevent cardiac arrest.

EXTRACORPOREAL LIFE SUPPORT

1. Zhonghua Yi Xue Za Zhi. 2022 Jul 5;102(25):1874-1877. doi: 10.3760/cma.j.cn112137-20220415-00817.

[Initiation timing of veno-arterial extracorporeal membrane oxygenation].

[Article in Chinese; Abstract available in Chinese from the publisher]

Li JJ(1), Luo XX(1), Huang XB(1).

ABSTRACT

Veno-arterial extracorporeal membrane oxygenation (VA-ECMO) is a salvage therapy for critical patients with refractory cardiogenic shock caused by various reasons. It can temporarily replace cardiopulmonary function, and rapidly improve hypoxemia, increase systemic oxygen content and remove carbon dioxide. Although the Extracorporeal Life Support Organization (ELSO) guideline proposed clear indication for VA-ECMO, the heterogeneity of cardiac pathogeny is large, so the clear timing of ECMO initiation is still vague. We discuss the timing of ECMO initiation for external cardiopulmonary resuscitation (ECPR) and cardiogenic shock which is caused by fulminant myocarditis, acute myocardial infarction, acute pulmonary embolism, acute right heart failure related to lung transplantation, corona virus disease 2019 (COVID-19)-associated cardiovascular collapse. Also, we look forward to making more suggestions for clinicians' judgment and choice for VA-ECMO.

2. J Clin Med. 2022 Jun 29;11(13):3773. doi: 10.3390/jcm11133773.

Extracorporeal Life Support and Temporary CentriMag Ventricular Assist Device to Salvage Cardiogenic-Shock Patients Suffering from Prolonged Cardiopulmonary Resuscitation.

Chen JL(1), Tsai YT(2), Lin CY(2), Ke HY(2), Lin YC(2), Yang HY(2), Liu CT(2), Sung SY(2), Chang JT(2), Wang YH(2), Lin TC(1), Tsai CS(2), Hsu PS(2).

ABSTRACT
Background: The extracorporeal life support (ECLS) and temporary bilateral ventricular assist device (t-BiVAD) are commonly applied in patients with cardiogenic shock. Prolonged cardiopulmonary resuscitation (CPR) has poor prognosis. Herein, we report our findings on a combined ECLS and t-BiVAD approach to salvage cardiogenic-shock patients with CPR for more than one hour. Methods: Fifty-nine patients with prolonged CPR and rescued by ECLS and subsequent t-BiVAD were retrospectively collected between January 2015 and December 2019. Primary diagnoses included ischemic, dilated cardiomyopathy, acute myocardial infarction, post-cardiotomy syndrome, and fulminant myocarditis. The mean LVEF was 16.9% ± 6.56% before t-BiVAD. The median ECLS-to-VAD interval is 26 h. Results: A total of 26 patients (44%) survived to weaning, including 13 (22%) bridged to recovery, and 13 (22%) bridged to transplantation. Survivors to discharge demonstrated better systemic perfusion and hemodynamics than non-survivors. The CentriMag-related complications included bleeding (n = 22, 37.2%), thromboembolism (n = 5, 8.4%), and infection (n = 4, 6.7%). The risk factors of mortality included Glasgow Coma Scale (Motor + Eye) ≤ 5, and lactate ≥ 8 mmol/L at POD-1, persistent ventricular rhythm or asystole, and total bilirubin ≥ 6 mg/dL at POD-3. Mortality factors included septic shock (n = 11, 18.6%), central failure (n = 10, 16.9%), and multiple organ failure (n = 12, 20.3%). Conclusions: Combined ECLS and t-BiVAD could be a salvage treatment for patients with severe cardiogenic shock, especially for those already having prolonged CPR. This combination can correct organ malperfusion and allow sufficient time to bridge patients to recovery and heart transplantation, especially in Asia, where donation rates are low, as well as intracorporeal VAD or total artificial heart being seldom available.

3. Clin Res Cardiol. 2022 Jul 8. doi: 10.1007/s00392-022-02057-4. Online ahead of print.
Association between stress hyperglycemia on admission and unfavorable neurological outcome in OHCA patients receiving ECPR.
Taira T(#)(1)(2), Inoue A(#)(3), Nishimura T(1), Takahashi R(1), Isobe M(1), Maemura S(1), Suga M(1), Ijuin S(1), Masano T(1), Matsuyama S(1), Ishihara S(1), Kuroda Y(2), Nakayama S(1).
ABSTRACT
BACKGROUND: Stress hyperglycemia is a normal response to stress and has been associated with outcomes in out-of-hospital cardiac arrest (OHCA) patients. However, this association remained unknown in OHCA patients receiving extracorporeal cardiopulmonary resuscitation (ECPR). This study aimed to examine the association between degree of stress hyperglycemia on admission and neurological outcomes at discharge in OHCA patients receiving ECPR. PATIENTS AND METHODS: This was a retrospective cohort study of adult OHCA patients receiving ECPR between 2011 and 2021. Patients were classified into three groups: absence of stress hyperglycemia (blood glucose level on admission < 200 mg/dL), moderate stress hyperglycemia (200-299 mg/dL), and severe stress hyperglycemia (≥ 300 mg/dL). The primary outcome was unfavorable neurological outcome (Cerebral Performance Category: 3-5) at discharge. RESULTS: This study included 160 patients; unfavorable neurological outcomes totaled 79.4% (n = 127). There were 23, 52, and 85 patients in the absence, moderate, and severe stress hyperglycemia groups, respectively. Of each group, unfavorable neurological outcomes constituted 91.3%, 71.2%, and 81.2%, respectively. Multivariable analysis showed that, compared with moderate stress hyperglycemia, absence of stress hyperglycemia on admission was significantly associated with unfavorable neurological outcome at discharge (odds ratio [OR], 4.70; 95% confidence interval [CI], 1.07-33.35; p = 0.039). CONCLUSION: Compared with moderate stress hyperglycemia on admission, absence of stress hyperglycemia showed significant association with unfavorable neurological outcome at discharge in OHCA patients receiving ECPR.

4. Artif Organs. 2022 Aug;46(8):1459-1462. doi: 10.1111/aor.14320. Epub 2022 May 29.
Resuscitation for moribund alpinists stranded at high altitudes: A stepwise approach including ECMO as a last resort strategy.

Follis F(1), Martucci G(2), Arcadipane A(2), Follis M(3), Rajbanshi B(4), Lorusso R(5).
NO ABSTRACT AVAILABLE

5. Resuscitation. 2022 Jul 11;178:19-25. doi: 10.1016/j.resuscitation.2022.07.010. Online ahead of print.
Cost-effectiveness of extracorporeal cardiopulmonary resuscitation for adult out-of-hospital cardiac arrest: A systematic review.
Addison D(1), Cheng E(2), Forrest P(3), Livingstone A(1), Morton RL(1), Dennis M(4).
ABSTRACT
OBJECTIVE: The use of extracorporeal cardiopulmonary resuscitation (ECPR) for out-of-hospital cardiac arrests (OHCA) has increased dramatically over the past decade. ECPR is resource intensive and costly, presenting challenges for policymakers. We sought to review the cost-effectiveness of ECPR compared with conventional cardiopulmonary resuscitation (CCPR) in OHCA. METHODS: We searched Medline, Embase, Tufts CEA registry and NHS EED databases from database inception to 2021 or 2015 for NHS EED. Cochrane Covidence was used to screen and assess studies. Data on costs, effects and cost-effectiveness of included studies were extracted by two independent reviewers. Costs were converted to USD using purchasing power parities (OECD, 2022).1 The Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist (Husereau et al., 2022)2 was used for reporting quality and completeness of cost-effectiveness studies; the review was registered on PROSPERO, and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. RESULTS: Four studies met the inclusion criteria; three cost-effectiveness studies reported an incremental cost-effectiveness ratio (ICER) for OHCA compared with conventional care, and one reported the mean operating cost of ECPR. ECPR was more costly, accrued more life years (LY) and quality-adjusted life years (QALYs) than CCPR and was more cost-effective when compared with CCPR and other standard therapies. Overall study quality was rated as moderate. CONCLUSION: Few studies have examined the cost-effectiveness of ECPR for OHCA. Of those, ECPR for OHCA was cost-effective. Further studies are required to validate findings and assess the cost-effectiveness of establishing a new ECPR service or alternate ECPR delivery models.

6. J Thorac Dis. 2022 Jun;14(6):1802-1814. doi: 10.21037/jtd-21-1512.
Effect of hospital case volume on clinical outcomes of patients requiring extracorporeal membrane oxygenation: a territory-wide longitudinal observational study.
Ng PY(#)(1)(2), Ip A(#)(1), Fang S(#)(1), Lin JCR(1), Ling L(3), Chan KM(3), Leung KHA(4), Chan KCK(5), So D(6), Shum HP(7), Ngai CW(2), Chan WM(2), Sin WC(2)(8).
ABSTRACT
BACKGROUND: The utilization of extracorporeal membrane oxygenation (ECMO) has increased rapidly around the world. Being an overall low-volume high-cost form of therapy, the effectiveness of having care delivered in segregated units across a geographical locality is debatable. METHODS: All adult extracorporeal membrane oxygenation cases admitted to public hospitals in Hong Kong between 2010 and 2019 were included. "High-volume" centers were defined as those with >20 extracorporeal membrane oxygenation cases in the respective calendar year, while "low-volume" centers were those with ≤20. Clinical outcomes of patients who received extracorporeal membrane oxygenation care in high-volume centers were compared with those in low-volume centers. RESULTS: A total of 911 patients received extracorporeal membrane oxygenation-297 (32.6%) veno-arterial extracorporeal membrane oxygenation, 450 (49.4%) veno-venous extracorporeal membrane oxygenation, and 164 (18.0%) extracorporeal membrane oxygenation-cardiopulmonary resuscitation. The overall hospital mortality was 456 (50.1%). The annual number of extracorporeal membrane oxygenation cases in high- and low-volume centers were 29 and 11, respectively. Management in a high-volume center was not significantly associated with hospital mortality (adjusted odds ratio (OR) 0.86, 95% confidence interval (CI): 0.61-1.21, P=0.38), or with intensive

care unit mortality (adjusted OR 0.76, 95% CI: 0.54-1.06, P=0.10) compared with a low-volume center. Over the 10-year period, the overall observed mortality was similar to the Acute Physiology And Chronic Health Evaluation IV-predicted mortality, with no significant difference in the standardized mortality ratios between high- and low-volume centers (P=0.46). CONCLUSIONS: In a territory-wide observational study, we observed that case volumes in extracorporeal membrane oxygenation centers were not associated with hospital mortality. Maintaining standards of care in low-volume centers is important and improves preparedness for surges in demand.

7. J Thorac Dis. 2022 Jun;14(6):1960-1971. doi: 10.21037/jtd-21-1770.
Predictors associated with mortality of extracorporeal life support therapy for acute heart failure: single-center experience with 679 patients.
Sahli SD(#)(1), Kaserer A(#)(1), Braun J(2), Halbe M(3), Dahlem Y(4), Spahn MA(1), Rössler J(1), Krüger B(1), Maisano F(5), Spahn DR(#)(1), Wilhelm MJ(#)(3).
ABSTRACT
BACKGROUND: Extracorporeal life support (ECLS) therapy is increasingly used for cardiac and respiratory support postcardiotomy, refractory cardiogenic shock and cardiopulmonary resuscitation. This study aims to describe in-hospital mortality of patients requiring ECLS, identify independent predictors associated with mortality and analyze changes of mortality over time. METHODS: This retrospective study includes all adult ECLS cases at the University Hospital Zurich, a designated ECLS center in Switzerland, in the period 2007 to 2019. RESULTS: ECLS therapy was required in 679 patients (median age 60 years, 27.5% female). In-hospital mortality was 55.5%. Cubic spline interpolation did not detect evidence for a change in mortality over the whole period of 13 years. In-hospital mortality significantly varied between ECLS indications: 70.7% (152/215) for postcardiotomy, 67.9% (108/159) for cardiopulmonary resuscitation, 47.0% (110/234) for refractory cardiogenic shock, and 9.9% (7/71) for lung transplantation and expansive thoracic surgery (P<0.001). Logistic regression modelling showed excellent discrimination in the receiver operating characteristic (ROC) area under the curve (AUC) of 0.89 [95% confidence interval (CI): 0.87-0.92] and identified significant mortality predictors: age, simplified acute physiology score (SAPS) II, as well as new liver failure and each allogenic blood transfusion unit given per day. ECLS after cardiopulmonary resuscitation was associated with significantly higher mortality compared to ECLS for refractory cardiogenic shock. CONCLUSIONS: In-hospital mortality of patients treated with ECLS therapy is high. Outcomes have not changed significantly in the observed period. We identified age, SAPS II, new liver failure and each allogenic blood transfusion unit given per day as independent mortality predictors. Knowledge of predictors strongly associated with in-hospital mortality may affect future decisions about ECLS indications and the respective management to use this elaborate therapy more effectively.

8. Resuscitation. 2022 Jul 8:S0300-9572(22)00593-7. doi: 10.1016/j.resuscitation.2022.07.003. Online ahead of print.
ECPR(2): Expert Consensus on PeRcutaneous Cannulation for Extracorporeal CardioPulmonary Resuscitation.
Schmitzberger FF(1), Haas NL(2), Coute RA(3), Bartos J(4), Hackmann A(5), Haft JW(6), Hsu CH(2), Hutin A(7), Lamhaut L(7), Marinaro J(8), Nagao K(9), Nakashima T(10), Neumar R(2), Pellegrino V(11), Shinar Z(12), Whitmore SP(13), Yannopoulos D(14), Peterson WJ(15).
ABSTRACT
AIM: Extracorporeal cardiopulmonary resuscitation (ECPR) has emerged as a promising resuscitation strategy for select patients suffering from refractory out-of-hospital cardiac arrest (OHCA), though limited data exist regarding the best practices for ECPR initiation after OHCA. METHODS: We utilized a modified Delphi process consisting of two survey rounds and a virtual consensus meeting to systematically identify detailed best practices for ECPR initiation following adult non-traumatic OHCA. A modified Delphi process builds content validity and is an accepted method to develop

consensus by eliciting expert opinions through multiple rounds of questionnaires. Consensus was achieved when items reached a high level of agreement, defined as greater than 80% responses for a particular item rated a 4 or 5 on a 5-point Likert scale. RESULTS: Snowball sampling generated a panel of 14 content experts, composed of physicians from four continents and five primary specialties. Seven existing institutional protocols for ECPR cannulation following OHCA were identified and merged into a single comprehensive list of 207 items. The panel reached consensus on 101 items meeting final criteria for inclusion: Prior to Patient Arrival (13 items), Inclusion Criteria (8), Exclusion Criteria (7), Patient Arrival (8), ECPR Cannulation (21), Go On Pump (18), and Post-Cannulation (26). CONCLUSION: We present a list of items for ECPR initiation following adult nontraumatic OHCA, generated using a modified Delphi process from an international panel of content experts. These findings may benefit centers currently performing ECPR in quality assurance and serve as a template for new ECPR programs.

9. Resuscitation. 2022 Jul 8:S0300-9572(22)00595-0. doi: 10.1016/j.resuscitation.2022.07.005. Online ahead of print.
Challenges in the initiation of extracorporeal cardiopulmonary resuscitation.
Radsel P(1), Goslar T(2).
NO ABSTRACT AVAILABLE

EXPERIMENTAL RESEARCH

1. Shock. 2022 Jun 1;57(6):243-250. doi: 10.1097/SHK.0000000000001946.
Whole Blood Selective Aortic Arch Perfusion for Exsanguination Cardiac Arrest: Assessing Myocardial Tolerance to the Duration of Cardiac Arrest.
Madurska MJ(1)(2), Abdou H(1), Elansary NN(1), Edwards J(1), Patel N(1), Stonko DP(1)(2)(3), Richmond MJ(1)(2), Scalea TM(1), Rasmussen TE(4), Morrison JJ(1).
ABSTRACT
INTRODUCTION: Selective aortic arch perfusion (SAAP) is an endovascular technique that consists of aortic occlusion with perfusion of the coronary and cerebral circulation. It been shown to facilitate return of spontaneous circulation (ROSC) after exanguination cardiac arrest (ECA), but it is not known how long arrest may last before the myocardium can no longer be durably recovered. The aim of this study is to assess the myocardial tolerance to exsanguination cardiac arrest before successful ROSC with SAAP. METHODS: Male adult swine (n = 24) were anesthetized, instrumented, and hemorrhaged to arrest. Animals were randomized into three groups: 5, 10, and 15 min of cardiac arrest before resuscitation with SAAP. Following ROSC, animals were observed for 60 min in a critical care environment. Primary outcomes were ROSC, and survival at 1-h post-ROSC. RESULTS: Shorter cardiac arrest time was associated with higher ROSC rate and better 1-h survival. ROSC was obtained for 100% (8/8) of the 5-min ECA group, 75% (6/8) of the 10-min group, 43% (3/7) of the 15-min group (P = 0.04). One-hour post-ROSC survival was 75%, 50%, and 14% in 5-, 10-, and 15-min groups, respectively (P = 0.02). One-hour survivors in the 5-min group required less norepinephrine (1.31 mg ± 0.83 mg) compared with 10-SAAP (0.76 mg ± 0.24 mg), P = 0.008. CONCLUSION: Whole blood SAAP can accomplish ROSC at high rates even after 10 min of unsupported cardiac arrest secondary to hemorrhage, with some viability beyond to 15 min. This is promising as a tool for ECA, but requires additional optimization and clinical trials.

CASE REPORTS

1. Catheter Cardiovasc Interv. 2022 Jul 8. doi: 10.1002/ccd.30329. Online ahead of print.

VA-ECMO-assisted aspiration thrombectomy in a patient presenting with acute massive PE with absolute contraindications to thrombolytics.

Patel M(1), Mujer M(1), John A(1), Darki A(1).

ABSTRACT

Massive pulmonary embolism (PE) is a life-threatening complication of major surgery with a mortality rate up to 50%. First-line therapy for massive PE is systemic thrombolytics, but surgical patients are at high bleeding risk with absolute contraindications. As surgical thrombectomy carries a high burden of morbidity and mortality, endovascular interventions are becoming more common in these clinical scenarios. We report a case of a neurosurgical patient whose postoperative course was complicated by massive PE and subsequent cardiac arrest that required emergent venoarterial extracorporeal membrane oxygenation, followed by aspiration thrombectomy with the Inari FlowTriever Device (Inari Medical). The patient had immediate hemodynamic improvement with eventual recovery to baseline functional status.

2. Vasa. 2022 Jul 8. doi: 10.1024/0301-1526/a001019. Online ahead of print.

VA-ECMO and thrombus aspiration in a pulmonary embolism patient with cardiac arrest and contraindications to thrombolytic therapy.

Reisinger AC(1), Fandler-Höfler S(2), Kreuzer P(1), Toth-Gayor G(3), Schmidt A(3), Gary T(4), Rief P(4), Eller P(1), Brodmann M(4).

ABSTRACT

A 57-year-old male patient with a history of proximal deep vein thrombosis on vitamin K antagonist therapy, suffered a recent hypertensive intracranial hemorrhage without significant neurological deficit. Three weeks later he presented with bilateral central pulmonary embolism. He had witnessed cardiac arrest and was put on veno-arterial extracorporeal membrane oxygenation (VA-ECMO). Endovascular thrombectomy with an Aspirex device led to a significant improvement of hemodynamics. VA-ECMO was terminated after one day, an IVC filter was inserted, and he was discharged from ICU after 15 days. In conclusion, VA-ECMO and endovascular therapy are rescue strategies in patients with contraindications for thrombolysis.

3. Resusc Plus. 2022 Jun 28;11:100265. doi: 10.1016/j.resplu.2022.100265. eCollection 2022 Sep.

Cardiopulmonary resuscitation of a very preterm infant using high-frequency oscillation ventilation.

Buchmayer J(1), Wisgrill L(1), Schneider M(1), Werther T(1), Goeral K(1), Berger A(1), Schmölzer GM(2)(3), Wagner M(1).

ABSTRACT

We present a novel approach of ventilation, using high-frequency oscillation ventilation (HFOV), during neonatal cardiopulmonary resuscitation (CPR) of a very preterm neonate. This case report highlights the importance of adequate lung inflation, which is a current topic, with neonatal resuscitation guidelines recommending a coordinated 3:1 compression:ventilation ratio during CPR. Our patient, a female infant born at 30 weeks gestational age, weighing 970 g, appeared floppy and apneic following birth in the amniotic sac. Lungs were unfolded and white-out in an x-ray done during resuscitation. The aim was to open lungs effectively using HFOV, instead of positive pressure ventilation, which was used unsuccessfully until the 7th minute of life. Heart rate continuously dropped below 60/min 15 min after birth and chest compressions with asynchronous HFOV were started, adrenalin was administered three times and surfactant was instilled endotracheally twice. It was possible to stabilize the patient after 15 min of CPR, following return of spontaneous circulation. HFOV may have enabled an alternative and rescue option of ventilation during neonatal CPR in this case.

4. J Med Toxicol. 2022 Jul 5. doi: 10.1007/s13181-022-00904-4. Online ahead of print.

Benzonatate Overdose Presenting as Cardiac Arrest with Rapidly Narrowing QRS Interval.

Stephens RJ(1), Filip AB(2), Baumgartner KT(2), Schwarz ES(2), Liss DB(2).

ABSTRACT

INTRODUCTION: Benzonatate is a local anesthetic-like sodium channel antagonist that is widely prescribed as an antitussive. While it may be reasonable to assume that patients would present with a prolonged QRS interval following benzonatate overdose, the published literature does not support this. We report a case of a patient presenting following a benzonatate overdose with a prolonged QRS on her initial electrocardiograph (ECG) rhythm strip with rapid normalization of QRS duration. CASE REPORT: A 14-year-old girl presented in cardiac arrest following a benzonatate overdose. The patient was found in cardiac arrest within minutes of last being known well. Bystanders immediately provided cardiopulmonary resuscitation (CPR), and she was in asystole on emergency medical services (EMS) arrival. Return of spontaneous circulation (ROSC) was obtained following administration of intraosseous epinephrine and naloxone. EMS obtained an ECG rhythm strip following ROSC demonstrating a sinus rhythm with a QRS duration of 160 ms. Over the ensuing 30 minutes, there was progressive narrowing of the QRS. A 12-lead ECG obtained on arrival in the emergency department (ED) 44 minutes later demonstrated a QRS duration of 94 ms. Initially, EMS ECG rhythm strips were unavailable and an isolated benzonatate ingestion was considered less likely as ECG intervals were normal. Benzonatate exposure was later confirmed with a urine benzonatate concentration, which was 8.5 mcg/mL. The patient made a full recovery. DISCUSSION: Cases of pediatric benzonatate overdose with rapid development of cardiac arrest and full recovery have been previously reported. In this case, evidence of cardiac sodium channel blockade was demonstrated with a prolonged QRS interval on initial ECG rhythm strip analysis. However, unlike previous cases, rapid resolution of QRS prolongation occurred in this case. While transient QRS prolongation may be observed, finding a normal QRS interval should not discount the possibility of benzonatate overdose.

5. Eur J Case Rep Intern Med. 2022 Jun 23;9(6):003327. doi: 10.12890/2022_003327. eCollection 2022.

Early Left Ventricular Thrombus Following Ventricular Fibrillation/Ventricular Tachycardia Electrical Storm.

Alyacoub R(1), Elkattawy S(1), Jesani S(1), Perez Hernandez C(1), Fichadiya H(1), Noori MAM(1), Elkattawy O(2), Williams E(3).

ABSTRACT

Left ventricular thrombus (LVT) formation is a serious clinical complication of low-flow states that may be seen in an ischaemic, arrhythmic heart. While LVT formation has a poor prognosis, in the setting of myocardial infarction it is usually a result of post-infarct sequelae such as left ventricle aneurysms, and inflammatory changes from damaged tissue, with the LVT taking several days to form. Arrythmias such as ventricular tachycardia (VT) or ventricular fibrillation (VF) may also lead to thrombus formation, as they contribute to stasis due to decreased cardiac output. Large anterolateral myocardial infarctions can cause electrical or arrhythmic storm, characterized by more than three episodes of VT or VF in a 24-hour period. This prolonged state of dyskinesis further increases the risk of thrombosis, creating a compounding effect. Here, we report the case of a patient who had a VF cardiac arrest with electrical storm secondary to anterolateral myocardial infarction complicated with LVT formation found on echocardiogram after the cardiac arrest, which was absent on presentation. This thrombus formation occurred particularly early during the course of the patient's arrest, possibly due to the compounding factors increasing the risk of thrombosis.

Herein, we discuss in detail the risk factors for LVT formation, its mechanism and management options. A review of the literature also shows that LVT formation in the acute phase of arrest, as seen in our patient, is rare. LEARNING POINTS: Left ventricular thrombus (LVT) formation occurs 3-14 days after myocardial infarction, but in the setting of concomitant ventricular fibrillation arrest, may occur within the first 24 hours.Risk factors for LVT formation include a large infarct, anterior/anterior apical infarction, decreased ejection fraction (particularly <30-35%), left ventricular aneurysm, and delayed time to revascularization. Although diagnosis is generally made on transthoracic echocardiography with intravenous contrast, cardiac MRI with contrast has better sensitivity and specificity.Treatment consists of anticoagulation with a vitamin K antagonist or heparin for 3-6 months with a repeat echocardiogram to confirm the thrombus has organized or resolved. Further trials are needed to assess the efficacy of direct oral anticoagulants.

6. World J Emerg Med. 2022;13(4):337-340. doi: 10.5847/wjem.j.1920-8642.2022.066.
The successful use of extracorporeal membrane oxygenation combined with continuous renal replacement therapy for a cardiac arrest patient with refractory hypokalemia and diabetic ketoacidosis.
Li Y(1), Xu R(1), Cao CS(1), Huang L(1).
NO ABSTRACT AVAILABLE

7. Resusc Plus. 2022 Jul 6;11:100272. doi: 10.1016/j.resplu.2022.100272. eCollection 2022 Sep.
Amiodarone induced movement disorder after cardiac arrest - A case report.
Ratay CR(1), Doshi AA(1), Steinberg A(1)(2)(3), Kaczorowski D(4), Phillips DP(5), Rhinehart ZJ(6), Fozard J(2), Rivosecchi RM(7), Schatz KW(6), Bahl KD(6), Schwarm P(8), Coppler PJ(1).
ABSTRACT
We describe a case of new onset movement disorder in a patient with ventricular tachycardia storm supported with peripheral VA ECMO. The differential diagnosis of abnormal movements in a post cardiac arrest patient requiring temporary mechanical circulatory support for cardiogenic shock is explored.

8. ESC Heart Fail. 2022 Jul 12. doi: 10.1002/ehf2.14060. Online ahead of print.
Cardiac arrest as a manifestation of unknown Type V glycogenosis: a case report.
Soria-Navarro R(1)(2), Burgos Palacios V(3), Castrillo Bustamante C(3), Gallardo Agromayor E(4), Marcos González S(5), González-Lamuño Leguina D(6).
ABSTRACT
Few cases have been reported to date, in which a massive rhabdomyolysis causes a cardiac arrest in a male adult suffering from undiagnosed McArdle disease. Veno-arterial extracorporeal membrane oxygenation and cytokine adsorption filter (CytoSorb®) were required to reach a complete and successful recovery.

9. Mol Genet Genomic Med. 2022 Jul;10(7):e1954. doi: 10.1002/mgg3.1954. Epub 2022 Jun 3.
Molecular autopsy and clinical family screening in a case of sudden cardiac death reveals ACTN2 mutation related to hypertrophic/dilated cardiomyopathy and a novel LZTR1 variant associated with Noonan syndrome.
Kraoua L(1)(2), Jaouadi H(3), Allouche M(4), Achour A(1)(2), Kaouther H(5), Ahmed HB(6), Chaker L(7), Maazoul F(1), Ouarda F(5), Zaffran S(3), M'rad R(1)(2).
ABSTRACT
BACKGROUND: Genetic cardiac diseases are the main trigger of sudden cardiac death (SCD) in young adults. Hypertrophic cardiomyopathy (HCM) is the most prevalent cardiomyopathy and accounts for

0.5 to 1% of SCD cases per year. METHODS: Herein, we report a family with a marked history of SCD focusing on one SCD young adult case and one pediatric case with HCM. RESULTS: For the deceased young adult, postmortem whole-exome sequencing (WES) revealed a missense variant in the ACTN2 gene: c.355G > A; p.(Ala119Thr) confirming the mixed hypertrophic/dilated cardiomyopathy phenotype detected in the autopsy. For the pediatric case, WES allowed us the identification of a novel frameshift variant in the LZTR1 gene: c.1745delT; p.(Val582Glyfs*10) which confirms a clinical suspicion of HCM related to Noonan syndrome. CONCLUSION: The present study adds further evidence on the pathogenicity of ACTN2: p. Ala119Thr variant in SCD and expands the mutational spectrum of the LZTR1 gene related to Noonan syndrome.