

**This week's PubMed 27<sup>th</sup> February – 5<sup>th</sup> March 2022: articles of interest n = 52**

**CPR AND COVID-19**

**1.** ASAIO J. 2022 Mar 2. doi: 10.1097/MAT.0000000000001640. Online ahead of print.

**Respiratory ECMO Survival Prediction (RESP) Score for COVID-19 Patients Treated with ECMO.**

Joshi H(1), Flanagan M, Subramanian R, Drouin M.

**ABSTRACT**

Veno-venous extracorporeal membrane oxygenation (VV ECMO) has been used as a life-supporting modality for patients with severe respiratory failure because of coronavirus disease 2019 (COVID-19). We aim to evaluate the performance of the RESP score in predicting the hospital survival of COVID-19 patients undergoing VV ECMO. We performed retrospective analysis of the extracorporeal life support organization (ELSO) dataset for COVID-19 patients requiring ECMO support to evaluate the performance of RESP score in predicting in hospital survival. All adult (age ≥18) COVID-19 patients receiving VV ECMO for acute respiratory failure enrolled in the ELSO database from March to August 2020 were included in the analysis. A total of 1985 patients from the ELSO registry were identified and analyzed based on pre-ECMO variables. Median RESP score of survivors was 3 (IQR 1-5) compared to 2 (IQR 0-4) in deceased. A logistic model including RESP score variables poorly discriminated survival and death with AUC (area under curve) 0.61 (95% confidence interval: 0.59-0.64). In-hospital survival for COVID-19 patients based on RESP score class from I to V was 69.7%, 59.3%, 45.7%, 42.5%, and 32.3%, respectively. Patients with immunosuppression (relative risk = 0.43) and pre-ECMO cardiac arrest (relative risk = 0.48) had lower survival. RESP score is a poor predictor of survival in COVID-19 patients undergoing ECMO. Compared to the original cohort used for RESP score creation, COVID-19 patients in RESP class I-III had worse survival whereas the patients in RESP class IV-V had better survival.

**2.** JAMA Netw Open. 2022 Mar 1;5(3):e220752. doi: 10.1001/jamanetworkopen.2022.0752.

**Association of COVID-19 Infection With Survival After In-Hospital Cardiac Arrest Among US Adults.**

Girotra S(1)(2), Chan ML(3), Starks MA(4), Churpek M(5), Chan PS(6); American Heart Association

Get With the Guidelines–Resuscitation Investigators.

**ABSTRACT**

This cohort study examines the association of COVID-19 infection with survival outcomes of US adults after in-hospital cardiac arrest.

**CPR/MECHANICAL CHEST COMPRESSION**

No articles identified.

**REGISTRIES, REVIEWS AND EDITORIALS**

**1.** Am J Emerg Med. 2022 Feb 24;55:27-31. doi: 10.1016/j.ajem.2022.02.032. Online ahead of print.

**Gender differences and survival after out of hospital cardiac arrest.**

Rob D(1), Kavalkova P(2), Smalcova J(2), Franek O(3), Smid O(2), Komarek A(4), Pisinger M(5), Belohlavek J(2).

**ABSTRACT**

**BACKGROUND:** Published evidence regarding the effect of gender on outcome after out of hospital cardiac arrest (OHCA) is inconsistent. We aimed to investigate the association of gender to outcome and resuscitation characteristics in OHCA patients admitted to the cardiac arrest center. **METHODS:** In this retrospective analysis of prospective registry data, all patients admitted for OHCA were included. The influence of gender on 30-day survival and good neurological outcome (cerebral performance category of 1 or 2) were examined using Kaplan-Meier estimates and multivariable logistic regression. **RESULTS:** In total, 932 patients were analysed (239 women, 26%). Women were older (64 vs 60 years,  $p < 0.001$ ) and less commonly had a shockable rhythm (47% vs 65%,  $P < 0.001$ ) compared to men. Women were less likely to have a cardiac cause of arrest (54% vs. 75%,  $p < 0.001$ ), received less therapeutic hypothermia (74% vs 86%,  $p < 0.001$ ) and coronary angiography (63% vs. 79%,  $p < 0.001$ ). The overall 30-day survival was lower for women (45% vs. 53%, log-rank  $p = 0.005$ ) as well as good neurological outcome (37% vs. 46%,  $p = 0.008$ ). However, according to the multivariate logistic regression, gender was not associated with survival (OR 0.98, 95% CI 0.65-1.50,  $p = 0.94$ ) nor with good neurological outcome (OR 0.91, 95% CI 0.59-1.40,  $p = 0.67$ ). **CONCLUSION:** Women admitted for OHCA to a cardiac center had a different cause of arrest that had a different treatment and outcome compared to men. Survival and good neurological outcome were lower in women, however, after adjusting for baseline characteristics, gender was not associated with survival nor neurological outcome.

**2.** Eur Heart J Acute Cardiovasc Care. 2022 Mar 3:zuac026. doi: 10.1093/ehjacc/zuac026. Online ahead of print.

**Delayed administration of epinephrine is associated with worse neurological outcomes in patients with out-of-hospital cardiac arrest and initial pulseless electrical activity: insight from the nationwide multicentre observational JAAM-OHCA (Japan Association for Acute Medicine) registry.**

Enzan N(1), Hiasa KI(1), Ichimura K(2), Nishihara M(3), Iyonaga T(3), Shono Y(3), Tohyama T(4), Funakoshi K(4), Kitazono T(3), Tsutsui H(1).

**ABSTRACT**

**AIMS:** The delayed administration of epinephrine has been proven to worsen the neurological outcomes of patients with out-of-hospital cardiac arrest (OHCA) and shockable rhythm or asystole. We aimed to investigate whether the delayed administration of epinephrine might also worsen the neurological outcomes of patients with witnessed OHCA and initial pulseless electrical activity (PEA). **METHODS AND RESULTS:** The JAAM-OHCA Registry is a multicentre registry including OHCA patients between 2014 and 2017. Patients with emergency medical services (EMS)-treated OHCA and initial PEA rhythm were included. The primary exposure was the time from the EMS call to the administration of epinephrine. The secondary exposure was the time to epinephrine dichotomized as early ( $\leq 15$  min) or delayed ( $> 15$  min). The primary outcome was the achievement of a favourable neurological outcome, defined as Cerebral Performance Categories Scale 1-2 at 30 days after OHCA. Out of 34 754 patients with OHCA, 3050 patients were included in the present study. After adjusting for potential confounders, the delayed administration of the epinephrine was associated with a lower likelihood of achieving a favourable neurological outcome [adjusted odds ratio (OR) 0.96; 95% confidence interval (CI) 0.93-0.99;  $P = 0.016$ ]. The percentage of patients who achieved a favourable neurological outcome in the delayed epinephrine group was lower than that in the early epinephrine group (1.3% vs. 4.7%; adjusted OR 0.33; 95% CI 0.15-0.72;  $P = 0.005$ ). A restricted cubic spline analysis demonstrated that delayed epinephrine administration could decrease the likelihood of achieving a favourable neurological outcome; this was significant within the first 10 min. **CONCLUSIONS:** The delayed administration of epinephrine was associated with worse neurological outcomes in patients with witnessed OHCA patients with initial PEA.

## **IN-HOSPITAL CARDIAC ARREST**

**1.** J Intensive Care. 2022 Mar 3;10(1):10. doi: 10.1186/s40560-022-00601-y.

### **Incidence and outcomes of in-hospital cardiac arrest in Japan 2011-2017: a nationwide inpatient database study.**

Ohbe H(1), Tagami T(2)(3), Uda K(2)(4), Matsui H(2), Yasunaga H(2).

#### **ABSTRACT**

**BACKGROUND:** Although numerous studies have investigated out-of-hospital cardiac arrest, few studies have been conducted on in-hospital cardiac arrest (IHCA). Knowledge of the nationwide epidemiology of IHCA in Japan, with its super-aging society, is important to understand the current situation of IHCA and to establish evidenced-based medicine in the future. The present study aimed to determine the incidence and outcomes of IHCA and their trends in Japan. **METHODS:** This observational cohort study was performed using a national administrative inpatient database for more than 1600 acute-care hospitals covering about 50% of all acute-care hospital beds in Japan from April 2011 to March 2018. We defined cardiac arrest patients who received cardiopulmonary resuscitation (chest compression) during hospitalization as IHCA. We excluded out-of-hospital cardiac arrest patients from the source population. The incidence of IHCA per 1000 hospital admissions and survival to discharge rate was reported with trend analyses by calendar year 2011-2017. **RESULTS:** Among 53,871,101 hospitalized patients without out-of-hospital cardiac arrest patients in 1626 hospitals, 2,136,038 (4.0%) had cardiac arrest. Of them, 274,664 (12.9%) received cardiopulmonary resuscitation at least once during hospitalization and were identified as IHCA, and 1,861,374 (87.1%) did not receive cardiopulmonary resuscitation. The incidence of IHCA per 1000 hospital admissions was 5.1, with a significant decreasing trend from 6.1 in 2011 to 4.6 in 2017 ( $P$  for trend = 0.033). Our estimated incidence can be translated to approximately 87,000 IHCA cases in Japan each year. The percentage of IHCA patients among cardiac arrest patients was 12.9%, with a significant decreasing trend from 14.0% in 2011 to 12.2% in 2017 ( $P$  for trend = 0.006). The overall rate of survival to discharge was 12.7%, with a significant increasing trend from 10.5% in 2011 to 14.0% in 2017 ( $P$  for trend < 0.001). **CONCLUSIONS:** We found substantial associations between mortality and loss of health and IHCA in Japan. The incidence of IHCA showed a decreasing trend over time, the percentage of treated cardiac arrest patients also had a decreasing trend, and the overall survival to discharge rate improved over time.

**2.** JAMA Netw Open. 2022 Feb 1;5(2):e2148485. doi: 10.1001/jamanetworkopen.2021.48485.

### **Variation Across Hospitals in In-Hospital Cardiac Arrest Incidence Among Medicare Beneficiaries.**

Rasmussen TP(1), Riley DJ(2), Sarazin MV(3), Chan PS(4), Girotra S(1)(3).

#### **ABSTRACT**

**IMPORTANCE:** Although survival for in-hospital cardiac arrest (IHCA) has improved substantially over the last 2 decades, survival rates have plateaued in recent years. A better understanding of hospital differences in IHCA incidence may provide important insights regarding best practices for prevention of IHCA. **OBJECTIVE:** To determine the incidence of IHCA among Medicare beneficiaries, and evaluate hospital variation in incidence of IHCA. **DESIGN, SETTING, AND PARTICIPANTS:** This observational cohort study analyzes 2014 to 2017 data from 170 hospitals participating in the Get With The Guidelines-Resuscitation registry, linked to Medicare files. Participants were adults aged 65 years and older. Statistical analysis was performed from January to December 2021. **EXPOSURES:** Case-mix index, teaching status, and nurse-staffing. **MAIN OUTCOMES AND MEASURES:** Hospital incidence of IHCA among Medicare beneficiaries was estimated as the number of IHCA patients divided by the total number of hospital admissions. Multivariable hierarchical regression models were used to calculate hospital incidence rates adjusted for differences in patient case-mix and evaluate the association of hospital variables with IHCA incidence. **RESULTS:** Among a total of 4.5 million admissions at 170 hospitals, 38 630 patients experienced an IHCA during 2014 to 2017.

Among the 38 630 patients with IHCA, 7571 (19.6%) were non-Hispanic Black, 26 715 (69.2%) were non-Hispanic White, and 16 732 (43.3%) were female; the mean (SD) age at admission was 76.3 (7.8) years. The median risk-adjusted IHCA incidence was 8.5 per 1000 admissions (95% CI, 8.2-9.0 per 1000 admissions). After adjusting for differences in case-mix index, IHCA incidence varied markedly across hospitals ranging from 2.4 per 1000 admissions to 25.5 per 1000 admissions (IQR, 6.6-11.4; median odds ratio, 1.51 [95% CI, 1.44-1.58]). Among hospital variables, a higher case-mix index, higher nurse staffing, and teaching status were associated with a lower hospital incidence of IHCA.

**CONCLUSIONS AND RELEVANCE:** This cohort study found that the incidence of IHCA varies markedly across hospitals, and hospitals with higher nurse staffing and teaching status had lower IHCA incidence rates. Future studies are needed to better understand processes of care at hospitals with exceptionally low IHCA incidence to identify best practices for cardiac arrest prevention.

## **INJURIES AND CPR**

1. Rev Cardiovasc Med. 2022 Feb 14;23(2):61. doi: 10.31083/j.rcm2302061.

### **Heart injuries related to cardiopulmonary resuscitation: a risk often overlooked.**

Girotti P(1), Rizzuto A(2), Orsini V(2), Hodja V(1), Koenigsrainer I(1).

#### **ABSTRACT**

**BACKGROUND:** Current studies focus primarily on skeletal injuries following cardiopulmonary resuscitation (CPR). Few studies report on intrathoracic injuries (ITI) and none, to our knowledge, focus exclusively on cardiovascular injuries related to cardiac massage. This study was based on autopsy findings and assessed the incidence of non-skeletal CPR related injuries related to chest compression. **METHODS:** This was a retrospective forensic autopsy cohort study conducted in a single institution after resuscitation. Pathologists recorded autopsy data using standardized protocol contained information from external and internal examination of the body. **RESULTS:** Thirty-eight autopsy reports (21 males and 17 females), post- CPR-failure were studied. Heart lesions were reported in 19 patients (group A). The average age was 65.7 years (69.05 group A and 66.5 group B). Median weight was 75.2 Kg and was significantly higher in group B ( $p = 0.01$ ). Pericardial lesions were identified in 6 patients in group A and 2 in group B ( $p = 0.2$  ns). No significant difference was observed among the two groups (Table 4) with the exception of the average number of rib fractures which was higher in group A ( $p = 0.04$ ). Autopsy findings revealed heart injuries in 50% of patients with a high prevalence (52.6%) of left ventricle injuries. **CONCLUSION:** Cardiac lesions represent frequent and serious complications of unsuccessful CPR. Correct performance of chest compressions according to guidelines is the best way to avoid these complications.

## **CAUSE OF THE ARREST**

1. Resusc Plus. 2022 Feb 19;9:100214. doi: 10.1016/j.resplu.2022.100214. eCollection 2022 Mar.

### **Incidence, characteristics and outcomes of out-of-hospital cardiac arrests in patients with psychiatric illness: A systematic review.**

Alotaibi R(1)(2), Halbesma N(1), Bijman LAE(1), Clegg G(3), Smith DJ(4), Jackson CA(1).

#### **ABSTRACT**

**AIM:** To conduct a systematic literature review of the existing evidence on incidence, characteristics and outcomes after out-of-hospital cardiac arrest (OHCA) in patients with psychiatric illness.

**METHODS:** We searched Embase, Medline, PsycINFO and Web of Science using a comprehensive electronic search strategy to identify observational studies reporting on OHCA incidence, characteristics or outcomes by psychiatric illness status. One reviewer screened all titles and abstracts, and a second reviewer screened a random 10%. Two reviewers independently performed

data extraction and quality assessment. RESULTS: Our search retrieved 11,380 studies, 10 of which met our inclusion criteria (8 retrospective cohort studies and two nested case-control studies). Three studies focused on depression, whilst seven included various psychiatric conditions. Among patients with an OHCA, those with psychiatric illness (compared to those without) were more likely to have: an arrest in a private location; an unwitnessed arrest; more comorbidities; less bystander cardio-pulmonary resuscitation; and an initial non-shockable rhythm. Two studies reported on OHCA incidence proportion and two reported on survival, showing higher risk, but lower survival, in patients with psychiatric illness. CONCLUSION: Psychiatric illness in relation to OHCA incidence and outcomes has rarely been studied and only a handful of studies have reported on OHCA characteristics, highlighting the need for further research in this area. The scant existing literature suggests that psychiatric illness may be associated with higher risks of OHCA, unfavourable characteristics and poorer survival. Future studies should further investigate these links and the role of potential contributory factors such as socioeconomic status and comorbidities.

**2. Neurosurg Focus. 2022 Mar;52(3):E6. doi: 10.3171/2021.12.FOCUS21650.**

**Cardiac arrest in spontaneous subarachnoid hemorrhage and associated outcomes.**

Feldstein E(1), Dominguez JF(1), Kaur G(1), Patel SD(2), Dicpinigaitis AJ(1), Semaan R(1), Fuentes LE(1), Ogulnick J(1), Ng C(1), Rawanduzy C(1), Kamal H(1), Pisapia J(1), Hanft S(1), Amuluru K(3), Naidu SS(4), Cooper HA(5), Prabhakaran K(6), Mayer SA(1), Gandhi CD(1), Al-Mufti F(1).

**ABSTRACT**

OBJECTIVE: The authors sought to analyze a large, publicly available, nationwide hospital database to further elucidate the impact of cardiopulmonary arrest (CA) in association with subarachnoid hemorrhage (SAH) on short-term outcomes of mortality and discharge disposition. METHODS: This retrospective cohort study was conducted by analyzing de-identified data from the National (Nationwide) Inpatient Sample (NIS). The publicly available NIS database represents a 20% stratified sample of all discharges and is powered to estimate 95% of all inpatient care delivered across hospitals in the US. A total of 170,869 patients were identified as having been hospitalized due to nontraumatic SAH from 2008 to 2014. RESULTS: A total of 5415 patients (3.2%) were hospitalized with an admission diagnosis of CA in association with SAH. Independent risk factors for CA included a higher Charlson Comorbidity Index score, hospitalization in a small or nonteaching hospital, and a Medicaid or self-pay payor status. Compared with patients with SAH and not CA, patients with CA-SAH had a higher mean NIS Subarachnoid Severity Score (SSS)  $\pm$  SD ( $1.67 \pm 0.03$  vs  $1.13 \pm 0.01$ ,  $p < 0.0001$ ) and a vastly higher mortality rate (82.1% vs 18.4%,  $p < 0.0001$ ). In a multivariable model, age, NIS-SSS, and CA all remained significant independent predictors of mortality. Approximately 18% of patients with CA-SAH survived and were discharged to a rehabilitation facility or home with health services, outcomes that were most predicted by chronic disease processes and large teaching hospital status. CONCLUSIONS: In the largest study of its kind, CA at onset was found to complicate roughly 3% of spontaneous SAH cases and was associated with extremely high mortality. Despite this, survival can still be expected in approximately 18% of patients.

**3. Scand J Trauma Resusc Emerg Med. 2022 Mar 4;30(1):13. doi: 10.1186/s13049-022-01000-w.**

**Accidental hypothermia: direct evidence for consciousness as a marker of cardiac arrest risk in the acute assessment of cold patients.**

Barrow S(1), Ives G(2).

**ABSTRACT**

BACKGROUND: Rapid stratification of the risk of cardiac arrest is essential in the assessment of patients with isolated accidental hypothermia. Traditional methods based on measurement of core temperature are unreliable in the field. Behavioural observations have been used as predictors of

core temperature and thus indirect predictors of cardiac arrest. This study aims to quantify the direct relationship between observed conscious level and cardiac arrest. METHODS: Retrospective case report analysis identified 114 cases of isolated accidental hypothermia meeting inclusion criteria. Level of consciousness in the acute assessment and management phase was classified using the AVPU system with an additional category of "Alert with confusion"; statistical analysis then related level of consciousness to incidence of cardiac arrest. RESULTS: All patients who subsequently suffered cardiac arrest showed some impairment of consciousness ( $p < .0001$ ), and the risk of arrest increased directly with the level of impairment; none of the 33 fully alert patients arrested. In the lowest impairment category, Alert confused, a quarter of the 12 patients went on to arrest, while in the highest Unresponsive category, two thirds of the 43 patients arrested. Where core temperature was available (62 cases), prediction of arrest by consciousness level was at least as good as prediction from core temperature. CONCLUSIONS: This study provides retrospective analytical evidence that consciousness level is a valid predictor of cardiac arrest risk in isolated accidental hypothermia; the importance of including confusion as a criterion is a new finding. This study suggests the use of consciousness alone may be at least as good as core temperature in cardiac arrest risk prediction. These results are likely to be of particular relevance to the management of accidental hypothermia in the pre-hospital and mass casualty environment, allowing for rapid and accurate triage of hypothermic patients.

#### **END-TIDAL CO<sub>2</sub>**

No articles identified.

#### **ORGAN DONATION**

No articles identified.

#### **FEEDBACK**

No articles identified.

#### **DRUGS**

**1.** Trials. 2022 Mar 4;23(1):197. doi: 10.1186/s13063-022-06127-w.

#### **Ceftriaxone to PRevent pneumOnia and inflammaTion aftEr Cardiac arresT (PROTECT): study protocol for a randomized, placebo-controlled trial.**

Gagnon DJ(1)(2)(3), Ryzhov SV(4), May MA(5), Riker RR(6)(7), Geller B(6)(8), May TL(4)(6)(7), Bockian S(9), deKay JT(4), Eldridge A(9), Van der Kloot T(7), Lerwick P(7), Lord C(9), Lucas FL(4), Mailloux P(7), McCrum B(9), Searight M(9), Wirth J(7), Zuckerman J(6), Sawyer D(4)(8), Seder DB(4)(6)(7).

#### **ABSTRACT**

**BACKGROUND:** Pneumonia is the most common infection after out-of-hospital cardiac arrest (OHCA) occurring in up to 65% of patients who remain comatose after return of spontaneous circulation.

Preventing infection after OHCA may (1) reduce exposure to broad-spectrum antibiotics, (2) prevent hemodynamic derangements due to local and systemic inflammation, and (3) prevent infection-associated morbidity and mortality. **METHODS:** The ceftriaxone to PRevent pneumOnia and inflammaTion aftEr Cardiac arrest (PROTECT) trial is a randomized, placebo-controlled, single-center,

quadruple-blind (patient, treatment team, research team, outcome assessors), non-commercial, superiority trial to be conducted at Maine Medical Center in Portland, Maine, USA. Ceftriaxone 2 g intravenously every 12 h for 3 days will be compared with matching placebo. The primary efficacy outcome is incidence of early-onset pneumonia occurring < 4 days after mechanical ventilation initiation. Concurrently, T cell-mediated inflammation bacterial resistomes will be examined. Safety outcomes include incidence of type-one immediate-type hypersensitivity reactions, gallbladder injury, and Clostridioides difficile-associated diarrhea. The trial will enroll 120 subjects over approximately 3 to 4 years. DISCUSSION: The PROTECT trial is novel in its (1) inclusion of OHCA survivors regardless of initial heart rhythm, (2) use of a low-risk antibiotic available in the USA that has not previously been tested after OHCA, (3) inclusion of anti-inflammatory effects of ceftriaxone as a novel mechanism for improved clinical outcomes, and (4) complete metagenomic assessment of bacterial resistomes pre- and post-ceftriaxone prophylaxis. The long-term goal is to develop a definitive phase III trial powered for mortality or functional outcome.

**2. J Am Heart Assoc.** 2022 Mar 4:e023958. doi: 10.1161/JAHA.121.023958. Online ahead of print.

**Effect of Time to Treatment With Antiarrhythmic Drugs on Return of Spontaneous Circulation in Shock-Refractory Out-of-Hospital Cardiac Arrest.**

Rahimi M(1), Dorian P(1)(2)(3), Cheskes S(1)(4)(3)(5), Lebovic G(6)(7), Lin S(1)(2)(6)(3).

**ABSTRACT**

**Background** The effects of amiodarone and lidocaine on the return of spontaneous circulation (ROSC) in relation to time to treatment in patients with out-of-hospital cardiac arrest is not known. We conducted a post hoc analysis of the ROC ALPS (Resuscitation Outcomes Consortium Amiodarone, Lidocaine, Placebo) randomized controlled trial examining the association of time to treatment (drug or placebo) with ROSC at hospital arrival. **Methods and Results** In the trial, adults with nontraumatic out-of-hospital cardiac arrest with initial refractory ventricular fibrillation or pulseless ventricular tachycardia after at least 1 defibrillation were randomly assigned to receive amiodarone, lidocaine, or placebo. We used logistic regression to examine the association of time to treatment (911 call to study drug administration) with ROSC. An interaction term between treatment and time to treatment was included to determine the potential effect of time on treatment effects. Overall, 1112 (36.7%) patients had ROSC at hospital arrival (350 in the amiodarone arm, 396 in the lidocaine arm, and 366 in the placebo arm). The proportion of patients who had ROSC decreased as time to drug administration increased, in patients treated with amiodarone (odds ratio, 0.92; 95% CI, 0.90-0.94 per minute increase), lidocaine (odds ratio, 0.95; 95% CI, 0.93-0.96), and placebo (odds ratio, 0.95; 95% CI, 0.93-0.96). With shorter times to drug administration, the proportion with ROSC was higher in amiodarone versus placebo recipients. **Conclusions** The probability of ROSC decreased as time to drug administration increased. The effect of amiodarone but not lidocaine to restore ROSC declined with longer times to drug administration, potentially attributable to its adverse hemodynamic effects.

**3. Heart.** 2022 Mar 2:heartjnl-2021-320513. doi: 10.1136/heartjnl-2021-320513. Online ahead of print.

**Bayesian analysis of amiodarone or lidocaine versus placebo for out-of-hospital cardiac arrest.**

Lane DJ(1), Grunau B(2)(3), Kudenchuk P(4), Dorian P(5), Wang HE(6), Daya MR(7), Lupton J(7), Vaillancourt C(8)(9), Okubo M(10), Davis D(11), Rea T(12), Yannopoulos D(13), Christenson J(2)(3), Scheuermeyer F(2)(3).

**ABSTRACT**

**OBJECTIVE:** Clinical trials for patients with shock-refractory out-of-hospital cardiac arrest (OHCA), including the Amiodarone, Lidocaine or Placebo (ALPS) trial, have been unable to demonstrate

definitive benefit after treatment with antiarrhythmic drugs. A Bayesian approach, combining the available evidence, may yield additional insights. METHODS: We conducted a reanalysis of the ALPS trial comparing treatment with amiodarone or lidocaine with placebo in patients with OHCA following shock-refractory ventricular fibrillation or ventricular tachycardia (VF/VT). We used Bayesian regression to assess the probability of improved survival or improved neurological outcome on the 7-point modified Rankin Scale. We derived weak, moderate and strong priors from a previous clinical trial. RESULTS: The original ALPS trial randomised 3026 adult patients with OHCA to amiodarone (n=974, survival to hospital discharge 24.4%), lidocaine, (n=993, survival 23.7%) or placebo (n=1059, survival 21.0%). In our reanalysis the probability of improved survival from amiodarone ranged from 83% (strong prior) to 95% (weak prior) compared with placebo and from 78% (strong) to 90% (weak) for lidocaine—an estimated improvement in survival of 2.9% (IQR 1.4%-3.8%) for amiodarone and 1.7% (IQR 0.84%-3.2%) for lidocaine over placebo (moderate prior). The probability of improved neurological outcome from amiodarone ranged from 96% (weak) to 99% (strong) compared with placebo and from 88% (weak) to 96% (strong) for lidocaine. CONCLUSIONS: In a Bayesian reanalysis of patients with shock-resistant VF/VT OHCA, treatment with amiodarone had high probabilities of improved survival and neurological outcome, while treatment with lidocaine had a more modest benefit.

## **TRAUMA**

No articles identified.

## **VENTILATION**

**1.** BMJ Open. 2022 Mar 3;12(3):e058001. doi: 10.1136/bmjopen-2021-058001.

### **Ventilation management and outcomes in out-of-hospital cardiac arrest: a protocol for a preplanned secondary analysis of the TTM2 trial.**

Robba C(1)(2), Nielsen N(3), Dankiewicz J(4), Badenes R(5), Battaglini D(6)(2)(7), Ball L(6)(2), Brunetti I(6), Pedro David WG(8), Young P(9), Eastwood G(10), Chew MS(11), Jakobsen J(12), Uden J(13)(14), Thomas M(15), Joannidis M(16), Nichol A(17), Lundin A(18), Hollenberg J(19), Lilja G(13), Hammond NE(20), Saxena M(21), Martin A(22), Solar M(23), Taccone FS(24), Friberg HA(25), Pelosi P(6)(26).

### **ABSTRACT**

**INTRODUCTION:** Mechanical ventilation is a fundamental component in the management of patients post cardiac arrest. However, the ventilator settings and the gas-exchange targets used after cardiac arrest may not be optimal to minimise post-anoxic secondary brain injury. Therefore, questions remain regarding the best ventilator management in such patients. **METHODS AND ANALYSIS:** This is a preplanned analysis of the international randomised controlled trial, targeted hypothermia versus targeted normothermia after out-of-hospital cardiac arrest (OHCA)-target temperature management 2 (TTM2). The primary objective is to describe ventilatory settings and gas exchange in patients who required invasive mechanical ventilation and included in the TTM2 trial. Secondary objectives include evaluating the association of ventilator settings and gas-exchange values with 6 months mortality and neurological outcome. Adult patients after an OHCA who were included in the TTM2 trial and who received invasive mechanical ventilation will be eligible for this analysis. Data collected in the TTM2 trial that will be analysed include patients' prehospital characteristics, clinical examination, ventilator settings and arterial blood gases recorded at hospital and intensive care unit (ICU) admission and daily during ICU stay. **ETHICS AND DISSEMINATION:** The TTM2 study has been approved by the regional ethics committee at Lund University and by all relevant ethics boards in participating countries. No further ethical committee approval is required for this secondary

analysis. Data will be disseminated to the scientific community by abstracts and by original articles submitted to peer-reviewed journals.

### **CEREBRAL MONITORING**

**1.** Resuscitation. 2022 Mar 1:S0300-9572(22)00063-6. doi: 10.1016/j.resuscitation.2022.02.024.

Online ahead of print.

#### **Neurofilament light compared to neuron-specific enolase as a predictor of unfavourable outcome after out-of-hospital cardiac arrest.**

Wihtersaari L(1), Reinikainen M(2), Furlan R(3), Mandelli A(3), Vaahersalo J(4), Kurola J(5), Tiainen M(6), Pettilä V(4), Bendel S(2), Varpula T(4), Latini R(7), Ristagno G(8), Skrifvars MB(9).

#### **ABSTRACT**

**AIM:** We compared the prognostic abilities of neurofilament light (NfL) and neuron-specific enolase (NSE) in patients resuscitated from out-of-hospital cardiac arrest (OHCA) of various aetiologies. **METHODS:** We analysed frozen blood samples obtained at 24 and 48 hours from OHCA patients treated in 21 Finnish intensive care units in 2010 and 2011. We defined unfavourable outcome as Cerebral Performance Category (CPC) 3-5 at 12 months after OHCA. We evaluated the prognostic ability of the biomarkers by calculating the area under the receiver operating characteristic curves (AUROCs [95% confidence intervals]) and compared these with a bootstrap method. **RESULTS:** Out of 248 adult patients, 12-month outcome was unfavourable in 120 (48.4%). The median (interquartile range) NfL concentrations for patients with unfavourable and those with favourable outcome, respectively, were 688 (146-1804) pg/mL vs. 31 (17-61) pg/mL at 24 h and 1162 (147-4361) pg/mL vs. 36 (21-87) pg/mL at 48 h,  $p < 0.001$  for both. The corresponding NSE concentrations were 13.3 (7.2-27.3) µg/L vs. 8.5 (5.8-13.2) µg/L at 24 h and 20.4 (8.1-56.6) µg/L vs. 8.2 (5.9-12.1) µg/L at 48 h,  $p < 0.001$  for both. The AUROCs to predict an unfavourable outcome were 0.90 (0.86-0.94) for NfL vs. 0.65 (0.58-0.72) for NSE at 24 h,  $p < 0.001$  and 0.88 (0.83-0.93) for NfL and 0.73 (0.66-0.81) for NSE at 48 h,  $p < 0.001$ . **CONCLUSION:** Compared to NSE, NfL demonstrated superior accuracy in predicting long-term unfavourable outcome after OHCA.

**2.** Intensive Care Med. 2022 Mar 4. doi: 10.1007/s00134-022-06618-z. Online ahead of print.

#### **Prediction of good neurological outcome in comatose survivors of cardiac arrest: a systematic review.**

Sandroni C(1)(2), D'Arrigo S(3), Cacciola S(1), Hoedemaekers CWE(4), Westhall E(5), Kamps MJA(6), Taccone FS(7), Poole D(8), Meijer FJA(9), Antonelli M(1)(2), Hirsch KG(10), Soar J(11), Nolan JP(#)(12), Cronberg T(#)(13).

#### **ABSTRACT**

**PURPOSE:** To assess the ability of clinical examination, blood biomarkers, electrophysiology or neuroimaging assessed within 7 days from return of spontaneous circulation (ROSC) to predict good neurological outcome, defined as no, mild, or moderate disability (CPC 1-2 or mRS 0-3) at discharge from intensive care unit or later, in comatose adult survivors from cardiac arrest (CA). **METHODS:** PubMed, EMBASE, Web of Science and the Cochrane Database of Systematic Reviews were searched. Sensitivity and specificity for good outcome were calculated for each predictor. The risk of bias was assessed using the QUIPS tool. **RESULTS:** A total of 37 studies were included. Due to heterogeneities in recording times, predictor thresholds, and definition of some predictors, meta-analysis was not performed. A withdrawal or localisation motor response to pain immediately or at 72-96 h after ROSC, normal blood values of neuron-specific enolase (NSE) at 24 h-72 h after ROSC, a short-latency somatosensory evoked potentials (SSEPs) N20 wave amplitude  $> 4 \mu\text{V}$  or a continuous background without discharges on electroencephalogram (EEG) within 72 h from ROSC, and absent

diffusion restriction in the cortex or deep grey matter on MRI on days 2-7 after ROSC predicted good neurological outcome with more than 80% specificity and a sensitivity above 40% in most studies. Most studies had moderate or high risk of bias. CONCLUSIONS: In comatose cardiac arrest survivors, clinical, biomarker, electrophysiology, and imaging studies identified patients destined to a good neurological outcome with high specificity within the first week after cardiac arrest (CA).

**3.** BMC Emerg Med. 2022 Feb 28;22(1):30. doi: 10.1186/s12873-022-00586-9.

**Prediction of return of spontaneous circulation during cardiopulmonary resuscitation by pulse-wave cerebral tissue oxygen saturation: a retrospective observational study.**

Sakaguchi K(1), Takada M(2), Takahashi K(2), Onodera Y(3), Kobayashi T(2), Kawamae K(3), Nakane M(2).

**ABSTRACT**

**BACKGROUND:** It is difficult to predict the return of spontaneous circulation (ROSC) during cardiopulmonary resuscitation (CPR). Cerebral tissue oxygen saturation during CPR, as measured by near-infrared spectroscopy (NIRS), is anticipated to predict ROSC. General markers of cerebral tissue oxygen saturation, such as the tissue oxygenation index (TOI), mainly reflect venous oxygenation, whereas pulse-wave cerebral tissue oxygen saturation ( $\text{SnO}_2$ ), which represents hemoglobin oxygenation in the pulse wave within the cerebral tissue, is an index of arterial and venous oxygenation. Thus,  $\text{SnO}_2$  may reflect arterial oxygenation to a greater degree than does TOI. Therefore, we conducted this study to verify our hypothesis that  $\text{SnO}_2$  measured during CPR can predict ROSC. **METHODS:** Cardiac arrest patients who presented at the Emergency Department of Yamagata University Hospital in Japan were included in this retrospective, observational study.  $\text{SnO}_2$  and TOI were simultaneously measured at the patient's forehead using an NIRS tissue oxygenation monitor (NIRO 200-NX; Hamamatsu Photonics, Japan). We recorded the initial, mean, and maximum values during CPR. We plotted receiver operating characteristic curves and calculated the area under the curve (AUC) to predict ROSC. **RESULTS:** Forty-two patients were included.  $\text{SnO}_2$  was significantly greater in the ROSC group than in the non-ROSC group in terms of the initial (37.5% vs 24.2%,  $p = 0.015$ ), mean (44.6% vs 10.8%,  $p < 0.001$ ), and maximum (79.7% vs 58.4%,  $p < 0.001$ ) values. Although the initial TOI was not significantly different between the two groups, the mean (45.1% vs 36.8%,  $p = 0.018$ ) and maximum (71.0% vs 46.3%,  $p = 0.001$ ) TOIs were greater in the ROSC group than in the non-ROSC group. The AUC was 0.822 for the mean  $\text{SnO}_2$  (95% confidence interval [CI]: 0.672-0.973; cut-off: 41.8%), 0.821 for the maximum  $\text{SnO}_2$  (95% CI: 0.682-0.960; cut-off: 70.8%), and 0.809 for the maximum TOI (95% CI: 0.667-0.951; cut-off: 49.3%). **CONCLUSION:**  $\text{SnO}_2$  values measured during CPR, including immediately after arrival at the emergency department, were higher in the ROSC group than in the non-ROSC group.

**4.** JAMA Neurol. 2022 Feb 28:e215598. doi: 10.1001/jamaneurol.2021.5598. Online ahead of print.

**Neurologic Prognostication After Cardiac Arrest Using Brain Biomarkers: A Systematic Review and Meta-analysis.**

Holand RL(1)(2)(3)(4), Rikhraj KJK(5), Thiara S(6), Fordyce C(7), Kramer AH(8), Skrifvars MB(9), Wellington CL(4)(10)(11), Griesdale DE(1)(6)(12), Fergusson NA(13), Sekhon MS(4)(6)(11).

**ABSTRACT**

**IMPORTANCE:** Brain injury biomarkers released into circulation from the injured neurovascular unit are important prognostic tools in patients with cardiac arrest who develop hypoxic ischemic brain injury (HIBI) after return of spontaneous circulation (ROSC). **OBJECTIVE:** To assess the neuro-prognostic utility of bloodborne brain injury biomarkers in patients with cardiac arrest with HIBI.

**DATA SOURCES:** Studies in electronic databases from inception to September 15, 2021. These databases included MEDLINE, Embase, Evidence-Based Medicine Reviews, CINAHL, Cochrane

Database of Systematic Reviews, and the World Health Organization Global Health Library. STUDY SELECTION: Articles included in this systematic review and meta-analysis were independently assessed by 2 reviewers. We included studies that investigated neuron-specific enolase, S100 calcium-binding protein  $\beta$ , glial fibrillary acidic protein, neurofilament light, tau, or ubiquitin carboxyl hydrolase L1 in patients with cardiac arrest aged 18 years and older for neurologic prognostication. We excluded studies that did not (1) dichotomize neurologic outcome as favorable vs unfavorable, (2) specify the timing of blood sampling or outcome determination, or (3) report diagnostic test accuracy or biomarker concentration. DATA EXTRACTION AND SYNTHESIS: Data on the study design, inclusion and exclusion criteria, brain biomarkers levels, diagnostic test accuracy, and neurologic outcome were recorded. This study was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline. MAIN OUTCOMES AND MEASURES: Summary receiver operating characteristic curve analysis was used to calculate the area under the curve, sensitivity, specificity, and optimal thresholds for each biomarker. Risk of bias and concerns of applicability were assessed with the Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) tool. RESULTS: We identified 2953 studies, of which 86 studies with 10 567 patients (7777 men [73.6] and 2790 women [26.4]; pooled mean [SD] age, 62.8 [10.2] years) were included. Biomarker analysis at 48 hours after ROSC demonstrated that neurofilament light had the highest predictive value for unfavorable neurologic outcome, with an area under the curve of 0.92 (95% CI, 0.84-0.97). Subgroup analyses of patients treated with targeted temperature management and those who specifically had an out-of-hospital cardiac arrest showed similar results (targeted temperature management, 0.92 [95% CI, 0.86-0.95] and out-of-hospital cardiac arrest, 0.93 [95% CI, 0.86-0.97]). CONCLUSIONS AND RELEVANCE: Neurofilament light, which reflects white matter damage and axonal injury, yielded the highest accuracy in predicting neurologic outcome in patients with HIBI at 48 hours after ROSC.

### **ULTRASOUND AND CPR**

No articles identified.

### **ORGANISATION AND TRAINING**

**1. Data Brief. 2022 Feb 18;41:107973. doi: 10.1016/j.dib.2022.107973. eCollection 2022 Apr.**

#### **A sliding-window based algorithm to determine the presence of chest compressions from acceleration data.**

Kern WJ(1)(2), Orlob S(2)(3)(4), Alpers B(3), Schörghuber M(4), Bohn A(5)(6), Holler M(1)(2), Gräsner JT(3)(7), Wnent J(3)(7)(8).

#### **ABSTRACT**

This publication presents in detail five exemplary cases and the algorithm used in the article (Orlob et al. 2022). Defibrillator records for the five exemplary cases were obtained from the German Resuscitation Registry. They consist of accelerometry, electrocardiogram and capnography time series as well as defibrillation times, energies and impedance when recorded. For these cases, experienced physicians annotated time points of cardiac arrest and return of spontaneous circulation or termination of resuscitation attempts, as well as the beginning and ending of every single chest compression period in consensus, as described in Orlob et al. (2022). Furthermore, an algorithm was developed which reliably detects chest compression periods automatically without the time-consuming process of manual annotation. This algorithm allows for an usage in automatic

resuscitation quality assessment, machine learning approaches, and handling of big amounts of data (Orlob et al. 2022).

**2.** Sci Rep. 2022 Mar 3;12(1):3509. doi: 10.1038/s41598-022-07442-7.

**A spatiotemporal data mining study to identify high-risk neighborhoods for out-of-hospital cardiac arrest (OHCA) incidents.**

Wong PP(1)(2)(3), Low CT(4), Cai W(5), Leung KT(6), Lai PC(4).

**ABSTRACT**

Out-of-hospital cardiac arrest (OHCA) is a worldwide health problem. The aim of the study is to utilize the territorial-wide OHCA data of Hong Kong in 2012-2015 to examine its spatiotemporal pattern and high-risk neighborhoods. Three techniques for spatiotemporal data mining (SaTScan's spatial scan statistic, Local Moran's I, and Getis Ord Gi\*) were used to extract high-risk neighborhoods of OHCA occurrence and identify local clusters/hotspots. By capitalizing on the strengths of these methods, the results were then triangulated to reveal "truly" high-risk OHCA clusters. The final clusters for all ages and the elderly 65+ groups exhibited relatively similar patterns. All ages groups were mainly distributed in the urbanized neighborhoods throughout Kowloon. More diverse distribution primarily in less accessible areas was observed among the elderly group. All outcomes were further converted into an index for easy interpretation by the general public. Noticing the spatial mismatches between hospitals and ambulance depots (representing supplies) and high-risk neighborhoods (representing demands), this setback should be addressed along with public education and strategic ambulance deployment plan to shorten response time and improve OHCA survival rate. This study offers policymakers and EMS providers essential spatial evidence to assist with emergency healthcare planning and informed decision-making.

**3.** BMC Med Educ. 2022 Mar 3;22(1):140. doi: 10.1186/s12909-022-03206-z.

**Basic life support, a necessary inclusion in the medical curriculum: a cross-sectional survey of knowledge and attitude in Uganda.**

Ssewante N(1), Wekha G(2), Iradukunda A(2), Musoke P(2), Kanyike AM(3), Nabukeera G(4), Wamala NK(5), Zziwa W(6), Kamuhangire L(7), Kajjimu J(8), Luggya TS(9), Tagg A(10)(11).

**ABSTRACT**

**BACKGROUND:** Uganda continues to depend on a health system without a well-defined emergency response system. This is in the face of the rising cases of out-of-hospital cardiac arrest contributed largely to the high incidence of road traffic accidents. Non-communicable diseases are also on the rise further increasing the incidence of cardiac arrest. Medical students are key players in the bid to strengthen the health system which warrants an assessment of their knowledge and attitude towards BLS inclusion in their study curriculum. **METHODS:** A descriptive cross-sectional study was conducted in 2021 among undergraduate medical students across eight public and private universities in Uganda. An online-based questionnaire was developed using Google forms and distributed via identified WhatsApp groups. Chi-square or Fisher's exact test and logistic regression were performed in STATA 15 to assess the association between knowledge of BLS and demographics.  $P < 0.05$  was considered statistically significant. **RESULTS:** Out of the total 354 entries obtained, 351 were analyzed after eligibility screening. Of these, ( $n = 250$ , 71.2%) were male less than 25 years ( $n = 273$ , 77.8%). Less than half ( $n = 150$ , 42.7%) participants had undergone formal BLS training. Less than a third of participants ( $n = 103$ , 29.3%) had good knowledge ( $\geq 50\%$ ) with an overall score of  $42.3 \pm 12.4\%$ . Age ( $p = 0.045$ ), level of academic progress ( $p = 0.001$ ), and prior BLS training ( $p = 0.033$ ) were associated with good knowledge. Participants with prior training were more likely to have more BLS knowledge (aOR: 1.7, 95% CI: 1.1-2.7,  $p = 0.009$ ). The majority ( $n = 348$ ,

99.1%) believed that BLS was necessary and would wish ( $n = 343$ , 97.7%) to have it included in their curriculum. CONCLUSIONS: Undergraduate medical students have poor BLS knowledge but understand its importance. Institutions need to adopt practical teaching methods such as clinical exposures, field experience in collaboration with local implementers, and participating in community health promotion campaigns.

**4. J Nurs Care Qual.** 2022 Feb 28. doi: 10.1097/NCQ.0000000000000620. Online ahead of print.

**Evaluation of an Intensive Care Outreach Nurse Program in 4 UAE Hospitals.**

Williams G(1), Du Plessis J, Rotering L, Samuel A, Abdel Khaleq MH, Sweeny A.

**ABSTRACT**

BACKGROUND: Intensive care outreach nurses (ICONs) can reduce deterioration and death of patients in hospitals. PURPOSE: Evaluate outcomes associated with implementation of the ICON role across 4 UAE hospitals. METHODS: Trend analyses and  $\chi^2$  tests were used to measure changes before ICON program, during ICON year 1, ICON year 2, when the service coverage extended 24/7, and until the end of 2019. RESULTS: From year 1 to year 2, failures to escalate decreased from a rate of 14.8 to 5.6 episodes per 1000 admissions for all sites combined ( $P < .001$ ). The cardiac arrest rate went from 4.04 to 1.42 per 1000 admissions in year 2 and continued downward to 0.72 per 1000 ( $P < .001$ ). Transfer from ward or readmission to intensive care unit/high dependency unit varied by site, although there was a statistically significant trend for all hospitals combined. CONCLUSION: The ICON role contributed to fewer failure to escalate incidents and lower cardiac arrest rates.

**5. JMIR Hum Factors.** 2022 Mar 1;9(1):e35399. doi: 10.2196/35399.

**Usability Testing and Technology Acceptance of an mHealth App at the Point of Care During Simulated Pediatric In- and Out-of-Hospital Cardiopulmonary Resuscitations: Study Nested Within 2 Multicenter Randomized Controlled Trials.**

Siebert JN(1)(2), Gogetto L(#)(3), Sauvage M(#)(3), Bloudeau L(4), Suppan L(2)(5), Rodieux F(2)(6), Haddad K(1), Hugon F(1), Gervaix A(1)(2), Lovis C(2)(7), Combescure C(2)(8), Manzano S(1)(2), Ehrler F(3); PedAMINES Trial Group(9); PedAMINES Prehospital Group(9).

**ABSTRACT**

BACKGROUND: Mobile apps are increasingly being used in various domains of medicine. Few are evidence-based, and their benefits can only be achieved if end users intend to adopt and use them. To date, only a small fraction of mobile apps have published data on their field usability and end user acceptance results, especially in emergency medicine. OBJECTIVE: This study aims to determine the usability and acceptance of an evidence-based mobile app while safely preparing emergency drugs at the point of care during pediatric in- and out-of-hospital cardiopulmonary resuscitations by frontline caregivers. METHODS: In 2 multicenter randomized controlled parent trials conducted at 6 pediatric emergency departments from March 1 to December 31, 2017, and 14 emergency medical services from September 3, 2019, to January 21, 2020, the usability and technology acceptance of the PedAMINES (Pediatric Accurate Medication in Emergency Situations) app were evaluated among skilled pediatric emergency nurses and advanced paramedics when preparing continuous infusions of vasoactive drugs and direct intravenous emergency drugs at pediatric dosages during standardized, simulation-based, pediatric in- and out-of-hospital cardiac arrest scenarios, respectively. Usability was measured using the 10-item System Usability Scale. A 26-item technology acceptance self-administered survey (5-point Likert-type scales), adapted from the Unified Theory of Acceptance and Use of Technology model, was used to measure app acceptance and intention to use. RESULTS: All 100% (128/128) of nurses (crossover trial) and 49.3% (74/150) of paramedics (parallel trial) were assigned to the mobile app. Mean total scores on the System Usability Scale were excellent and reached 89.5 (SD 8.8; 95% CI 88.0-91.1) for nurses and 89.7 (SD 8.7; 95% CI 87.7-

91.7) for paramedics. Acceptance of the technology was very good and rated on average >4.5/5 for 5 of the 8 independent constructs evaluated. Only the image construct scored between 3.2 and 3.5 by both participant populations. CONCLUSIONS: The results provide evidence that dedicated mobile apps can be easy to use and highly accepted at the point of care during in- and out-of-hospital cardiopulmonary resuscitations by frontline emergency caregivers. These findings can contribute to the implementation and valorization of studies aimed at evaluating the usability and acceptance of mobile apps in the field by caregivers, even in critical situations.

**6. J Womens Health (Larchmt). 2022 Feb 28. doi: 10.1089/jwh.2021.0399. Online ahead of print.**

**Does Physician Gender and Gender Composition of Clinical Teams Affect Guideline Concordance and Patient Outcomes in Out-of-Hospital Cardiac Arrest?**

Becker L(1), Siry-Bove BJ(2), Shelton SK(2), McDaniel K(3), Nelson JL(4), Perman SM(2).

**ABSTRACT**

**Objective:** Prior literature has shown improved outcomes in morbidity and mortality for admitted patients cared for by female physicians. One theory is that female physicians adhere closely to guideline recommendations. We sought to determine whether patients who have out-of-hospital cardiac arrest (OHCA) experience more guideline-concordant postcardiac arrest care and potentially better outcomes based on the gender of their treating physician and gender distribution of the treatment teams. **Study Design:** This study is a retrospective cohort study from the Colorado Cardiac Arrest Registry, local registry of OHCA patients treated at one academic urban tertiary care hospital. We analyzed adult OHCA patients who survived to hospital admission but were comatose. **Patient demographic data and arrest characteristics were abstracted for subjects, and the gender of the provider was abstracted from the medical record.** **Results:** Patients were admitted by a female attending in 28.5% of the cohort. The difference in guideline-concordant care between male and female providers was not significant. No statistical difference was found between all-male or mixed gender teams in adherence to guideline-concordant care. No patient was cared for by an all-female team. Neither gender of the admitting physician nor gender of the physician who led the family meeting to discuss prognosis was associated with a survival difference. **Conclusions:** Prior literature has described differences in outcome based on gender of the treating physician. Our analysis targeted a similar question in a cohort of OHCA patients with survival to hospital admission. We determined that there was no difference in postcardiac arrest guideline concordance and survival to hospital discharge based on treating physician gender. This finding differs from the prior literature and supports the importance of diverse clinical teams in medicine.

**7. Cureus. 2022 Jan 25;14(1):e21594. doi: 10.7759/cureus.21594. eCollection 2022 Jan.**

**The PHOENIX: Design and Development of a Three-Dimensional-Printed Drone Prototype and Corresponding Simulation Scenario Based on the Management of Cardiac Arrest.**

Gino B(1)(2)(3)(4), Williams KL(5), Neilson CS(2), d'Entremont P(6), Dubrowski A(7), Renouf TS(1).

**ABSTRACT**

Sudden cardiac arrest (SCA) remains one of the most prevalent cardiovascular emergencies in the world. The development of international protocols and the use of accessible devices such as automated external defibrillators (AEDs) allowed for the standardization and organization of medical care related to SCA. When defibrillation is performed within five minutes of starting ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT), the victim survival rate has increased considerably. Therefore, training healthcare professionals to use AEDs correctly is essential to improve patient outcomes and response time in the intervention. In this technical report, we advocate simulation-based education as a teaching methodology and an essential component of drone adaptation, novel technology, that can deliver AEDs to the site, as well as a training scenario

to teach healthcare professionals how to operate the real-time communication components of drones and AEDs efficiently. Studies have suggested that simulation can be an effective way to train healthcare professionals. Through teaching methodology using simulation, training these audiences has the potential to reduce the response time to intervention, consequently, increasing the patient's chance of surviving.

**8.** BMC Emerg Med. 2022 Feb 28;22(1):33. doi: 10.1186/s12873-022-00590-z.

**Monitoring cardiopulmonary resuscitation quality in emergency departments: a national survey in China on current knowledge, attitudes, and practices.**

Zheng K(1), Du L(1), Cao Y(2), Niu Z(2), Song Z(3), Liu Z(4), Liu X(4), Xiang X(5), Zhou Q(6), Xiong H(7), Chen F(8), Zhang G(9), Ma Q(10).

**ABSTRACT**

**BACKGROUND:** To investigate current knowledge, attitudes, and practices for CPR quality control among emergency physicians in Chinese tertiary hospitals. **METHODS:** Anonymous questionnaires were distributed to physicians in 75 tertiary hospitals in China between January and July 2018. **RESULTS:** A total of 1405 respondents answered the survey without obvious logical errors. Only 54.4% respondents knew all criteria of high-quality CPR. A total of 91.0% of respondents considered CPR quality monitoring should be used, 72.4% knew the objective method for monitoring, and 63.2% always/often monitored CPR quality during actual resuscitation. The main problems during CPR were related to chest compression: low quality due to fatigue (67.3%), inappropriate depth (57.3%) and rate (54.1%). The use of recommended monitoring methods was reported as follows, ETCO<sub>2</sub> was 42.7%, audio-visual feedback devices was 10.1%, coronary perfusion pressure was 17.9%, and invasive arterial pressure was 31.1%. A total of 96.3% of respondents considered it necessary to participate in regular CPR retraining, but 21.4% did not receive any retraining. The ideal retraining interval was considered to be 3 to 6 months, but the actual interval was 6 to 12 months. Only 49.7% of respondents reported that feedback devices were always/often used in CPR training.

**CONCLUSION:** Chinese emergency physicians were very concerned about CPR quality, but they did not fully understand the high-quality criteria and their impact on prognosis. CPR quality monitoring was not a routine procedure during actual resuscitation. The methods recommended in guidelines were rarely used in practice. Many physicians had not received retraining or received retraining at long intervals. Feedback devices were not commonly used in CPR training.

**9.** JMIR Serious Games. 2022 Mar 2;10(1):e30456. doi: 10.2196/30456.

**Virtual Reality Simulation Training for Cardiopulmonary Resuscitation After Cardiac Surgery: Face and Content Validity Study.**

Sadeghi AH(#)(1), Peek JJ(#)(1)(2), Max SA(1)(3), Smit LL(1), Martina BG(1), Rosalia RA(1)(4), Bakhuis W(1), Bogers AJ(1), Mahtab EA(1).

**ABSTRACT**

**BACKGROUND:** Cardiac arrest after cardiac surgery commonly has a reversible cause, where emergency resternotomy is often required for treatment, as recommended by international guidelines. We have developed a virtual reality (VR) simulation for training of cardiopulmonary resuscitation (CPR) and emergency resternotomy procedures after cardiac surgery, the Cardiopulmonary Resuscitation Virtual Reality Simulator (CPVR-sim). Two fictive clinical scenarios were used: one case of pulseless electrical activity (PEA) and a combined case of PEA and ventricular fibrillation. In this prospective study, we researched the face validity and content validity of the CPVR-sim. **OBJECTIVE:** We designed a prospective study to assess the feasibility and to establish the face and content validity of two clinical scenarios (shockable and nonshockable cardiac arrest) of the CPVR-sim partly divided into a group of novices and experts in performing CPR and emergency

resternotomies in patients after cardiac surgery. METHODS: Clinicians (staff cardiothoracic surgeons, physicians, surgical residents, nurse practitioners, and medical students) participated in this study and performed two different scenarios, either PEA or combined PEA and ventricular fibrillation. All participants (N=41) performed a simulation and completed the questionnaire rating the simulator's usefulness, satisfaction, ease of use, effectiveness, and immersiveness to assess face validity and content validity. RESULTS: Responses toward face validity and content validity were predominantly positive in both groups. Most participants in the PEA scenario (n=26, 87%) felt actively involved in the simulation, and 23 (77%) participants felt in charge of the situation. The participants thought it was easy to learn how to interact with the software (n=24, 80%) and thought that the software responded adequately (n=21, 70%). All 15 (100%) expert participants preferred VR training as an addition to conventional training. Moreover, 13 (87%) of the expert participants would recommend VR training to other colleagues, and 14 (93%) of the expert participants thought the CPVR-sim was a useful method to train for infrequent post-cardiac surgery emergencies requiring CPR. Additionally, 10 (91%) of the participants thought it was easy to move in the VR environment, and that the CPVR-sim responded adequately in this scenario. CONCLUSIONS: We developed a proof-of-concept VR simulation for CPR training with two scenarios of a patient after cardiac surgery, which participants found was immersive and useful. By proving the face validity and content validity of the CPVR-sim, we present the first step toward a cardiothoracic surgery VR training platform.

**10. Circulation.** 2022 Mar;145(9):e760. doi: 10.1161/CIR.0000000000001050. Epub 2022 Feb 28.  
**Correction to:** 2021 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations: Summary From the Basic Life Support; Advanced Life Support; Neonatal Life Support; Education, Implementation, and Teams; First Aid Task Forces; and the COVID-19 Working Group.

[No authors listed]

**NO ABSTRACT AVAILABLE**

#### **POST-CARDIAC ARREST TREATMENTS**

**1. Br J Hosp Med (Lond).** 2022 Feb 2;83(2):1-4. doi: 10.12968/hmed.2021.0646. Epub 2022 Feb 10.  
**Time matters: reviewing the care provided to patients admitted to hospital following an out-of-hospital cardiac arrest.**

Smith N(1), Koomson D(1), McPherson S(1), Juniper M(1).

#### **ABSTRACT**

The National Confidential Enquiry into Patient Outcome and Death reviewed the organisation of services and the quality of clinical care provided to patients who were admitted to hospital following an out-of-hospital cardiac arrest. The report looked at all four links in the 'chain of survival', covering the last link, in-hospital advanced life support and post-resuscitation care, in most detail.

**2. Resuscitation.** 2022 Feb 25:S0300-9572(22)00060-0. doi: 10.1016/j.resuscitation.2022.02.021.  
Online ahead of print.

**Hemoadsorption after cardiac arrest - not quite the "shelter from the cytokine storm" we were hoping for.**

Drabek T(1).

**NO ABSTRACT AVAILABLE**

**3. Yonago Acta Med.** 2022 Jan 4;65(1):8-13. doi: 10.33160/yam.2022.02.001. eCollection 2022 Feb.  
**Estimation of Postcardiac Arrest Interval Based on Atrial Cavity Density in Postmortem Computed Tomography.**

Yoshimiya M(1)(2), Ueda T(1), Ogoshi T(1), Zangpo D(2), Nakatome M(2), Iino M(2).

## **ABSTRACT**

**BACKGROUND:** Intracardiac hypostasis is frequently observed in postmortem computed tomography (PMCT) of acute deaths, and it becomes clearer as the postmortem interval increases. To determine the postcardiac arrest interval (PCAI), we evaluated densities of the right and left atria [anterior part of the right atrium (AR) and posterior part of the left atrium (PL)] using postmortem computed tomographic images. **METHODS:** A total of 184 patients were included in the study. Patients with return of spontaneous circulation and those with final alive confirmation time over 1 hour were excluded. We evaluated the density of AR and PL at the level of the right inferior pulmonary vein entry to the left atrium. We defined the interval between the estimated cardiac arrest time and the postmortem CT time as the PCAI. **RESULTS:** There was a negative correlation between AR and PCAI in 59 patients who died owing to cardiovascular disease. The regression equation ( $PCAI = -1.725 \times AR + 132.95$ ) was obtained based on this result. There was no correlation between PL and PCAI.

**CONCLUSION:** The result suggests that the density of the anterior part of the right atrium decreases as postcardiac arrest interval increases in the case of cardiovascular disease. The regression equation may be used as an additional method to estimate postcardiac arrest interval.

**4.** Trials. 2022 Feb 24;23(1):177. doi: 10.1186/s13063-022-06101-6.

## **The "Blood pressure and oxygenation targets in post resuscitation care, a randomized clinical trial": design and statistical analysis plan.**

Kjaergaard J(1)(2), Schmidt H(3), Møller JE(4)(3), Hassager C(4)(5).

## **ABSTRACT**

**BACKGROUND:** Comatose patients admitted after resuscitation from cardiac arrest have a significant risk of poor outcome due to hypoxic brain injury. While numerous studies have investigated and challenged the target temperature as the efficacious part of the guideline endorsed Targeted Temperature Management (TTM) protocols, our knowledge and how the remaining parts of the TTM are optimized remain sparse. The present randomized trial investigated two aspects of the TTM protocol: target blood pressure during the ICU stay and oxygenation during mechanical ventilation. Furthermore, the efficacy of device-based post-TTM fever management is addressed. **METHODS:** Investigator-initiated, dual-center, randomized clinical trial in comatose OHCA patients admitted to an intensive cardiac care unit. Patients are eligible for inclusion if unconscious, older than 18 years of age, and have return of spontaneous circulation for more than 20 min. **INTERVENTION:** allocation 1:1:1:1 into a group defined by (a) blood pressure targets in double-blind intervention targeting a mean arterial blood pressure of 63 or 77 mmHg and (b) restrictive (9–10 kPa) or liberal (13–14 kPa) of arterial oxygen concentration during mechanical ventilation. As a subordinate intervention, device-based active fever management is discontinued after 36 h or 72. Patients will otherwise receive protocolized standard of care according to international guidelines, including targeted temperature management at 36 °C for 24 h, sedation with fentanyl and propofol, and multimodal neuro-prognostication. **Primary endpoint:** Discharge from hospital in poor neurological status (Cerebral Performance category 3 or 4) or death, whichever comes first. **SECONDARY OUTCOMES:** Time to initiation of renal replacement therapy or death, neuron-specific enolase (NSE) level at 48 h, MOCA score at day 90, Modified Ranking Scale (mRS) and CPC at 3 months, NT-pro-BNP at 90 days, eGFR and LVEF at 90 days, daily cumulated vasopressor requirement during ICU stay, and need for a combination of vasopressors and inotropic agents or mechanical circulatory support. **DISCUSSION:** We hypothesize that low or high target blood pressure and restrictive and liberal oxygen administration will have an impact on mortality by reducing the risk and degree of hypoxic brain injury. This will be assessed neurological outcome and biochemical and neuropsychological testing after 90 days.

**5.** Eur J Anaesthesiol. 2022 Apr 1;39(4):405–407. doi: 10.1097/EJA.0000000000001572.

**Blood urea nitrogen kinetics in the early postcardiac arrest phase are associated with clinical outcome: A retrospective cohort study.**

Schriefl C(1), Schwameis M, Ettl F, Poppe M, Clodi C, Mueller M, Grafeneder J, Eskandary F, Reindl-Schwaighofer R, Warenits AM, Kupis A, Holzer M, Sterz F, Schoergenhofer C.

**NO ABSTRACT AVAILABLE**

**TARGETED TEMPERATURE MANAGEMENT**

**1.** Eur J Anaesthesiol. 2022 Apr 1;39(4):401-402. doi: 10.1097/EJA.0000000000001663.

**The effectiveness of targeted temperature management following cardiac arrest may depend on bystander cardiopulmonary resuscitation rates.**

Böttiger BW(1), Hellmich M, Wetsch WA.

**NO ABSTRACT AVAILABLE**

**2.** Neurocrit Care. 2022 Mar 1. doi: 10.1007/s12028-022-01464-9. Online ahead of print.

**Precision Care in Cardiac Arrest: ICECAP (PRECICECAP) Study Protocol and Informatics Approach.**

Elmer J(1), He Z(2)(3), May T(4), Osborn E(2), Moberg R(5), Kemp S(2), Stover J(5), Moyer E(5), Geocadin RG(6), Hirsch KG(2); PRECICECAP Study Team.

**ABSTRACT**

**BACKGROUND:** Most trials in critical care have been neutral, in part because between-patient heterogeneity means not all patients respond identically to the same treatment. The Precision Care in Cardiac Arrest: Influence of Cooling duration on Efficacy in Cardiac Arrest Patients (PRECICECAP) study will apply machine learning to high-resolution, multimodality data collected from patients resuscitated from out-of-hospital cardiac arrest. We aim to discover novel biomarker signatures to predict the optimal duration of therapeutic hypothermia and 90-day functional outcomes. In parallel, we are developing a freely available software platform for standardized curation of intensive care unit-acquired data for machine learning applications. **METHODS:** The Influence of Cooling duration on Efficacy in Cardiac Arrest Patients (ICECAP) study is a response-adaptive, dose-finding trial testing different durations of therapeutic hypothermia. Twelve ICECAP sites will collect data for PRECICECAP from multiple modalities routinely used after out-of-hospital cardiac arrest, including ICECAP case report forms, detailed medication data, cardiopulmonary and electroencephalographic waveforms, and digital imaging and communications in medicine files (DICOMs). We partnered with Moberg Analytics to develop a freely available software platform to allow high-resolution critical care data to be used efficiently and effectively. We will use an autoencoder neural network to create low-dimensional representations of all raw waveforms and derivative features, censored at rewarming to ensure clinical usability to guide optimal duration of hypothermia. We will also consider simple features that are historically considered to be important. Finally, we will create a supervised deep learning neural network algorithm to directly predict 90-day functional outcome from large sets of novel features. **RESULTS:** PRECICECAP is currently enrolling and will be completed in late 2025. **CONCLUSIONS:** Cardiac arrest is a heterogeneous disease that causes substantial morbidity and mortality. PRECICECAP will advance the overarching goal of titrating personalized neurocritical care on the basis of robust measures of individual need and treatment responsiveness. The software platform we develop will be broadly applicable to hospital-based research after acute illness or injury.

**ELECTROPHYSIOLOGY AND DEFIBRILLATION**

**1.** Front Cardiovasc Med. 2022 Feb 15;9:819609. doi: 10.3389/fcvn.2022.819609. eCollection 2022.

## **Cardiopulmonary Resuscitation and Defibrillator Use in Sports.**

Carrington M(1), Providência R(2)(3)(4), Chahal CAA(2)(5)(6)(7), D'Ascenzi F(8), Cipriani A(9), Ricci F(10)(11)(12), Khanji MY(2)(3)(13).

### **ABSTRACT**

Sudden cardiac arrest (SCA) in young athletes is rare, with an estimated incidence ranging from 0.1 to 2 per 100,000 per athlete year. The creation of SCA registries can help provide accurate data regarding incidence, treatment, and outcomes and help implement primary or secondary prevention strategies that could change the course of these events. Early cardiopulmonary resuscitation (CPR) and defibrillation are the most important determinants of survival and neurological prognosis in individuals who suffer from SCA. Compared with the general population, individuals with clinically silent cardiac disease who practice regular physical exercise are at increased risk of SCA events. While the implementation of national preparticipation screening has been largely debated, with no current consensus, the number of athletes who will be diagnosed with cardiac disease and have an indication for implantable defibrillator cardioverter defibrillator (ICD) is unknown. Many victims of SCA do not have a previous cardiac diagnosis. Therefore, the appropriate use and availability of automated external defibrillators (AEDs) in public spaces is the crucial part of the integrated response to prevent these fatalities both for participating athletes and for spectators. Governments and sports institutions should invest and educate members of the public, security, and healthcare professionals in immediate initiation of CPR and early AED use. Smartphone apps could play an integral part to allow bystanders to alert the emergency services and CPR trained responders and locate and utilize the nearest AED to positively influence the outcomes by strengthening the chain of survival. This review aims to summarize the available evidence on sudden cardiac death prevention among young athletes and to provide some guidance on strategies that can be implemented by governments and on the novel tools that can help save these lives.

2. Neurocrit Care. 2022 Mar 2. doi: 10.1007/s12028-022-01449-8. Online ahead of print.

## **Outcome Prediction of Postanoxic Coma: A Comparison of Automated Electroencephalography Analysis Methods.**

Pham SDT(1)(2), Keijzer HM(1)(3), Ruijter BJ(2), Seeber AA(4), Scholten E(5), Drost G(6), van den Bergh WM(7), Kornips FHM(8), Foudraine NA(9), Beishuizen A(10), Blans MJ(11), Hofmeijer J(1)(2), van Putten MJAM(2)(12), Tjepkema-Cloostermans MC(13)(14).

### **ABSTRACT**

**BACKGROUND:** To compare three computer-assisted quantitative electroencephalography (EEG) prediction models for the outcome prediction of comatose patients after cardiac arrest regarding predictive performance and robustness to artifacts. **METHODS:** A total of 871 continuous EEGs recorded up to 3 days after cardiac arrest in intensive care units of five teaching hospitals in the Netherlands were retrospectively analyzed. Outcome at 6 months was dichotomized as "good" (Cerebral Performance Category 1-2) or "poor" (Cerebral Performance Category 3-5). Three prediction models were implemented: a logistic regression model using two quantitative features, a random forest model with nine features, and a deep learning model based on a convolutional neural network. Data from two centers were used for training and fivefold cross-validation ( $n = 663$ ), and data from three other centers were used for external validation ( $n = 208$ ). Model output was the probability of good outcome. Predictive performances were evaluated by using receiver operating characteristic analysis and the calculation of predictive values. Robustness to artifacts was evaluated by using an artifact rejection algorithm, manually added noise, and randomly flattened channels in the EEG. **RESULTS:** The deep learning network showed the best overall predictive performance. On the external test set, poor outcome could be predicted by the deep learning network at 24 h with a sensitivity of 54% (95% confidence interval [CI] 44-64%) at a false positive rate (FPR) of 0% (95% CI 0-

2%), significantly higher than the logistic regression (sensitivity 33%, FPR 0%) and random forest models (sensitivity 13%, FPR, 0%) ( $p < 0.05$ ). Good outcome at 12 h could be predicted by the deep learning network with a sensitivity of 78% (95% CI 52-100%) at a FPR of 12% (95% CI 0-24%) and by the logistic regression model with a sensitivity of 83% (95% CI 83-83%) at a FPR of 3% (95% CI 3-3%), both significantly higher than the random forest model (sensitivity 1%, FPR 0%) ( $p < 0.05$ ). The results of the deep learning network were the least affected by the presence of artifacts, added white noise, and flat EEG channels. CONCLUSIONS: A deep learning model outperformed logistic regression and random forest models for reliable, robust, EEG-based outcome prediction of comatose patients after cardiac arrest.

## **PEDIATRICS AND CHILDREN**

**1.** Zhonghua Er Ke Za Zhi. 2022 Mar 2;60(3):197-202. doi: 10.3760/cma.j.cn112140-20211116-00962.

**[Effect and influence factors of cardiopulmonary resuscitation in children with congenital heart disease in pediatric intensive care unit].** [Article in Chinese]

Liu G(1), Chu JP(2), Chen JL(3), Qian SY(1), Jin DQ(4), Lu XL(5), Xu MX(6), Cheng YB(7), Sun ZY(8), Miao HJ(9), Li J(10), Dong SY(11), Ding X(1), Wang Y(2), Chen Q(3), Duan YY(4), Huang JT(5), Guo YM(6), Shi XN(6), Su J(7), Yin Y(8), Xin XW(8), Zhao SD(9), Lou ZX(10), Jiang JH(11), Zeng JS(1).

### **ABSTRACT**

Objective: To investigate the prognostic factors of children with congenital heart disease (CHD) who had undergone cardiopulmonary resuscitation (CPR) in pediatric intensive care unit (PICU) in China.

Methods: From November 2017 to October 2018, this retrospective multi-center study was conducted in 11 hospitals in China. It contained data from 281 cases who had undergone CPR and all of the subjects were divided into CHD group and non-CHD group. The general condition, duration of CPR, epinephrine doses during resuscitation, recovery of spontaneous circulation (ROSC), discharge survival rate and pediatric cerebral performance category in viable children at discharge were compared. According to whether malignant arrhythmia is the direct cause of cardiopulmonary arrest or not, children in CHD and non-CHD groups were divided into 2 subgroups: arrhythmia and non-arrhythmia, and the ROSC and survival rate to discharge were compared. Data in both groups were analyzed by t-test, chi-square analysis or ANOVA, and logistic regression were used to analyze the prognostic factors for ROSC and survival to discharge after cardiac arrest (CA). Results: The incidence of CA in PICU was 3.2% (372/11 588), and the implementation rate of CPR was 75.5% (281/372). There were 144 males and 137 females with median age of 32.8 (5.6, 42.7) months in all 281 CPA cases who received CPR. CHD group had 56 cases while non-CHD had 225 cases, with the percentage of 19.9% (56/281) and 80.1% (225/281) respectively. The proportion of female in CHD group was 60.7% (34/56) which was higher than that in non-CHD group (45.8%, 103/225) ( $\chi^2=4.00$ ,  $P=0.045$ ). There were no differences in ROSC and rate of survival to discharge between the two groups ( $P>0.05$ ). The ROSC rate of children with arrhythmia in CHD group was 70.0% (28/40), higher than 6/16 for non-arrhythmic children ( $\chi^2=5.06$ ,  $P=0.024$ ). At discharge, the pediatric cerebral performance category scores (1-3 scores) of CHD and non-CHD child were 50.9% (26/51) and 44.9% (92/205) respectively. Logistic regression analysis indicated that the independent prognostic factors of ROSC and survival to discharge in children with CHD were CPR duration (odds ratio (OR)=0.95, 0.97; 95%CI: 0.92~0.97, 0.95~0.99; both  $P<0.05$ ) and epinephrine dosage (OR=0.87 and 0.79, 95%CI: 0.76-1.00 and 0.69-0.89, respectively; both  $P<0.05$ ). Conclusions: There is no difference between CHD and non-CHD children in ROSC and survival rate of survival to discharge was low. The epinephrine dosage and the duration of CPR are related to the ROSC and survival to discharge of children with CHD.

**2.** Resuscitation. 2022 Feb 25:S0300-9572(22)00056-9. doi: 10.1016/j.resuscitation.2022.02.017.  
Online ahead of print.

**Magnetic Resonance Imaging Adds Prognostic Value to EEG After Pediatric Cardiac Arrest.**

Smith AE(1), Ganninger AP(2), Mian AY(3), Friess SH(4), Guerrero RM(2), Guilliams KP(5).

**ABSTRACT**

AIM: To investigate how combined electrographic and radiologic data inform outcomes in children after cardiac arrest. METHODS: Retrospective observational study of children admitted to the pediatric intensive care unit (PICU) of a tertiary children's hospital with diagnosis of cardiac arrest from 2009 to 2016. The first 20 minutes of electroencephalogram (EEG) background was blindly scored. Presence and location of magnetic resonance imaging (MRI) diffusion-weighted image (DWI) abnormalities were correlated with T2-weighted signal. Outcomes were categorized using Pediatric Cerebral Performance Category (PCPC) scores at hospital discharge, with "poor outcome" reflecting a PCPC score of 4-6. Logistic regression models examined the association of EEG and MRI variables with outcome. RESULTS: 41 children met inclusion criteria and had both post-arrest EEG monitoring within 72 hours after ROSC and brain MRI performed within 8 days. Among the 19 children with poor outcome, 10 children did not survive to discharge. Severely abnormal EEG background ( $p<0.0001$ ) and any diffusion restriction ( $p<0.0001$ ) were associated with poor outcome. The area under the ROC curve (AUC) for identifying outcome based on EEG background alone was 0.86, which improved to 0.94 with combined EEG and MRI data ( $p=0.02$ ). CONCLUSION: Diffusion abnormalities on MRI within 8 days after ROSC add to the prognostic value of EEG background in children surviving cardiac arrest.

**3.** Resuscitation. 2022 Feb 25:S0300-9572(22)00057-0. doi: 10.1016/j.resuscitation.2022.02.018.  
Online ahead of print.

**Outcomes of Pediatric Patients with COVID-19 and In-Hospital Cardiopulmonary Resuscitation.**

El-Zein RS(1), Chan ML(2), Su L(3), Chan PS(4); American Heart Association's Get With the Guidelines®-Resuscitation Investigators.

**ABSTRACT**

BACKGROUND: Early studies found low survival rates for adults with COVID-19 infection and in-hospital cardiac arrest (IHCA). We evaluated the association of COVID-19 infection on survival outcomes in pediatric patients undergoing cardiopulmonary resuscitation (CPR). METHODS: Within Get-With-The-Guidelines®-Resuscitation, we identified pediatric patients who underwent CPR for an IHCA or bradycardia with poor perfusion between March and December, 2020. We compared survival outcomes (survival to discharge and return of spontaneous circulation for  $\geq 20$  minutes [ROSC]) between patients with suspected/confirmed COVID-19 infection and non-COVID-19 patients using multivariable hierarchical regression, with hospital site as a random effect and patient and cardiac arrest variables with a significant ( $p<0.05$ ) bivariate association as fixed effects. RESULTS: Overall, 1328 pediatric in-hospital CPR events were identified (590 IHCA, 738 bradycardia with poor perfusion), of which 46 (32 IHCA, 14 bradycardia) had suspected/confirmed COVID-19 infection. Rates of survival to discharge were similar between those with and without COVID-19 infection (39.1% vs. 44.9%; adjusted RR, 1.14 [95% CI: 0.55-2.36]), and these estimates were similar for those with IHCA and bradycardia with poor perfusion (adjusted RRs of 1.03 and 1.05; interaction  $p=0.96$ ). Rates of ROSC were also similar between pediatric patients with and without COVID-19 overall (67.4% vs. 76.9%; adjusted RR, 0.87 [0.43, 1.77]), and for the subgroups with IHCA or bradycardia requiring CPR (adjusted RRs of 0.95 and 0.86, interaction  $p=0.26$ ). CONCLUSIONS: In a large multicenter national registry of CPR events, COVID-19 infection was not associated with lower rates of ROSC or survival to hospital discharge in pediatric patients undergoing CPR.

**4.** Front Pediatr. 2022 Feb 9;10:780251. doi: 10.3389/fped.2022.780251. eCollection 2022.

**Cognitive and Psychological Outcomes Following Pediatric Cardiac Arrest.**

Huebschmann NA(1)(2)(3), Cook NE(1)(2), Murphy S(4)(5), Iverson GL(1)(2)(6).

**ABSTRACT**

Cardiac arrest is a rare event in children and adolescents. Those who survive may experience a range of outcomes, from good functional recovery to severe and permanent disability. Many children experience long-term cognitive impairment, including deficits in attention, language, memory, and executive functioning. Deficits in adaptive behavior, such as motor functioning, communication, and daily living skills, have also been reported. These children have a wide range of neurological outcomes, with some experiencing specific deficits such as aphasia, apraxia, and sensorimotor deficits. Some children may experience emotional and psychological difficulties, although many do not, and more research is needed in this area. The burden of pediatric cardiac arrest on the child's family and caregivers can be substantial. This narrative review summarizes current research regarding the cognitive and psychological outcomes following pediatric cardiac arrest, identifies areas for future research, and discusses the needs of these children for rehabilitation services and academic accommodations.

**EXTRACORPOREAL LIFE SUPPORT**

**1.** J Chest Surg. 2022 Mar 2. doi: 10.5090/jcs.21.127. Online ahead of print.

**Prediction of 6-Month Mortality Using Pre-Extracorporeal Membrane Oxygenation Lactate in Patients with Acute Coronary Syndrome Undergoing Veno-Arterial-Extracorporeal Membrane Oxygenation.**

Kim E(1), Sodirzhon-Ugli NY(1), Kim DW(1), Lee KS(1), Lim Y(2), Kim MC(2), Cho YS(3), Jung YH(3), Jeung KW(3), Cho HJ(4), Jeong IS(1).

**ABSTRACT**

**BACKGROUND:** The effectiveness of extracorporeal membrane oxygenation (ECMO) for patients with refractory cardiogenic shock or cardiac arrest is being established, and serum lactate is well known as a biomarker of end-organ perfusion. We evaluated the efficacy of pre-ECMO lactate for predicting 6-month survival in patients with acute coronary syndrome (ACS) undergoing ECMO.  
**METHODS:** We reviewed the medical records of 148 patients who underwent veno-arterial (VA) ECMO for ACS between January 2015 and June 2020. These patients were divided into survivors and non-survivors based on 6-month survival. All clinical data before and during ECMO were compared between the 2 groups. **RESULTS:** Patients' mean age was  $66.0 \pm 10.5$  years, and 116 (78.4%) were men. The total survival rate was 45.9% (n=68). Cox regression analysis showed that the pre-ECMO lactate level was an independent predictor of 6-month mortality (hazard ratio, 1.210; 95% confidence interval [CI], 1.064-1.376; p=0.004). The area under the receiver operating characteristic curve of pre-ECMO lactate was 0.64 (95% CI, 0.56-0.72; p=0.002; cut-off value=9.8 mmol/L). Kaplan-Meier survival analysis showed that the cumulative survival rate at 6 months was significantly higher among patients with a pre-ECMO lactate level of 9.8 mmol/L or less than among those with a level exceeding 9.8 mmol/L (57.3% vs. 31.8%, p=0.0008). **CONCLUSION:** A pre-ECMO lactate of 9.8 mmol/L or less may predict a favorable outcome at 6 months in ACS patients undergoing VA-ECMO. Further research aiming to improve the accuracy of predictions of reversibility in patients with high pre-ECMO lactate levels is essential.

**2.** BMC Emerg Med. 2022 Feb 28;22(1):31. doi: 10.1186/s12873-022-00587-8.

**Out of hospital cardiac arrest in Western Sydney—an analysis of outcomes and estimation of future eCPR eligibility.**

Chandru P(1), Mitra TP(2), Dhanekula ND(3)(2), Dennis M(2)(4), Eslick A(2)(5), Kruit N(2)(5), Coggins A(3)(6).

**ABSTRACT**

**BACKGROUND:** Refractory out of hospital cardiac arrest (OHCA) is associated with extremely poor outcomes. However, in selected patients extracorporeal cardiopulmonary resuscitation (eCPR) may be an effective rescue therapy, allowing time treat reversible causes. The primary goal was to estimate the potential future caseload of eCPR at historically 'low-volume' extracorporeal membrane oxygenation (ECMO) centres. **METHODS:** A 3-year observational study of OHCA presenting to the Emergency Department (ED of an urban referral centre without historical protocolised use of eCPR. Demographics and standard Utstein outcomes are reported. Further, an a priori analysis of each case for potential eCPR eligibility was conducted. A current eCPR selection criteria (from the 2-CHEER study) was used to determine eligibly. **RESULTS:** In the study window 248 eligible cardiac arrest cases were included in the OHCA registry. 30-day survival was 23.4% (n = 58). The mean age of survivors was 55.4 years. 17 (6.8%) cases were deemed true refractory arrests and fulfilled the 2-CHEER eligibility criteria. The majority of these cases presented within "office hours" and no case obtained a return of spontaneous circulation standard advanced life support. **CONCLUSIONS:** In this contemporary OHCA registry a significant number of refractory cases were deemed potential eCPR candidates reflecting a need for future interdisciplinary work to support delivery of this therapy.

3. Pediatr Crit Care Med. 2022 Feb 28. doi: 10.1097/PCC.0000000000002915. Online ahead of print.

**Outcome of Extracorporeal Membrane Oxygenation for Pediatric Patients With Neoplasm: An Extracorporeal Life Support Organization Database Study (2000-2019).**

Suzuki Y(1), Cass SH, Kugelmann A, Mobli K, Taylor WP, Radhakrishnan RS.

**ABSTRACT**

**OBJECTIVES:** This study update in usage and outcomes of pediatric extracorporeal membrane oxygenation (ECMO) for patients with neoplasm analyzed according to demographics, clinical variables, and complications. **DESIGN:** Retrospective database review of the Extracorporeal Life Support Organization registry from the last 2 decades (2000-2019). The data were divided between two decades in order to compare patients' backgrounds and outcomes over time. **SETTING:** ECMO centers reporting to Extracorporeal Life Support Organization. **PATIENTS:** Patients equal to or younger than 18 years old with International Classification of Diseases, 9th Revision and International Classification of Diseases, 10th Revision codes that referred to neoplasms who were managed with ECMO. **INTERVENTIONS:** None. **MEASUREMENTS AND MAIN RESULTS:** Demographics, cancer subtype, clinical variables, and ECMO complications were assessed in relation to the primary study outcome of survival to hospital discharge. Nine-hundred two patients met inclusion criteria; 699 patients were in the latest decade, which is more than three times the number from the previous decade (203 patients). On univariate analysis, compared with the previous decade, in the later decade, ECMO was more frequently applied in patients with pre-ECMO cardiac arrest (31.3% vs 17.1%; p < 0.001), and/or lower oxygenation index (38.0 vs 48.1; p < 0.001). We failed to identify a difference in survival between the 2 decades (42.8% vs 37.9%; p = 0.218). On multivariable analysis, diagnosis of hematologic malignancy, post-cardiopulmonary resuscitation support type, hematopoietic stem cell transplant, and age older than seven were each associated with greater odds of mortality. **CONCLUSIONS:** The use of ECMO in children with neoplasm has expanded over the latest decade with changes in patient selection. Mortality remains unchanged. Hence, although the clinician still should stay cautious in its application, ECMO can be considered as an option to rescue pediatric oncologic patients in the setting of worsening cardiopulmonary status in the PICU.

## **EXPERIMENTAL RESEARCH**

**1.** Ther Hypothermia Temp Manag. 2022 Feb 28. doi: 10.1089/ther.2021.0034. Online ahead of print.

### **Noninvasive Versus Invasive Brain Temperature Measurement During Targeted Temperature Management: A Preclinical Study in a Swine Cardiac Arrest Model.**

Kim T(1)(2), Jin H(3)(4), Kim KS(1)(2), Kwon WY(1)(2), Jung YS(5), Lee MS(1), Kim T(6), Kwak H(7), Park H(5), Kim H(1), Shin J(1), Suh GJ(1)(2), Park KS(3)(8).

#### **ABSTRACT**

We aimed to evaluate correlation and agreement between noninvasive brain temperature (TBN) and invasive brain temperature (TBI) measurement during targeted temperature management (TTM) in a swine cardiac arrest model. Defibrillation attempts were provided after 5 minutes of ventricular fibrillation and 12 minutes of cardiopulmonary resuscitation in five pigs. After return of spontaneous circulation, TTM was provided with induction and maintenance phases with a target temperature of 33°C for 6 hours and a rewarming phase with a rewarming rate of 1°C/h for 4 hours. TBN and TBI were measured using a double sensor method and an intracranial catheter, respectively. Pulmonary artery temperature (TP), esophageal temperature (TE), and rectal temperature (TR) were measured. Primary outcomes were correlation and agreement between TBN and TBI and secondary outcomes were correlation and agreement among TBN and other temperatures. The Pearson correlation coefficient (PCC) between TBN and TBI was 0.95 ( $p < 0.001$ ) during the whole TTM phases. PCCs between TBN and TBI during the induction, maintenance, and rewarming phases were 0.91 ( $p < 0.001$ ), 0.88 ( $p < 0.001$ ), and 0.94 ( $p < 0.001$ ) and 95% limits of agreement (LoAs) between TBN and TBI were (-0.27°C to 0.78°C), (-0.18°C to 0.54°C), and (-0.93°C to 0.88°C), respectively. Correlation between TBN and TBI during the maintenance phase was higher than correlation between TBN and TE (PCC = 0.74,  $p < 0.001$ ) or TP (PCC = 0.81,  $p < 0.001$ ). The 95% LoAs were narrowest between TBN and TP in the induction phase (-0.58 to 0.11), between TBN and TBI in the maintenance phase (-0.54 to 0.18), and between TBN and TR in the rewarming phase (-0.96 to 0.84). Noninvasive brain temperature showed good correlation with invasive brain temperature during TTM in a swine cardiac arrest model. Correlation was highest during the rewarming phase and lowest during the maintenance phase. Agreement between the two measurements was not clinically acceptable.

**2.** Animal Model Exp Med. 2022 Feb;5(1):56-60. doi: 10.1002/ame2.12200. Epub 2022 Jan 28.

### **A comprehensive neuromonitoring approach in a large animal model of cardiac arrest.**

Annoni F(1), Peluso L(1), Hirai LA(2), Babini G(3)(4), Khaldi A(1), Herpain A(1), Pitisci L(1), Ferlini L(1), Garcia B(1), Taccone FS(1), Creteur J(1), Su F(1).

#### **ABSTRACT**

**BACKGROUND:** Anoxic brain injuries represent the main determinant of poor outcome after cardiac arrest (CA). Large animal models have been described to investigate new treatments during CA and post-resuscitation phase, but a detailed model that includes extensive neuromonitoring is lacking. **METHOD:** Before an electrically-induced 10-minute CA and resuscitation, 46 adult pigs underwent neurosurgery for placement of a multifunctional probe (intracranial pressure or ICP, tissue oxygen tension or PbtO<sub>2</sub> and cerebral temperature) and a bolt-based technique for the placement and securing of a regional blood flow probe and two sEEG electrodes; two modified cerebral microdialysis (CMD) probes were also inserted in the frontal lobes and accidental misplacement was prevented using a perforated head support. **RESULT:** 42 animals underwent the CA procedure and 41 achieved the return of spontaneous circulation (ROSC). In 4 cases (8.6%) an adverse event took place during preparation, but only in two cases (4.3%) this was related to the neurosurgery. In 6 animals (13.3%) the minor complications that occurred resolved after probe repositioning. **CONCLUSION:**

Herein we provide a detailed comprehensive neuromonitoring approach in a large animal model of CA that might help future research.

**3. Oxid Med Cell Longev. 2022 Feb 18;2022:1630918. doi: 10.1155/2022/1630918. eCollection 2022.**

**Arterial Pulsatility Augments Microcirculatory Perfusion and Maintains the Endothelial Integrity during Extracorporeal Membrane Oxygenation via hsa\_circ\_0007367 Upregulation in a Canine Model with Cardiac Arrest.**

Li G(1)(2), Zhu S(3)(4), Zeng J(5), Yu Z(6), Meng F(7), Tang Z(3)(4), Zhu P(1).

**ABSTRACT**

**BACKGROUND:** The impairment of microcirculation is associated with the unfavorable outcome for extracorporeal membrane oxygenation (ECMO) patients. Studies revealed that pulsatile modification improves hemodynamics and attenuates inflammation during ECMO support. However, whether flow pattern impacts microcirculation and endothelial integrity is rarely documented. The objective of this work was to explore how pulsatility affects microcirculation during ECMO. **METHODS:** Canine animal models with cardiac arrest were supported by ECMO, with the i-Cor system used to generate nonpulsatile or pulsatile flow. The sublingual microcirculation parameters were examined using the CytoCam microscope system. The expression of hsa\_circ\_0007367, a circular RNA, was measured during ECMO support. In vitro validation was performed in pulmonary vascular endothelial cells (PMVECs) exposed to pulsatile or nonpulsatile flow, and the expressions of hsa\_circ\_0007367, endothelial tight junction markers, endothelial adhesive molecules, endothelial nitric oxide synthases (eNOS), and NF- $\kappa$ B signaling activity were analyzed. **RESULTS:** The pulsatile modification of ECMO enhanced microcirculatory perfusion, attenuated pulmonary inflammation, and stabilized endothelial integrity in animal models; meanwhile, the expression of hsa\_circ\_0007367 was significantly upregulated both in animals and PMVECs exposed to pulsatile flow. In particular, upregulation of hsa\_circ\_0007367 stabilized the expressions of endothelial tight junction markers zonula occludens- (ZO-) 1 and occludin, followed by modulating the endothelial nitric oxide synthases (eNOS) activity and inhibiting the NF- $\kappa$ B signaling pathway. **CONCLUSION:** The modification of pulsatility contributes to microcirculatory perfusion and endothelial integrity during ECMO. The expression of hsa\_circ\_0007367 plays a pivotal role in this protective mechanism.

**4. Crit Care Med. 2022 Feb 1;50(2):e189-e198. doi: 10.1097/CCM.0000000000005268.**

**Exogenous Nicotinamide Adenine Dinucleotide Attenuates Postresuscitation Myocardial and Neurologic Dysfunction in a Rat Model of Cardiac Arrest.**

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**ABSTRACT**

**OBJECTIVES:** To investigate the therapeutic potential and underlying mechanisms of exogenous nicotinamide adenine dinucleotide+ on postresuscitation myocardial and neurologic dysfunction in a rat model of cardiac arrest. **DESIGN:** Thirty-eight rats were randomized into three groups: 1) Sham, 2) Control, and 3) NAD. Except for the sham group, untreated ventricular fibrillation for 6 minutes followed by cardiopulmonary resuscitation was performed in the control and NAD groups. Nicotinamide adenine dinucleotide+ (20 mg/kg) was IV administered at the onset of return of spontaneous circulation. **SETTING:** University-affiliated research laboratory. **SUBJECTS:** Sprague-Dawley rats. **INTERVENTIONS:** Nicotinamide adenine dinucleotide+. **MEASUREMENTS AND MAIN RESULTS:** Hemodynamic and myocardial function were measured at baseline and within 4 hours following return of spontaneous circulation. Survival analysis and Neurologic Deficit Score were

performed up to 72 hours after return of spontaneous circulation. Adenosine triphosphate (adenosine triphosphate) level was measured in both brain and heart tissue. Mitochondrial respiratory chain function, acetylation level, and expression of Sirtuin3 and NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 9 (NDUFA9) in isolated mitochondrial protein from both brain and heart tissue were evaluated at 4 hours following return of spontaneous circulation. The results demonstrated that nicotinamide adenine dinucleotide+ treatment improved mean arterial pressure (at 1 hr following return of spontaneous circulation,  $94.69 \pm 4.25$  mm Hg vs  $89.57 \pm 7.71$  mm Hg;  $p < 0.05$ ), ejection fraction (at 1 hr following return of spontaneous circulation,  $62.67\% \pm 6.71\%$  vs  $52.96\% \pm 9.37\%$ ;  $p < 0.05$ ), Neurologic Deficit Score (at 24 hr following return of spontaneous circulation,  $449.50 \pm 82.58$  vs  $339.50 \pm 90.66$ ;  $p < 0.05$ ), and survival rate compared with that of the control group. The adenosine triphosphate level and complex I respiratory were significantly restored in the NAD group compared with those of the control group. In addition, nicotinamide adenine dinucleotide+ treatment activated the Sirtuin3 pathway, down-regulating acetylated-NDUFA9 in the isolated mitochondria protein. CONCLUSIONS: Exogenous nicotinamide adenine dinucleotide+ treatment attenuated postresuscitation myocardial and neurologic dysfunction. The responsible mechanisms may involve the preservation of mitochondrial complex I respiratory capacity and adenosine triphosphate production, which involves the Sirtuin3-NDUFA9 deacetylation.

5. Ultrasound Q. 2022 Feb 25. doi: 10.1097/RUQ.0000000000000596. Online ahead of print.

#### **Contrast-Enhanced Ultrasound of Brain Perfusion in Cardiopulmonary Resuscitation.**

Hwang M(1), Sridharan A, Freeman CW, Viaene AN, Kilbaugh TJ.

#### **ABSTRACT**

To evaluate the feasibility and potential utility of contrast-enhanced ultrasound for real-time imaging of whole-brain perfusion during cardiopulmonary resuscitation (CPR), cardiac arrest was induced in 8- to 7-week-old 10-kg piglets (*Sus scrofa domesticus*). Contrast-enhanced ultrasound was performed through a parietal cranial window in the coronal plane visualizing the thalamus during hemodynamic-directed CPR. Whole-brain mean and maximum pixel intensities in each slice during resuscitation were calculated. Piglets were monitored for 24 hours postarrest. Seven piglets achieved return of spontaneous circulation and 6 survived to 24 hours. Of the 6 surviving piglets, 2 piglets demonstrated greater intra-CPR brain enhancement at maximum 73.2% and 42.1% and mean 36.7% and 31.9% enhancement above background, respectively, compared with maximum 5.8%, 22.9%, 6.0%, and 26.6% and mean 5.1%, 8.9%, 2.9%, and 6.6% above background, respectively, in the other 4. Intra-CPR average mean arterial pressures were similar between all 6 surviving piglets. One piglet achieved return of spontaneous circulation but expired 10 minutes later with enhancement maximum 45.2% and mean 18.9% enhancement above background. The final piglet did not achieve return of spontaneous circulation and exhibited minimal enhancement at maximum 2.8% and mean 0.9% enhancement above background. Contrast-enhanced ultrasound can detect brain perfusion during CPR, identifying a spectrum of cerebral blood flow responses in the brain despite similar systemic hemodynamics. This novel application can form the basis for future large animal model studies and eventually human clinical studies to further explore the neurologic implications of cerebral blood flow responses during resuscitation and stimulate novel strategies for optimizing brain perfusion restoration.

#### **CASE REPORTS**

1. Cureus. 2022 Jan 28;14(1):e21697. doi: 10.7759/cureus.21697. eCollection 2022 Jan.

#### **Cardiac Arrest With Spontaneous Coronary Artery Dissection in a Young Female.**

Adhikari P(1), Elkhider O(1), Friedman H(2), Akbar MS(3), Trongtorsk A(1).

**ABSTRACT**

Spontaneous coronary artery dissection (SCAD) is a rare condition that has variable clinical presentations requiring a very high index of suspicion for diagnosis. We present here a case of a young female with SCAD who initially presented with chest pain and syncope, with progression to cardiac arrest.

**2. Case Rep Cardiol. 2022 Feb 17;2022:2462781. doi: 10.1155/2022/2462781. eCollection 2022.**

**Right Ventricular Myocardial Infarction Complicated by Cardiac Arrest: Utilization of Extracorporeal Membrane Oxygenation.**

Alabre-Bonsu A(1), Uppal S(1), Mazzaferri EL Jr(1), Boudoulas KD(1).

**ABSTRACT**

A 44-year-old male with an out-of-hospital cardiac arrest due to an acute left ventricular (LV) inferoposterior wall myocardial infarction (MI) involving the right ventricle (RV) is presented. This case highlights the challenges in the management of patients with cardiac arrest, indications for use of ventricular assist devices, potential effects of LV assist devices on the RV in the setting of RV MI, and culprit versus complete coronary artery revascularization in these patients.

**3. Surg Neurol Int. 2022 Feb 11;13:42. doi: 10.25259/SNI\_25\_2022. eCollection 2022.**

**Postoperative vasovagal cardiac arrest after spinal anesthesia for lumbar spine surgery.**

Keenan C(1), Wang AY(1), Balonov K(2), Kryzanski J(1).

**ABSTRACT**

**BACKGROUND:** Spinal anesthesia is being increasingly recognized as a favorable alternative to general anesthesia. However, there are still several considerations for its safe and effective use.

**CASE DESCRIPTION:** A 62-year-old male received spinal anesthesia during an uneventful L3-L5 decompressive laminectomy. However, he subsequently experienced a brief episode of pulseless electrical activity in the post-anesthesia care unit, and was successfully resuscitated without further sequelae. This was attributed to a vasovagal episode, with his notable prior history of experiencing vasovagal syncope with lightheadedness and fainting at the sight of blood. **CONCLUSION:** Patients with a history of vasovagal syncope may be predisposed to experiencing brief potentiated episodes of severe bradycardia and even cardiac arrest following spinal anesthesia.