

This week's PubMed 17<sup>th</sup> – 23<sup>rd</sup> October 2021: articles of interest n = 21

### **CPR AND COVID-19**

No articles identified.

### **CPR/MECHANICAL CHEST COMPRESSION**

No articles identified.

### **REGISTRIES, REVIEWS AND EDITORIALS**

1. Prehosp Emerg Care. 2021 Oct 20:1-11. doi: 10.1080/10903127.2021.1995799. Online ahead of print.

#### **The Association Between the Number of Prehospital Providers On-Scene and Out-of-Hospital Cardiac Arrest Outcomes.**

Lupton JR(1), Neth MR(1), Sahni R(1), Wittwer L(1), Le N(1), Jui J(1), Newgard CD(1), Daya MR(1).

#### **ABSTRACT**

Objective: The ideal number of emergency medical services (EMS) providers needed on-scene during an out-of-hospital cardiac arrest (OHCA) resuscitation is unknown. Our objective was to evaluate the association between the number of providers on-scene and OHCA outcomes. Methods: This was a secondary analysis of adults ( $\geq 18$  years old) with non-traumatic OHCA from a 10-site North American prospective cardiac arrest registry (Resuscitation Outcomes Consortium) including a 2005-2011 cohort and a 2011-2015 cohort. The primary outcome was survival to hospital discharge. We calculated the median number of EMS providers on-scene during the first 10 minutes of the resuscitation and used multivariable logistic regression adjusting for age, sex, witness status, bystander CPR, arrest location, initial rhythm, and dispatch to EMS arrival time. Results: There were 30,613 and 41,946 patients with necessary variables in the 2005-2011 and 2011-2015 cohorts, respectively. Survival to hospital discharge (95% CI) was higher with 9 or more providers on-scene (17.2% [15.8-18.5] and 14.0% [12.6-15.4]) compared to 7-8 (14.1% [13.4-14.8] and 10.5% [9.9-11.1]), 5-6 (10.0% [9.5-10.5] and 8.5% [8.1-8.9]), 3-4 (10.5% [9.3-11.6] and 9.3% [8.5-10.1]), and 1-2 (8.6% [7.2-10.0] and 8.0% [7.1-9.0]) providers for the 2005-2011 and 2011-2015 cohorts, respectively. In multivariable logistic regressions, compared to 5-6 providers, there were no significant differences in survival to hospital discharge for 1-2 or 3-4 providers, while having 7-8 (adjusted odds ratios (aORs) 1.53 [1.39-1.67] and 1.31 [1.20-1.44]) and 9 or more (aORs 1.76 [1.56-1.98] and 1.63 [1.41-1.89]) providers were associated with improved survival in both the 2005-2011 and 2011-2015 cohorts, respectively. Conclusions: The presence of seven or more prehospital providers on-scene was associated with significantly greater adjusted odds of survival to hospital discharge after OHCA compared to fewer on-scene providers.

2. Int J Cardiol. 2021 Nov 15;343:156-161. doi: 10.1016/j.ijcard.2021.09.007. Epub 2021 Sep 9.

#### **Sex differences in incidence of out-of-hospital cardiac arrest across ethnic and socioeconomic groups: A population-based cohort study in the Netherlands.**

Bolijn R(1), Sieben CHAM(2), Kunst AE(2), Blom M(3), Tan HL(4), van Valkengoed IGM(2).

#### **ABSTRACT**

**BACKGROUND:** Insight into the occurrence of out-of-hospital cardiac arrest (OHCA) within general populations may help to target prevention strategies. Case registries suggest that there may be substantial differences in emergency medical service (EMS)-attended OHCA incidence between men and women, but relative sex differences across ethnic groups and socioeconomic (SES) groups have not been studied. We investigated sex differences in OHCA incidence, overall and across these subgroups. **METHODS:** We performed a retrospective population-based cohort study, combining individual-level data on ethnicity and income (as SES measure) from Statistics Netherlands of all men and women aged  $\geq 25$  years living in one study region in the Netherlands on 01-01-2009 ( $n = 1,688,285$ ) with prospectively collected EMS-attended OHCA cases ( $n = 5676$ ) from the ARREST registry until 31-12-2015. We calculated age-standardised incidence rates of OHCA. Sex differences were assessed with Cox proportional hazards regression analyses, adjusted for age, ethnicity and income, in the overall population, and across ethnic and SES groups. **RESULTS:** The age-standardised incidence rate of OHCA was lower in women than in men (30.9 versus 87.3 per 100,000 person-years), corresponding with a hazard ratio (HR) of 0.33 (95% confidence interval [CI] 0.31-0.35). These sex differences in hazard for OHCA existed in all income quintiles (HR range: 0.30-0.35) and ethnic groups (HR range: 0.19-0.40), except among Moroccans (HR 0.89, 95% CI 0.51-1.57). **CONCLUSION:** Women have a substantial, yet lower OHCA incidence rate than men. The magnitude of these sex differences did not vary across social strata.

3. Resuscitation. 2021 Oct 16:S0300-9572(21)00398-1. doi: 10.1016/j.resuscitation.2021.09.039. Online ahead of print.

**EMS Agencies with High Rates of Field Termination of Resuscitation and Longer Scene Times Also Have High Rates of Survival.**

Berry C(1), Olaf MF(2), Kupas DF(3), Berger A(4), Knorr A(3); CARES Surveillance Group.

**ABSTRACT**

**AIM:** Out-of-hospital cardiac arrest (OOHCA) management dichotomizes strategies to (1) "scoop-and-run" to a higher level of care or (2) "treat on the X" with the goal of return of spontaneous circulation (ROSC) before transport, with field termination of resuscitation (FTOR) of unsuccessful resuscitations. We hypothesized that EMS agencies with greater average time on-scene and higher rates of field termination of resuscitation would have more favorable outcomes. **METHODS:** The Cardiac Arrest Registry to Enhance Survival (CARES) was used to identify OOHCA cases from 2013 to 2018. Agencies in the top and bottom quartiles of on-scene time were categorized as high (HiOST) and low (LoOST); in the top and bottom quartiles of field termination rate were categorized as high (HiTOR) and low (LoTOR). Generalized estimating equation models compared top and bottom quartiles. **RESULTS:** We classified 95 agencies as HiOST (average  $>25.1$  minutes) or LoOST (average  $<19.3$  minutes). We classified 95 agencies as HiTOR (average  $>46.5\%$  FTOR) or LoTOR (average  $<23.5\%$  FTOR). Controlling for agency characteristics, HiOST had a higher survival to discharge for transported patients (28.1% vs 23.1%, OR=2.8, 95%CI 2.1 to 3.5,  $p<.001$ ), ROSC on emergency department arrival, and favorable neurologic outcome than LoOST. HiTOR had a higher survival to discharge for transported patients (25.6% vs 19.3%, OR=3.3, 95%CI 2.5 to 4.4,  $p<.001$ ), ROSC on emergency department arrival, and favorable neurologic outcome than LoTOR. **CONCLUSION:** EMS agencies with higher rates of FTOR and longer on-scene times for patients with OOHCA have higher overall patient survival, ROSC, and favorable neurologic function.

4. Neurology. 2021 Oct 18:10.1212/WNL.000000000012967. doi: 10.1212/WNL.000000000012967. Online ahead of print.

**Serum Neuron-Specific-Enolase Thresholds for Predicting Postcardiac Arrest Outcome: A Systematic Review and Meta-analysis.**

Sharma K(1), John M(2), Zhang S(3), Gronseth G(4)

#### **ABSTRACT**

**OBJECTIVE:** To determine thresholds of serum neuron-specific-enolase (NSE) for prediction of poor outcome after cardiac arrest with > 95% specificity using a unique method of multiple thresholds meta-analysis. **METHODS:** Data from a systematic review by the European Resuscitation Council (ERC 2014) were updated with literature searches from PubMed, Cochrane, and Scopus until August 2020. Search terms included the MeSH terms "heart arrest" and "biological markers"; and the text words "cardiac arrest", "neuron specific enolase", "coma" and "prognosis". Cohort studies with comatose cardiac arrest survivors aged > 16 years, undergoing targeted temperature management (TTM) and NSE levels within 96 h of resuscitation, were included. Poor outcome was defined as cerebral performance category 3-5 at hospital discharge or later. Studies without extractable contingency tables were excluded. A multiple thresholds meta-analysis model was used to generate summary ROC curves for various time-points. NSE thresholds [and 95% prediction intervals] for > 95% specificity were calculated. Evidence appraisal was performed using a method adapted from the American Academy of Neurology grading criteria. **RESULTS:** Data from 11 studies (n = 1982) at 0-24 h, 21 studies (n =2815) at 24-48 h, and 13 studies (n =2557) at 48-72 h was analyzed. AUCs for prediction of poor outcomes were significantly larger at 24-48 h and 48-72 h compared to 0-24 h (0.82 and 0.83 vs 0.64). Quality of evidence was very low for most studies because of the risk of incorporation bias-knowledge of NSE levels potentially influenced life support withdrawal decisions. To minimize falsely pessimistic predictions, NSE thresholds at the upper 95% limit of prediction intervals are reported. For prediction of poor outcome with specificity > 95%, upper limits of the prediction interval for NSE were 70.4 ng/mL at 24-48 h, and 58.6 ng/mL at 48-72 h. Sensitivity analyses excluding studies with inconsistent TTM use or different outcome criteria did not substantially alter the results. **CONCLUSIONS:** NSE thresholds for highly specific prediction of poor outcome are much higher than generally used. Future studies must minimize bias by masking treatment teams to the results of potential predictors and by pre-specifying criteria for withdrawal of life support.

#### **IN-HOSPITAL CARDIAC ARREST**

1. J Adv Pract Oncol. 2021 Sep;12(7):705-714. doi: 10.6004/jadpro.2021.12.7.4. Epub 2021 Sep 1.

#### **Short- and Long-Term Outcomes of Hematologic Malignancy Patients After Cardiopulmonary Resuscitation: Experience of a Large Oncology Center.**

Warren ML(1), Schneider VV(1), Qing Y(1), Feng L(1), Campbell JY(1), Myers JW(1), Von-Maszewski M(1), Gutierrez C(1).

#### **ABSTRACT**

**PURPOSE:** The objective of this study is to describe characteristics and short- and long-term outcomes of patients with hematologic malignancies who received cardiopulmonary resuscitation (CPR). **METHODS:** A retrospective review was conducted of all Code Blues at a large comprehensive cancer center. Demographic, clinical, and outcome variables were analyzed for patients with a hematologic malignancy who underwent CPR. **RESULTS:** Of 258 patients, 60.1% had leukemia. Outcomes included return of spontaneous circulation (70.2%), hospital survival (12%), and 90-day, 6-month, and 1-year survival rates of 9.8%, 8.2%, and 5.9%, respectively. Factors associated with hospital mortality included establishing a do not resuscitate order after CPR (p < .0001), location of CPR (p = .0004), cause of arrest (p = .0019), requiring vasopressors (p = .0130), mechanical ventilation (p = .0423), and acute renal failure post CPR (p = .0006). Although no difference in hospital survival between leukemia and non-leukemia patients was found, more non-leukemia patients were alive at 90 days (p = .0099), 6 months (p = .0023), and 1 year (p = .0119).

CONCLUSIONS: Factors including organ dysfunction, location of CPR, and cause of arrest are associated with hospital mortality post CPR. However, immediate survival post CPR does not seem to be affected by a diagnosis of leukemia. These data should assist health care providers with discussions regarding advance care planning and goals of care after cardiac arrest.

### **INJURIES AND CPR**

No articles identified.

### **CAUSE OF THE ARREST**

1. Europace. 2021 Oct 18:euab251. doi: 10.1093/europace/euab251. Online ahead of print.

#### **Multiple categories of non-cardiac QT-prolonging drugs are associated with increased risk of out-of-hospital cardiac arrest: real-world data from a population-based study.**

Eroglu TE(1)(2)(3), Blom MT(1), Souverein PC(2), de Boer A(2), Tan HL(1)(4).

#### **ABSTRACT**

AIM: Drugs causing QT-prolongation as off-target effect [non-cardiac QT-prolonging drugs (QT-drugs)] increase the risk of out-of-hospital cardiac arrest (OHCA). Such drugs are categorized in multiple clinically widely used CredibleMeds.org lists. Category 1 ('known risk of Torsade de Pointes') and category 2 ('possible risk of Torsade de Pointes') are of particular clinical relevance. However, a category-stratified analysis of OHCA-risk is presently unavailable. METHODS AND RESULTS: We conducted a case-control study with OHCA-cases from presumed cardiac causes included from the ARREST registry in the Netherlands (2009-2018) that was specifically designed to study OHCA, and age/sex/OHCA-date matched non-OHCA-controls. Adjusted odds ratios for OHCA (OR<sub>adj</sub>) of QT-drugs from categories 1 or 2 were calculated, using conditional logistic regression. Stratified analysis was performed according to sex, age, and presence of cardiovascular drugs (proxy for cardiovascular disease). We included 5473 OHCA-cases (68.8 years, 69.9% men) and matched them to 20 866 non-OHCA-controls. Compared with no use of non-cardiac QT-drugs, drugs of both categories were associated with increased OHCA-risk, but seemingly weaker for category 2 {category 1: case 3.2%, control 1.4%, OR<sub>adj</sub> 1.7 [95% confidence interval (CI): 1.3-2.1]}; [category 2: case 7.3%, control 4.0%, OR<sub>adj</sub> 1.4 (95% CI: 1.2-1.6)]. The increased risk occurred in men and women, at all ages (highest in patients aged ≤50 years), and both in the presence or absence of cardiovascular drug use. CONCLUSION: Both category 1 and category 2 QT-drugs are associated with increased OHCA-risk in both sexes, at all ages, and in patients taking or not taking cardiovascular drugs.

2. Medicine (Baltimore). 2021 Sep 17;100(37):e27269. doi: 10.1097/MD.00000000000027269.

#### **Impact of air temperature on occurrence of bath-related cardiac arrest.**

Hiraki K(1), Irie J(2), Nomura O(2), Machino H(1), Yaguchi S(2), Ishizawa Y(2), Soma Y(3), Hanada H(2).

#### **ABSTRACT**

The mortality of the bath-related cardiac arrest (BRCA) is extremely high. While air temperature is reported to be associated with the BRCA occurrence, it is unclear whether daily minimum temperatures or the difference between maximum and minimum air temperatures influences BRCA occurrence the most. A retrospective cohort study of adult patients was conducted between January 2015 and February 2020 at Hirosaki University Hospital Emergency Department. The following data were collected: age, sex, day of cardiac arrest event, location of the event, initial cardiac rhythm, presence of return of spontaneous circulation, and overall mortality (status at 1 month after cardiac arrest event). Based on the day of the event and the location in which the event occurred, daily

minimum and maximum temperatures were obtained from the Japan Meteorological Agency database. A total of 215 eligible cardiac arrest cases were identified, including 25 cases of BRCA. Comparing BRCA and non-BRCA, initial shockable cardiac rhythm (4.0% vs 44.7%), presence of return of spontaneous circulation (8.0% vs 34.7%), and overall mortality (96.0% vs 71.6%) differed significantly ( $P < .05$  each). Daily minimum and maximum temperatures showed no significant relationships with BRCA or non-BRCA. Daily minimum temperature was a risk factor of BRCA occurrence after adjusting for age and temperature difference (risk ratio, 0.937; 95% confidence interval, 0.882-0.995). Daily minimum temperature represents a potential risk factor for BRCA occurrence.

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

1. J Clin Anesth. 2021 Oct 14;75:110553. doi: 10.1016/j.jclinane.2021.110553. Online ahead of print.

**End-tidal carbon dioxide and ventilation during CPR in relation to the 2020 American Heart Association guidelines for cardiopulmonary resuscitation.**

Curtis J(1), Gravenstein N(2), Giordano C(3).

**NO ABSTRACT AVAILABLE**

### **ORGAN DONATION**

1. Pediatr Transplant. 2021 Oct 18:e14169. doi: 10.1111/ptr.14169. Online ahead of print.

**A Neonatal ABO non-compatible heart transplant from a circulatory-determined death donor using NRP/Cold storage.**

Gil-Jaurena JM(1)(2), Pérez-Caballero R(1)(2), Murgoitio U(1)(2), Pardo C(1)(2), Pita A(1)(2), Calle C(1)(2), Camino M(2)(3), Medrano C(2)(3).

#### **ABSTRACT**

**BACKGROUND:** Donation after Circulatory death is gaining worldwide acceptance. Most protocols regard their first cases to be performed with donor and recipient in the same institution. Few records of children or distant procurement have been published. **METHODS:** Our institution was offered a heart from a 3-day-old, 3.4-kg child, blood group A, suffering irreversible encephalopathy. Parents accepted withdrawal of life-sustaining therapy and agreed to donation. The donor hospital was located 340 km away. Concomitantly, a 2-month-old, 3.1 kg, blood group type B and with non-compaction ventricles was awaiting for the heart transplant in our unit. **RESULTS:** Thirty-seven minutes after withdrawal of life-sustaining therapy, the heart arrested. Five minutes afterwards, a sternotomy was performed. The supra-aortic vessels were clamped altogether. Aorta and right appendage were cannulated and connected to heart-lung machine. The innominate artery above the clamp was severed. The heart resumed spontaneous rhythm in less than 1 min. Ventilation was restored and extracorporeal circulation was maintained for 32 min. Upon cardiologic arrest, the graft was harvested as routinely. The heart was cold-stored and transported by plane to our Hospital. An orthotopic bicaval transplant was performed. Overall cold ischaemia was 245 min. Ten weeks later, the child was discharged home in good condition. **CONCLUSION:** Donation in circulatory death could increase the pool in neonates. Extracorporeal circulation proves successful for procurement in neonates. Distant procurement plus cold storage for donation in circulatory death is feasible. Donation in circulatory death and ABO non-compatible strategies are complementary to each other.

## **FEEDBACK**

No articles identified.

## **DRUGS**

No articles identified.

## **TRAUMA**

No articles identified.

## **VENTILATION**

No articles identified.

## **CEREBRAL MONITORING**

1. Neurosciences (Riyadh). 2021 Oct;26(4):372-378. doi: 10.17712/nsj.2021.4.20210056.

### **Derivation and validation of the CANP scoring model for predicting the neurological outcome in post-cardiac arrest patients.**

Wang G(1), Zhang Z(1), Xu X(1), Sun Q(1), Yang H(1), Zhang J(1).

#### **ABSTRACT**

**OBJECTIVES:** To establish and validate a prognostic scoring model in a Chinese population to predict the neurological outcome among comatose survivors of cardiac arrest (CA). **METHODS:** 159 CA patients between January 2016 and November 2020 were recruited in this retrospective study. In the derivation cohort, prognostic factors available from arrest circumstances and early in-hospital indicators were measured. The Cardiac Arrest Neurological Prognosis (CANP) score was then constructed to predict unfavorable outcomes at 30 days after CA. The assessment of predictive effectiveness of this scoring model was conducted in both derivation and validation cohorts.

**RESULTS:** Witnessed status, bystander cardiopulmonary resuscitation, initial rhythm, duration of resuscitation, Glasgow Coma Scale motor score, pupillary/corneal reflex, gray-white matter ratio and neuron-specific enolase exhibit strong correlations with the neurological outcomes in the derivation cohort (all  $p < 0.05$ ), and a risk scoring model for the prediction of an unfavorable outcome was created using these factors. In the validation cohort, significantly higher CANP scores were noted in the unfavorable outcome group. A CANP score  $\geq 5$  was associated with unfavorable neurological outcomes (sensitivity 68.8%, specificity 100%). **CONCLUSION:** The CANP score was established and validated for predicting the possible neurological prognosis in comatose post-CA survivors.

2. Resusc Plus. 2021 Oct 5;8:100168. doi: 10.1016/j.resplu.2021.100168. eCollection 2021 Dec.

### **Seizure-like activity at the onset of emergency medical service-witnessed out-of-hospital cardiac arrest: An observational study.**

Murasaka K(1), Takada K(2), Yamashita A(2)(3), Ushimoto T(1), Wato Y(1), Inaba H(1)(4)(5).

#### **ABSTRACT**

**AIMS:** Emergency medical service (EMS) may detect seizure-like activity in addition to agonal breathing in out-of-hospital cardiac arrest (OHCA). This study investigates the incidence and predictors of seizure-like activity in nontraumatic, EMS-witnessed OHCA and their association with

clinical outcomes. **METHODS:** This prospective study explored EMS-recorded concomitant signs/symptoms that lead to the requirement of advanced life support in patients with nontraumatic, EMS-witnessed OHCA. Seizure-like activity includes abnormal/tonic movements and eyeball deviation. Sudden OHCA was defined by the absence of signs/symptoms of impending cardiac arrest at EMS contact or progressive circulatory/respiratory depressions after the EMS contact. Neurologically favorable outcomes were defined as the cerebral performance category score of 1 or 2 at discharge. **RESULTS:** From April 2012 to March 2020, 465 patients were studied. The incidence of seizure-like activity at cardiac arrest onset was 12.7% (59/465) in all patients with nontraumatic, EMS-witnessed OHCA. Seizure-like activity was common during shockable initial rhythm; in patients with "sudden" OHCA; and in patients who were younger, male, or had a presumed cardiac etiology. In a boosting tree, shockable initial rhythm, "sudden" OHCA, and presumed cardiac etiology were major factors that predicted the incidence of seizure-like activity. Multivariate logistic regression models including and excluding OHCA characteristics revealed that both seizure-like activity and agonal breathing recorded during EMS-witnessed OHCA were associated with favorable outcomes. **CONCLUSIONS:** Seizure-like activity is a major sign/symptom of the onset of "sudden" cardiac arrest of presumed cardiac etiology, particularly in patients with shockable initial rhythms. Such activity were significantly associated with neurologically favorable outcomes.

### **ULTRASOUND AND CPR**

No articles identified.

### **ORGANISATION AND TRAINING**

1. Front Pediatr. 2021 Sep 30;9:711124. doi: 10.3389/fped.2021.711124. eCollection 2021.

#### **Availability and Utilization of Automated External Defibrillators in New York State Schools.**

Arabadjian M(1)(2), Serrato S(2), Sherrid MV(2)

#### **ABSTRACT**

**Background:** Use of automated external defibrillators (AEDs) in out-of-hospital cardiac arrests (OHCAs) improve survival. Professional health organizations recommend that AEDs be available in crowded places, including schools but currently only 18 US states require them. Sudden cardiac arrest (SCA) research in the school-age population has largely focused on school sub-groups, leaving out the majority of US students and adults working in schools. New York State (NYS) has one of the largest student populations in the US. Our objective was to gain epidemiologic data on SCA across a variety of school levels and examine the availability and utilization of AEDs in a state that requires them. **Methods:** This was an observational, cross-sectional study utilizing an electronic survey. We included NYS school nurses and collected electronic surveys in January-March, 2018. We analyzed demographic data of school characteristics, SCA occurrences and AED use and availability. **Results:** Of 876 respondents (36.1% response rate), 71 (8.2%) reported SCAs, with 41 occurring in adults. AEDs were deployed in 59 of 71 (84.3%) events, 40 individuals had long-term survival. Most SCAs occurred in middle-schools. School size or number of AEDs/school had no bearing on short-term or long-term survival. AEDs were widely available in private schools, though this was not required by state law. **Conclusions:** Our data suggest a need for more comprehensive examination of SCA in US schools. Research comparing the availability and utilization of school AEDs between states that do and do not require them is needed and may have important clinical and policy implications for SCA emergency preparedness in US schools.

2. Int J Clin Pract. 2021 Oct 20:e14978. doi: 10.1111/ijcp.14978. Online ahead of print.

**The skills of defibrillation practice and certified life-support training in the healthcare providers in Turkey.**

Derinoz-Guleryuz O(1), Uysal-Yazici M(2), Üdürgücü M(3), Karacan C(4), Akça H(5), Ongun EA(6), Ekinci F(7), Duman M(8), Akça-Çaglar A(4), Vatanserver G(9), Bilen S(10), Uysalol M(11), Akcan-Yıldız L(12), Saz EU(13), Bal A(14), Piskin E(15), Sahin S(16), Kurt F(5), Anil M(17), Besli E(18), Alakaya M(19), Gültekingil A(20), Yılmaz R(21), Temel-Koksoy O(22), Kesici S(23), Akcay N(24), Cebisli E(25), Emeksiz S(26), Kılinc MA(27), Köker A(28), Çoban Y(28), Erkek N(29), Gurlu R(29), Eksi-Alp E(30), Apa H(31); Turkish Defibrillation Study Group.

**ABSTRACT**

AIM OF THE STUDY: Successful cardiopulmonary resuscitation and early defibrillation are critical in survival after in- or out-of-hospital cardiopulmonary arrest. The scope of this multi-center study is to a) assess skills of pediatric health care providers (HCPs) concerning two domains: 1) recognizing rhythm abnormalities, 2) the use of defibrillator devices, and b) to evaluate the impact of certified basic-life-support (BLS) and advanced-life-support (ALS) training to offer solutions for quality of improvement in several pediatric emergency cares and intensive care settings of Turkey. METHODS: This cross-sectional and multi-center survey study included several pediatric emergency care and intensive care settings from different regions of Turkey. this is a survey and is cross-sectional RESULTS: A total of 716 HCPs participated in the study (physicians: 69.4%, healthcare staff: 30.6%). The median age was 29 (27-33) years. Certified BLS-ALS training was received in 61% (n=303/497) of the physicians and 45.2% (n=99/219) of the non-physician healthcare staff (p<0.001). The length of professional experience had favorable outcome towards an increased self-confidence in the physicians (p<0.01, p<0.001). Both physicians and non-physician healthcare staff improved their theoretical knowledge in the practice of synchronized cardioversion defibrillation (p<0.001, p<0.001). Non-certified healthcare providers were less likely to manage the initial doses of synchronized cardioversion and defibrillation: the correct responses remained at 32.5% and 9.2% for synchronized cardioversion and 44.8% and 16.7% for defibrillation in the physicians and healthcare staff respectively. The indications for defibrillation were correctly answered in the physicians who had acquired a certificate of BLS-ALS training (p=0.047, p=0.003). CONCLUSIONS: The professional experience is significant in the correct use of a defibrillator and related procedures. Given the importance of early defibrillation in survival, the importance and proper use of defibrillators should be emphasized in Certified BLS - ALS programs. Certified BLS - ALS programs increase the level of knowledge and self-confidence towards synchronized cardioversion - defibrillation procedures.

**POST-CARDIAC ARREST TREATMENTS**

No articles identified.

**TARGETED TEMPERATURE MANAGEMENT**

1. JAMA. 2021 Oct 19;326(15):1494-1503. doi: 10.1001/jama.2021.15703.

**Effect of Moderate vs Mild Therapeutic Hypothermia on Mortality and Neurologic Outcomes in Comatose Survivors of Out-of-Hospital Cardiac Arrest: The CAPITAL CHILL Randomized Clinical Trial.**

Le May M(1), Osborne C(1), Russo J(1), So D(1), Chong AY(1), Dick A(1), Froeschl M(1), Glover C(1), Hibbert B(1), Marquis JF(1), De Roock S(1), Labinaz M(1), Bernick J(1), Marshall S(2), Maze R(1), Wells G(1)(3).



## **ABSTRACT**

**IMPORTANCE:** Comatose survivors of out-of-hospital cardiac arrest experience high rates of death and severe neurologic injury. Current guidelines recommend targeted temperature management at 32 °C to 36 °C for 24 hours. However, small studies suggest a potential benefit of targeting lower body temperatures. **OBJECTIVE:** To determine whether moderate hypothermia (31 °C), compared with mild hypothermia (34 °C), improves clinical outcomes in comatose survivors of out-of-hospital cardiac arrest. **DESIGN, SETTING, AND PARTICIPANTS:** Single-center, double-blind, randomized, clinical superiority trial carried out in a tertiary cardiac care center in eastern Ontario, Canada. A total of 389 patients with out-of-hospital cardiac arrest were enrolled between August 4, 2013, and March 20, 2020, with final follow-up on October 15, 2020. **INTERVENTIONS:** Patients were randomly assigned to temperature management with a target body temperature of 31 °C (n = 193) or 34 °C (n = 196) for a period of 24 hours. **MAIN OUTCOMES AND MEASURES:** The primary outcome was all-cause mortality or poor neurologic outcome at 180 days. Neurologic outcome was assessed using the Disability Rating Scale, with poor neurologic outcome defined as a score greater than 5 (range, 0-29, with 29 being the worst outcome [vegetative state]). There were 19 secondary outcomes, including mortality at 180 days and length of stay in the intensive care unit. **RESULTS:** Among 367 patients included in the primary analysis (mean age, 61 years; 69 women [19%]), 366 (99.7%) completed the trial. The primary outcome occurred in 89 of 184 patients (48.4%) in the 31 °C group and in 83 of 183 patients (45.4%) in the 34 °C group (risk difference, 3.0% [95% CI, 7.2%-13.2%]; relative risk, 1.07 [95% CI, 0.86-1.33]; P = .56). Of the 19 secondary outcomes, 18 were not statistically significant. Mortality at 180 days was 43.5% and 41.0% in patients treated with a target temperature of 31 °C and 34 °C, respectively (P = .63). The median length of stay in the intensive care unit was longer in the 31 °C group (10 vs 7 days; P = .004). Among adverse events in the 31 °C group vs the 34 °C group, deep vein thrombosis occurred in 11.4% vs 10.9% and thrombus in the inferior vena cava occurred in 3.8% and 7.7%, respectively. **CONCLUSIONS AND RELEVANCE:** In comatose survivors of out-of-hospital cardiac arrest, a target temperature of 31 °C did not significantly reduce the rate of death or poor neurologic outcome at 180 days compared with a target temperature of 34 °C. However, the study may have been underpowered to detect a clinically important difference.

2. Resuscitation. 2021 Oct 16:S0300-9572(21)00425-1. doi: 10.1016/j.resuscitation.2021.09.040. Online ahead of print.

**"Meta-analyses of targeted temperature management in adult cardiac arrest studies - the big picture is dependent on study selection".**

Behringer W(1), Abella B(2), Sunde K(3).

**NO ABSTRACT AVAILABLE**

## **ELECTROPHYSIOLOGY AND DEFIBRILLATION**

1. Resuscitation. 2021 Oct 16:S0300-9572(21)00408-1. doi: 10.1016/j.resuscitation.2021.10.012. Online ahead of print.

**Change in Out-of-Hospital 12-lead ECG Diagnostic Classification Following Resuscitation from Cardiac Arrest.**

Aufderheide TP(1), Li T E(2), Saleh HO(3), Gutterman DD(4), Weston BW(5), Pepe PE(6), Baker JE(7), Labinski J(8), Debaty G(9), Tang L(10), Szabo A(11), Kalra R(12), Yannopoulos D(13), Colella MR(14).

## **ABSTRACT**

**INTRODUCTION:** We evaluated the incidence of change in serial 12-lead electrocardiogram (ECG) diagnostic classifications in patients resuscitated from out-of-hospital (OH) cardiac arrest (OHCA) comparing OH to emergency department (ED) ECGs. **METHODS:** This retrospective case series

included: 1) adults ( $\geq 18$  years old), 2) resuscitated OHCA, 3)  $\geq 1$  OH and 1 ED ECG/patient, and 4) emergency medical services (EMS) transport to the study hospital. OH and ED ECGs were classified as: 1) STEMI (ST-segment Elevation Myocardial Infarction), 2) ischemia, and 3) non-ischemic. Two ED physicians and one cardiologist independently classified all ECGs, then generated a consensus opinion classification for each ECG based on American Heart Association's 2018 Expert Consensus criteria. The most ischemic OH ECG classification was compared with the last ED ECG classification. RESULTS: From 7/27/12 to 7/18/19, 176 patients were entered with a mean age of  $61.2 \pm 16.6$  years; 102/176 (58%) were male. Overall, 504 OH and ED 12-lead ECGs were acquired (2.9 ECGs/patient). ECG classification inter-rater reliability kappa score was  $0.63 \pm 0.02$  (substantial agreement). Overall, 86/176 (49%) changed ECG classification from the OH to ED setting; 69/86 (80%) of these ECGs changed from more to less ischemic classifications. Of 49 OH STEMI ECG classifications, 33/49 (67%) changed to a less ischemic (non-STEMI) ED ECG classification. CONCLUSIONS: Change in 12-lead ECG classification from OH to ED setting in patients resuscitated from OHCA was common (49%). The OH STEMI classification changed to a less ischemic (non-STEMI) ED classification in 67% of cases.

## **PEDIATRICS AND CHILDREN**

1. J Cardiovasc Electrophysiol. 2021 Oct;32(10):2737-2745. doi: 10.1111/jce.15204. Epub 2021 Aug 21.

### **High-risk features and predictors of unexplained syncope in the young SCD-SOS cohort.**

Carrington M(1), Pais J(1), Brás D(1), Creta A(2), Teixeira R(3), Gonçalves L(3), Providência R(2).

#### **ABSTRACT**

INTRODUCTION: The Sudden Cardiac Death-Screening of Risk FactOrS survey included a 12-lead electrocardiogram (ECG) plus a digital-based questionnaire and aimed to screen for warning signs of diseases that may course with sudden cardiac death in children and young adults. We aimed to estimate the prevalence of unexplained syncope (US) and characterize its high-risk features and predictors in this cohort. METHODS AND RESULTS: We determined the most probable etiology of transient loss of consciousness (TLOC) episodes based on clinical criteria. US was an exclusion diagnosis and we analyzed its potential clinical and ECG predictors. Among 11 878 individuals, with a mean age of  $21 \pm 6$  (range 6-40) years old, the cumulative incidence of TLOC was 26.5%, 76.2% corresponding to females. Reflex syncope was present in 66.4%, orthostatic hypotension in 8.2%, and 14.8% of the individuals had US. Unexplained syncope was independently associated with age  $< 18$  years old (odds ratio [OR] 1.695; 95% confidence interval [CI] 1.26-2.29,  $p = .001$ ), male gender (OR 1.642; 95% CI 1.22-2.22,  $p = .001$ ), participation in competitive sports (OR 1.644; 95% CI 1.01-2.66,  $p = .043$ ), syncope during exertion and/or palpitations preceding syncope (OR 2.556; 95% CI 1.92-3.40,  $p < .001$ ), syncope after exertion (OR 2.662; 95% CI 1.73-4.10,  $p < .001$ ), fever context (OR 9.606; 95% CI 4.13-22.34,  $p < .001$ ), isolated previous syncopal episode (OR 2.780; 95% CI 0.2-06-3.75,  $p < .001$ ), and history of palpitations requiring medical care (OR 1.945; 95% CI 1.14-3.31,  $p = .014$ ). We found no ECG predictors of US in this population. CONCLUSIONS: The cumulative incidence of TLOC in children and young adults is high and remains unexplained in an important proportion of individuals. We identified eight clinical characteristics that may be useful for the risk stratification of individuals evaluated in a nonacute setting.

## **EXTRACORPOREAL LIFE SUPPORT**

No articles identified.

## **EXPERIMENTAL RESEARCH**

1. Cureus. 2021 Sep 7;13(9):e17798. doi: 10.7759/cureus.17798. eCollection 2021 Sep.

### **Ventilation With or Without Endotracheal Tube Leak in Prolonged Neonatal Asphyxia.**

Douvanas A(1), Kalafati M(2), Tamvaki E(3), Nieri A(2), Papalois A(4), Koulouglioti C(5), Aggelina A(6), Papathanassoglou E(7).

#### **ABSTRACT**

**Background** Severe and prolonged asphyxia can result in either intrauterine fetal death and stillbirth or multiorgan failure in surviving neonates. Establishing effective ventilation is the primary aim of resuscitation in newborns with asphyxia. The objective of this study was to compare the outcome of resuscitation by applying an endotracheal tube (ETT) with less, an ETT with moderate, and an ETT with high leakage during mechanical ventilation in swine neonates after prolonged perinatal asphyxia. **Materials and methods** A prospective, randomized controlled laboratory study was performed. Thirty Landrace/large white pigs, aged one to four days and weighted  $1.754 \pm 218$  gr, were randomly allocated into three groups depending on the ETT size: Group C (less leak: ETT no 4.0, n=10); Group A (high leak: ETT no 3.0, n=10); and Group B (moderate leak: ETT no 3.5, n=10). Mechanical asphyxia was performed until their heart rate was less than 60 bpm or their mean arterial pressure was below 15 mmHg. All animals with return of spontaneous circulation (ROSC) were monitored for four hours for their hemodynamic parameters, arterial oxygen saturation, and lactate acid levels. **Results** We demonstrate that 70% of the surviving animals were ventilated with an ETT with a leak (no. 3.5 and 3). A statistically significant difference was noted in PO<sub>2</sub> (p=0.032) between Group B ( $126.4 \pm 53.4$  mmHg) compared to Group A ( $72.28 \pm 29.18$  mmHg) and Group C ( $94.28 \pm 20.46$  mmHg) as well as in the right atrial pressure (p<0.001) between Group C (4.5 mmHg) vs Groups A (2 mmHg) and B (2 mmHg) during ROSC time. Lactate levels were statistically significantly lower (p=0.035) in Group C (mean= $0.92 \pm 0.07$  mmol/L) as compared to Group A (mean= $1.13 \pm 0.1$  mmol/L) and Group B (mean= $1.08 \pm 0.07$  mmol/L; p = 0.034) at 4h post-ROSC. **Conclusion** We provide preliminary evidence that ventilation with ETT with moderate leakage improves survival after 2h of ROSC, along with oxygenation and hemodynamic parameters, in a porcine model of neonatal asphyxia and resuscitation, compared to less leakage ETT.

2. Front Physiol. 2021 Sep 29;12:741241. doi: 10.3389/fphys.2021.741241. eCollection 2021.

### **Rewarming With Closed Thoracic Lavage Following 3-h CPR at 27°C Failed to Reestablish a Perfusing Rhythm.**

Nivfors JO(1), Mohyuddin R(1), Schanche T(1)(2), Nilsen JH(1)(3)(4), Valkov S(1), Kondratiev TV(1), Sieck GC(2), Tveita T(1)(2)(3).

#### **ABSTRACT**

**Introduction:** Previously, we showed that the cardiopulmonary resuscitation (CPR) for hypothermic cardiac arrest (HCA) maintained cardiac output (CO) and mean arterial pressure (MAP) to the same reduced level during normothermia (38°C) vs. hypothermia (27°C). In addition, at 27°C, the CPR for 3-h provided global O<sub>2</sub> delivery (DO<sub>2</sub>) to support aerobic metabolism. The present study investigated if rewarming with closed thoracic lavage induces a perfusing rhythm after 3-h continuous CPR at 27°C. **Materials and Methods:** Eight male pigs were anesthetized, and immersion-cooled. At 27°C, HCA was electrically induced, CPR was started and continued for a 3-h period. Thereafter, the animals were rewarmed by combining closed thoracic lavage and continued CPR. Organ blood flow was measured using microspheres. **Results:** After cooling with spontaneous circulation to 27°C, MAP and CO were initially reduced by 37 and 58% from baseline, respectively. By 15 min after the onset of CPR, MAP, and CO were further reduced by 58 and 77% from baseline, respectively, which remained unchanged throughout the rest of the 3-h period of CPR. During CPR at

27°C, DO<sub>2</sub> and O<sub>2</sub> extraction rate (VO<sub>2</sub>) fell to critically low levels, but the simultaneous small increase in lactate and a modest reduction in pH, indicated the presence of maintained aerobic metabolism. During rewarming with closed thoracic lavage, all animals displayed ventricular fibrillation, but only one animal could be electro-converted to restore a short-lived perfusing rhythm. Rewarming ended in circulatory collapse in all the animals at 38°C. Conclusion: The CPR for 3-h at 27°C managed to sustain lower levels of CO and MAP sufficient to support global DO<sub>2</sub>. Rewarming accidental hypothermia patients following prolonged CPR for HCA with closed thoracic lavage is not an alternative to rewarming by extra-corporeal life support as these patients are often in need of massive cardio-pulmonary support during as well as after rewarming.

## **CASE REPORTS**

1. J Extra Corpor Technol. 2021 Sep;53(3):193-198. doi: 10.1182/ject-2100017.

### **A Novel Method to Safely De-Air a HeartWare System in a Single-Ventricle Patient by Utilizing ECMO and a Minimized CPB Circuit.**

Robb TM(1), Denison B(1), Mizrahi M(1), Owens R(1), Fraser CD Jr(1).

#### **ABSTRACT**

The survival of congenital heart disease (CHD) patients with single-ventricle (SV) physiology has markedly increased as a result of advances in operative techniques and postsurgical management. Nonetheless, these patients remain highly susceptible to end-stage heart failure requiring cardiac replacement therapies at early ages. Given a worldwide shortage of transplantable organs, mechanical circulatory support (MCS) represents an alternative treatment option. The significant heterogeneity of the SV population presents unique indications for MCS that have begun to be evaluated. This case study describes a 12-year-old female with heterotaxy syndrome and an SV condition, previously palliated with a Fontan operation at another institution. The patient was placed on veno-arterial (VA) extracorporeal membrane oxygenation (ECMO) during prolonged cardiopulmonary resuscitation, and later underwent HeartWare ventricular assist device (HVAD) implantation as a bridge to transplantation (BTT). A novel method was chosen to optimize careful de-airing of the heart through a minimized cardiopulmonary bypass (CPB) setup, during full ECMO support and surgical insertion of the HeartWare. The ascending aorta was vented proximal to the HVAD outflow graft anastomosis through a minimized CPB circuit at <10% of the ECMO flow rate. This circuit adaptation allowed for euvolemic resuscitation via connection from the minimized CPB circuit to the venous limb of the ECMO circuit. The transition from VA-ECMO to the HeartWare was well tolerated despite a challenging sternotomy and cardiac anomaly. A minimized bypass circuit proved efficacious for the benefit of volume resuscitation and safe de-airing of the HVAD while on ECMO support. The literature is limited concerning safe practices for implantation of durable VADs in complex SV patients coupled with those transitioning from varying modalities of MCS. As SV survivability regresses to heart failure, it is essential that we share techniques that aim to improve the long-term outcomes for successful BTT or bridge to decision (BTD).

2. Mo Med. 2021 Sep-Oct;118(5):450-452.

### **Vaping Associated Cardiac Arrest at School in a Teenager with Anomalous Left Coronary Artery.**

Glenski TA(1), Dorris CE(2), Patel GM(3), Taylor CM(4), Doyle NM(5).

#### **ABSTRACT**

The prevalence of electronic cigarette use is increasing at an astonishing pace, particularly in the teenage population. While at school, a healthy 13-year-old male experienced a sudden cardiac arrest after vaping multiple times throughout the day. Workup revealed an anomalous left coronary artery originating from the right sinus of Valsalva. Given this patient's underlying anomalous left coronary

artery, we suspect that sympathoexcitatory and arrhythmogenic effects of high dose nicotine from vaping led to his cardiovascular collapse. This is the first published case report of a vaping associated cardiac arrest in a patient of this age.