This week's PubMed 19th – 25th November 2023: articles of interest n = 29

CPR AND COVID-19

1. Resuscitation. 2023 Nov 20:110054. doi: 10.1016/j.resuscitation.2023.110054. Online ahead of print.

Impact of the COVID-19 Pandemic on Canadian Emergency Medical System Management of Out-of-Hospital Cardiac Arrest: a Retrospective Cohort Study.

Armour R(1), Ghamarian E(2), Helmer J(3), Buick JE(4), Thorpe K(2), Austin M(5), Bacon J(6), Boutet M(6), Cournoyer A(7), Dionne R(8), Goudie M(9), Lin S(10), Welsford M(11), Grunau B(12).

ABSTRACT

AIM: We sought to describe the impact of the COVID-19 pandemic on the care provided by Canadian emergency medical system (EMS) clinicians to patients suffering out of hospital cardiac arrest (OHCA), and whether any observed changes persisted beyond the initial phase of the pandemic. METHODS: We analysed cases of adult, non-traumatic, OHCA from the Canadian Resuscitation Outcome Consortium (CanROC) registry who were treated between January 27th, 2018, and December 31st, 2021. We used adjusted regression models and interrupted time series analysis to examine the impact of the COVID-19 pandemic (January 27th, 2020 - December 31st, 2021)on the care provided to patients with OHCA by EMS clinicians. RESULTS: There were 12,947 cases of OHCA recorded in the CanROC registry in the pre-COVID-19 period and 17,488 during the COVID-19 period. We observed a reduction in the cumulative number of defibrillations provided by EMS (aRR 0.91, 95% CI 0.89 - 0.93, p<0.01), a reduction in the odds of attempts at intubation (aOR 0.33, 95% CI 0.31 - 0.34, p<0.01), higher rates of supraglottic airway use (aOR 1.23, 95% CI 1.16 - 1.30, p<0.01), a reduction in vascular access (aOR for intravenous access 0.84, 95% CI 0.79 - 0.89, p<0.01; aOR for intraosseous access 0.89, 95% CI 0.82 - 0.96, p<0.01), a reduction in the odds of epinephrine administration (aOR 0.89, 95% CI 0.85 - 0.94, p<0.01), and higher odds of resuscitation termination on scene (aOR 1.38, 95% CI 1.31 - 1.46, p<0.01). Delays to initiation of chest compressions (2 min. vs. 3 min., p<0.01), intubation (16 min. vs. 19 min., p=0.01), and epinephrine administration (11 min. vs. 13 min., p<0.01) were observed, whilst supraglottic airways were inserted earlier (11 min. vs. 10 min., p<0.01). CONCLUSION: The COVID-19 pandemic was associated with substantial changes in EMS management of OHCA. EMS leaders should consider these findings to optimise current OHCA management and prepare for future pandemics.

CPR/MECHANICAL CHEST COMPRESSION

No articles identified.

REGISTRIES, REVIEWS AND EDITORIALS

1. J Clin Med. 2023 Nov 20;12(22):7196. doi: 10.3390/jcm12227196.

Trend of Outcome Metrics in Recent Out-of-Hospital-Cardiac-Arrest Research: A Narrative Review of Clinical Trials.

Htet NN(1), Jafari D(2)(3), Walker JA(4)(5), Pourmand A(6), Shaw A(7), Dinh K(7), Tran QK(7)(8)(9).

ABSTRACT

Cardiopulmonary resuscitation (CPR) research traditionally focuses on survival. In 2018, the International Liaison Committee on Resuscitation (ILCOR) proposed more patient-centered

outcomes. Our narrative review assessed clinical trials after 2018 to identify the trends of outcome metrics in the field OHCA research. We performed a search of the PubMed database from 1 January 2019 to 22 September 2023. Prospective clinical trials involving adult humans were eligible. Studies that did not report any patient-related outcomes or were not available in full-text or English language were excluded. The articles were assessed for demographic information and primary and secondary outcomes. We included 89 studies for analysis. For the primary outcome, 31 (35%) studies assessed neurocognitive functions, and 27 (30%) used survival. For secondary outcomes, neurocognitive function was present in 20 (22%) studies, and survival was present in 10 (11%) studies. Twenty-six (29%) studies used both survival and neurocognitive function. Since the publication of the COSCA guidelines in 2018, there has been an increased focus on neurologic outcomes. Although survival outcomes are used frequently, we observed a trend toward fewer studies with ROSC as a primary outcome. There were no quality-of-life assessments, suggesting a need for more studies with patient-centered outcomes that can inform the guidelines for cardiac-arrest management.

2. Crit Care. 2023 Nov 20;27(1):451. doi: 10.1186/s13054-023-04734-w.
Serial assessments of cardiac output and mixed venous oxygen saturation in comatose patients after out-of-hospital cardiac arrest.
Zimmermann T(1), Lopez-Ayala P(2), Singer M(3).
NO ABSTRACT AVAILABLE

3. Can J Anaesth. 2023 Nov 20. doi: 10.1007/s12630-023-02657-2. Online ahead of print.
In reply: Remarks on autoresuscitation-Polish analysis of Lazarus syndrome.
Zorko DJ(1), Hornby L(2), Dhanani S(3).
NO ABSTRACT AVAILABLE

4. Int J Cardiol. 2023 Nov 18:131595. doi: 10.1016/j.ijcard.2023.131595. Online ahead of print.
Comparative outcomes in patients with preexisting heart failure to those without heart failure after out-of-hospital cardiac arrest: A nationwide registry study.
Tayal B(1), Rørth R(2), Kristensen SL(2), Wissenberg M(3), Dutta A(4), Gislason G(5), Køber L(2), Lippert F(6), Torp-Pedersen C(7), Søgaard P(8), Kragholm KH(8).
ABSTRACT
BACKGROUND: The knowledge of prognosis following out-of-hospital cardiac arrest (OHCA) in patients with heart failure heart failure (HF) is sparse. The objective of this study was to compare the outcome after OHCA among patients with and without HF. METHODS: We studied 45,293 patients who were included for the Danish cardiac arrest registry between 2001 and 2014. Patients were stratified into two groups based on the presence of HF prior to cardiac arrest. The primary outcome was 30-day survival and secondary outcome was anoxic brain damage or permanent nursing home admission at 1-year among 30-day survivors. RESULTS: Among the final 28,955 patients included, 6675 (23%) patients had prior HF and 22,280 (77%) patients had no prior HF. At 30 days, 616 (9.2%) patients survived among the patients with HF and 1916 (8.6%) among the patients without HF. There was a significant interaction between atrial fibrillation (AF) and HF for primary outcome and therefore it was assessed separately between the two study groups stratified based on AF. Among patients without AF a significantly higher odds of 30-day survival were observed among patients with HF (OR 2.69, 95% CI 2.34-3.08, P < 0.001), but no difference was observed among the patients from two study groups with no AF. No significant difference in risk for secondary outcome was observed among the two study groups. In multivariable average treatment effect modeling, all the

results largely remain unchanged. CONCLUSIONS: Outcome following OHCA among patients with and without HF is found to be similar in this large Danish OHCA registry.

5. Intensive Care Med. 2023 Nov 20. doi: 10.1007/s00134-023-07267-6. Online ahead of print.
Should we give steroids after out-of-hospital cardiac arrest?
Anstey MH(1)(2)(3), de Jong A(4), Skrifvars MB(5).
NO ABSTRACT AVAILABLE

6. Resuscitation. 2023 Nov 13:110046. doi: 10.1016/j.resuscitation.2023.110046. Online ahead of print.
Corrigendum to "Expert consensus on training and accreditation for extracorporeal cardiopulmonary resuscitation an international, multidisciplinary modified Delphi Study" [Resuscitation 192 (2023) 109989].
Kruit N(1), Burrell A(2), Tian D(3), Barrett N(4), Bělohlávek J(5), Bernard S(6), Braude D(7), Buscher H(8), Chen YS(9), Donker DW(10), Finney S(11), Forrest P(12), Fowles JA(13), Hifumi T(14), Hodgson C(15), Hutin A(16), Inoue A(17), Jung JS(18), Kruse JM(19), Lamhaut L(20), Ming-Hui Lin R(21), Reis Miranda D(22), Müller T(23), Bhagyalakshmi Nanjayya V(24), Nickson C(25), Pellegrino V(26), Plunkett B(27), Richardson C(28), Alexander Richardson S(29), Shekar K(30), Shinar Z(31), Singer B(32), Stub D(33), Totaro RJ(34), Vuylsteke A(35), Yannopoulos D(36), Zakhary B(37), Dennis M(38).
NO ABSTRACT AVAILABLE

IN-HOSPITAL CARDIAC ARREST

1. J Clin Med. 2023 Nov 15;12(22):7102. doi: 10.3390/jcm12227102.
Discrepancies between Retrospective Review of "Real-Time" Electronic Health Record Documentation and Prospective Observer Documentation of In-Hospital Cardiac Arrest Quality Metrics in an Academic Cardiac Intensive Care Unit.
Morris NA(1)(2)(3), Couperus C(4), Jasani G(4), Day L(4), Stultz C(5), Tran QK(2)(4).
ABSTRACT
BACKGROUND: Every year, approximately 200,000 patients will experience in-hospital cardiac arrest (IHCA) in the United States. Survival has been shown to be greatest with the prompt initiation of CPR and early interventions, leading to the development of time-based quality measures. It is uncertain how documentation practices affect reports of compliance with time-based quality measures in IHCA. METHODS: A retrospective review of all cases of IHCA that occurred in the Cardiac Intensive Care Unit (CICU) at an academic quaternary hospital was conducted. For each case, a member of the code team (observer) documented performance measures as part of a prospective cardiac arrest quality improvement database. We compared those data to those abstracted in the retrospective review of "real-time" documentation in a Resuscitation Narrator module within electronic health records (EHRs) to investigate for discrepancies. RESULTS: We identified 52 cases of IHCA, all of which were witnessed events. In total, 47 (90%) cases were reviewed by observers as receiving epinephrine within 5 min, but only 42 (81%) were documented as such in the EHR review ($p = 0.04$), meaning that the interrater agreement for this metric was low (Kappa = 0.27, 95% CI 0.16-0.36). Four (27%) eligible patients were reported as having defibrillation within 2 min by observers, compared to five (33%) reported by the EHR review ($p = 0.90$), and with substantial agreement (Kappa = 0.73, 95% CI 0.66-0.79). There was almost perfect agreement (Kappa = 0.82, 95% CI 0.76-0.88) for the initial rhythm of cardiac arrest (25% shockable rhythm by observers vs. 29% for EHR review, $p = 0.31$). CONCLUSION: There was a discrepancy between prospective observers' documentation of meeting quality standards and that of the retrospective review of "real-time" EHR documentation. A further study is required to understand the cause of discrepancy and its consequences.

2. NPJ Digit Med. 2023 Nov 23;6(1):215. doi: 10.1038/s41746-023-00960-2.
Real-time machine learning model to predict in-hospital cardiac arrest using heart rate variability in ICU.
Lee H(1)(2), Yang HL(1)(3), Ryu HG(4)(5), Jung CW(4), Cho YJ(4), Yoon SB(4), Yoon HK(4), Lee HC(6)(7).
ABSTRACT
Predicting in-hospital cardiac arrest in patients admitted to an intensive care unit (ICU) allows prompt interventions to improve patient outcomes. We developed and validated a machine learning-based real-time model for in-hospital cardiac arrest predictions using electrocardiogram (ECG)-based heart rate variability (HRV) measures. The HRV measures, including time/frequency domains and nonlinear measures, were calculated from 5 min epochs of ECG signals from ICU patients. A light gradient boosting machine (LGBM) algorithm was used to develop the proposed model for predicting in-hospital cardiac arrest within 0.5-24 h. The LGBM model using 33 HRV measures achieved an area under the receiver operating characteristic curve of 0.881 (95% CI: 0.875-0.887) and an area under the precision-recall curve of 0.104 (95% CI: 0.093-0.116). The most important feature was the baseline width of the triangular interpolation of the RR interval histogram. As our model uses only ECG data, it can be easily applied in clinical practice.

3. Circ Cardiovasc Qual Outcomes. 2023 Nov;16(11):e010491. doi: 10.1161/CIRCOUTCOMES.123.010491. Epub 2023 Nov 10.
Ten Steps Toward Improving In-Hospital Cardiac Arrest Quality of Care and Outcomes.
Nallamothu BK(1), Greif R(2), Anderson T(1), Atiq H(3), Couto TB(4), Considine J(5), De Caen AR(6), Djärv T(7), Doll A(8), Douma MJ(9), Edelson DP(10), Xu F(11), Finn JC(12), Firestone G(13), Girotra S(14), Lauridsen KG(15), Leong CK(16), Lim SH(16), Morley PT(17), Morrison LJ(18), Moskowitz A(19), Mullasari Sankardas A(19), Mohamed MTM(20), Myburgh MC(21), Nadkarni VM(22), Neumar RW(23), Nolan JP(24), Athieno Odakha J(25), Olasveengen TM(26), Orosz J(27), Perkins GD(24), Previdi JK(27), Vaillancourt C(28), Montgomery WH(29), Sasson C(30), Chan PS(31); International Liaison Committee on Resuscitation.
NO ABSTRACT AVAILABLE

INJURIES AND CPR

1. Ann Intensive Care. 2023 Nov 21;13(1):113. doi: 10.1186/s13613-023-01210-0.
The effect of higher or lower mean arterial pressure on kidney function after cardiac arrest: a post hoc analysis of the COMACARE and NEUROPROTECT trials.
Laurikkala J(1), Ameloot K(2)(3)(4)(5), Reinikainen M(6), Palmers PJ(2)(3), De Deyne C(5)(7), Bert F(2)(3), Dupont M(2)(3), Janssens S(4), Dens J(2)(3)(5), Hästbacka J(8), Jakkula P(9), Loisa P(10), Birkelund T(11), Wilkman E(9), Vaara ST(9), Skrifvars MB(12).
ABSTRACT
BACKGROUND: We aimed to study the incidence of acute kidney injury (AKI) in out-of-hospital cardiac arrest (OHCA) patients treated according to low-normal or high-normal mean arterial pressure (MAP) targets. METHODS: A post hoc analysis of the COMACARE (NCT02698917) and Neuroprotect (NCT02541591) trials that randomized patients to lower or higher targets for the first 36 h of intensive care. Kidney function was defined using the Kidney Disease Improving Global Outcome (KDIGO) classification. We used Cox regression analysis to identify factors associated with AKI after OHCA. RESULTS: A total of 227 patients were included: 115 in the high-normal MAP group and 112 in the low-normal MAP group. Eighty-six (38%) patients developed AKI during the first five days; 40 in the high-normal MAP group and 46 in the low-normal MAP group (p = 0.51). The median creatinine and daily urine output were 85 µmol/l and 1730 mL/day in the high-normal MAP group

and 87 µmol/l and 1560 mL/day in the low-normal MAP group. In a Cox regression model, independent AKI predictors were no bystander cardiopulmonary resuscitation ($p < 0.01$), non-shockable rhythm ($p < 0.01$), chronic hypertension ($p = 0.03$), and time to the return of spontaneous circulation ($p < 0.01$), whereas MAP target was not an independent predictor ($p = 0.29$). CONCLUSION: Any AKI occurred in four out of ten OHCA patients. We found no difference in the incidence of AKI between the patients treated with lower and those treated with higher MAP after CA. Higher age, non-shockable initial rhythm, and longer time to ROSC were associated with shorter time to AKI.

CAUSE OF THE ARREST

No articles identified.

END-TIDAL CO_2

No articles identified.

ORGAN DONATION

No articles identified.

FEEDBACK

No articles identified.

DRUGS

No articles identified.

TRAUMA

No articles identified.

VENTILATION

1. Ann Emerg Med. 2023 Nov 22:S0196-0644(23)01277-5. doi:10.1016/j.annemergmed.2023.09.023. Online ahead of print.
Early Versus Late Advanced Airway Management for Pediatric Patients With Out-of-Hospital Cardiac Arrest.
Amagasa S(1), Iwamoto S(2), Kashiura M(3), Yasuda H(3), Kishihara Y(3), Uematsu S(4).
ABSTRACT
STUDY OBJECTIVE: To determine the association between early versus late advanced airway management and improved outcomes in pediatric out-of-hospital cardiac arrest. METHODS: We performed a retrospective cohort study using data from the out-of-hospital cardiac arrest registry in Japan. We included pediatric patients (<18 years) with out-of-hospital cardiac arrest who had

received advanced airway management (tracheal intubation, supraglottic airway, and esophageal obturator). The main exposure was early (≤20 minutes) versus late (>20 minutes) advanced airway management. The primary and secondary outcome measurements were survival and favorable neurologic outcomes at 1 month, respectively. To address resuscitation time bias, we performed risk-set matching analyses using time-dependent propensity scores. RESULTS: Out of the 864 pediatric patients with both out-of-hospital cardiac arrest and advanced airway management over 67 months (2014 to 2019), we included 667 patients with adequate data (77%). Of these 667 patients, advanced airway management was early for 354 (53%) and late for 313 (47%) patients. In the risk-set matching analysis, the risk of both survival (risk ratio 0.98 for early versus late [95% confidence interval 0.95 to 1.02]) and favorable 1-month neurologic outcomes (risk ratio 0.99 [95% confidence interval 0.97 to 1.00]) was similar between early and late advanced airway management groups. In sensitivity analyses, with time to early advanced airway management defined as ≤10 minutes and ≤30 minutes, both outcomes were again similar. CONCLUSION: In pediatric out-of-hospital cardiac arrest, the timing of advanced airway management may not affect patient outcomes, but randomized controlled trials are needed to address this question further.

CERERBRAL MONITORING

1. Am Heart J. 2023 Nov 20:S0002-8703(23)00320-4. doi: 10.1016/j.ahj.2023.11.011. Online ahead of print.

Association of Admission Serum Sodium and Outcomes Following Out-of-Hospital Cardiac Arrest.

Ye SC(1), Cheung CC(2), Lauder E(1), Grunau B(3), Moghaddam N(2), van Diepen S(4), Holmes DT(5), Sekhon MS(6), Christenson J(7), Tallon JM(8), Fordyce CB(9).

ABSTRACT

BACKGROUND: The prognostic association between dysnatremia and outcomes in out-of-hospital cardiac arrest (OHCA) is not well understood. Given hypernatremia is associated with poor outcomes in critical illness and hyponatremia may exacerbate cerebral edema, we hypothesized that dysnatremia on OHCA hospital admission would be associated with worse neurological outcomes. METHODS: We studied adults (≥19 yrs) with non-traumatic OHCA between 2009 and 2016 who were enrolled in the British Columbia Cardiac Arrest Registry and survived to hospital admission at two quaternary urban hospitals. We stratified cases by admission serum sodium into hyponatremic (<135 mmol/L), normonatremic (135-145 mmol/L), and hypernatremic (>145 mmol/L) groups. We used logistic regression models, adjusted for age, sex, shockable rhythm, admission serum lactate, and witnessed arrest, to estimate the association between admission sodium and favorable neurological outcome (cerebral performance category 1-2 or modified Rankin scale 0-3). RESULTS: Of 414 included patients, 63 were hyponatremic, 330 normonatremic, and 21 hypernatremic. In each respective group, 21 (33.3%), 159 (48.2%), and 3 (14.3%) experienced good neurological outcomes. In univariable models, hyponatremia (OR 0.53, 95% CI 0.30-0.93) and hypernatremia (OR 0.19, 95% CI 0.05-0.65) were associated with lower odds of good neurological outcomes compared to the normonatremia group. After adjustment, only hypernatremia was associated with lower odds of good neurological outcomes (OR 0.22, 95% CI 0.05-0.98). CONCLUSIONS: Hypernatremia at admission was independently associated with decreased probability of good neurological outcomes at discharge post-OHCA. Future studies should focus on elucidating the pathophysiology of dysnatremia following OHCA.

ULTRASOUND AND CPR

1. CJEM. 2023 Nov 23. doi: 10.1007/s43678-023-00611-1. Online ahead of print.

POCUS literature primer: key papers on POCUS in cardiac arrest and shock.

Kim DJ(1), Atkinson P(2), Sheppard G(3), Chenkin J(4), Thavanathan R(5), Lewis D(2), Bell CR(6), Jelic T(7), Lalande E(8), Buchanan IM(9), Heslop CL(4), Burwash-Brennan T(10), Myslik F(11), Olszynski P(12).

ABSTRACT

OBJECTIVE: The objective of this study is to identify the top five most influential papers published on the use of point-of-care ultrasound (POCUS) in cardiac arrest and the top five most influential papers on the use of POCUS in shock in adult patients. METHODS: An expert panel of 14 members was recruited from the Canadian Association of Emergency Physicians (CAEP) Emergency Ultrasound Committee and the Canadian Ultrasound Fellowship Collaborative. The members of the panel are ultrasound fellowship trained or equivalent, are engaged in POCUS research, and are leaders in POCUS locally and nationally in Canada. A modified Delphi process was used, consisting of three rounds of sequential surveys and discussion to achieve consensus on the top five most influential papers for the use of POCUS in cardiac arrest and shock. RESULTS: The panel identified 39 relevant papers on POCUS in cardiac arrest and 42 relevant papers on POCUS in shock. All panel members participated in all three rounds of the modified Delphi process, and we ultimately identified the top five most influential papers on POCUS in cardiac arrest and also on POCUS in shock. Studies include descriptions and analysis of safe POCUS protocols that add value from a diagnostic and prognostic perspective in both populations during resuscitation. CONCLUSION: We have developed a reading list of the top five influential papers on the use of POCUS in cardiac arrest and shock to better inform residents, fellows, clinicians, and researchers on integrating and studying POCUS in a more evidence-based manner.

ORGANISATION AND TRAINING

1. Ren Fail. 2023;45(2):2285865. doi: 10.1080/0886022X.2023.2285865. Epub 2023 Nov 23.

Construction and validation of a risk prediction model for acute kidney injury in patients after cardiac arrest.

Lin L(1), Chen L(1), Jiang Y(1), Gao R(1), Wu Z(1), Lv W(1), Xie Y(1).

ABSTRACT

OBJECTIVE: Identifying patients at high risk for cardiac arrest-associated acute kidney injury (CA-AKI) helps in early preventive interventions. This study aimed to establish and validate a high-risk nomogram for CA-AKI. METHODS: In this retrospective dataset, 339 patients after cardiac arrest (CA) were enrolled and randomized into a training or testing dataset. The Student's t-test, non-parametric Mann-Whitney U test, or χ2 test was used to compare differences between the two groups. Optimal predictors of CA-AKI were determined using the Least Absolute Shrinkage and Selection Operator (LASSO). A nomogram was developed to predict the early onset of CA-AKI. The performance of the nomogram was assessed using metrics such as area under the curve (AUC), calibration curves, decision curve analysis (DCA), and clinical impact curve (CIC). RESULTS: In total, 150 patients (44.2%) were diagnosed with CA-AKI. Four independent risk predictors were identified and integrated into the nomogram: chronic kidney disease, albumin level, shock, and heart rate. Receiver operating characteristic (ROC) analyses showed that the nomogram had a good discrimination performance for CA-AKI in the training dataset 0.774 (95%CI, 0.715-0.833) and testing dataset 0.763 (95%CI, 0.670-0.856). The AUC values for the two groups were calculated and compared using the Hanley-McNeil test. No statistically significant differences were observed between the groups. The calibration curve demonstrated good agreement between the predicted outcome and actual observations. Good clinical usefulness was identified using DCA and CIC. CONCLUSION: An easy-to-use nomogram for predicting CA-AKI was established and validated, and the prediction efficiency of the clinical model has reasonable clinical practicability.

2. Anaesthesia. 2023 Nov 22. doi: 10.1111/anae.16179. Online ahead of print.

Peri-operative decisions about cardiopulmonary resuscitation among adults as reported to the 7th National Audit Project of the Royal College of Anaesthetists.

Nolan JP(1)(2), Soar J(3), Kane AD(4)(5), Moppett IK(4)(6), Armstrong RA(4)(7), Kursumovic E(2)(4), Cook TM(2)(8).

ABSTRACT

Current guidance recommends that, in most circumstances, cardiopulmonary resuscitation should be attempted when cardiac arrest occurs during anaesthesia, and when a patient has a pre-existing 'do not attempt cardiopulmonary resuscitation' recommendation, this should be suspended. How this guidance is translated into everyday clinical practice in the UK is currently unknown. Here, as part of the 7th National Audit Project of the Royal College of Anaesthetists, we have: assessed the rates of pre-operative 'do not attempt cardiopulmonary resuscitation' recommendations via an activity survey of all cases undertaken by anaesthetists over four days in each participating site; and analysed our one-year case registry of peri-operative cardiac arrests to understand the rates of cardiac arrest in patients who had 'do not attempt cardiopulmonary resuscitation' decisions pre-operatively. In the activity survey, among 20,717 adults (aged > 18 y) undergoing surgery, 595 (3%) had a 'do not attempt cardiopulmonary resuscitation' recommendation pre-operatively, of which less than a third (175, 29%) were suspended. Of the 881 peri-operative cardiac arrest reports, 54 (6%) patients had a 'do not attempt cardiopulmonary resuscitation' recommendation made pre-operatively and of these 38 (70%) had a clinical frailty scale score ≥ 5. Just under half (25, 46%) of these 'do not attempt cardiopulmonary resuscitation' recommendations were formally suspended at the time of anaesthesia and surgery. One in five of these patients with a 'do not attempt cardiopulmonary resuscitation' recommendation who had a cardiac arrest survived to leave hospital and of the seven patients with documented modified Rankin Scale scores before and after cardiac arrest, four remained the same and three had worse scores. Very few patients who had a pre-existing 'do not attempt cardiopulmonary resuscitation' recommendation had a peri-operative cardiac arrest, and when cardiac arrest did occur, return of spontaneous circulation was achieved in 57%, although > 50% of these patients subsequently died before discharge from hospital.

3. Sci Rep. 2023 Nov 21;13(1):20344. doi: 10.1038/s41598-023-45767-z.

Machine learning pre-hospital real-time cardiac arrest outcome prediction (PReCAP) using time-adaptive cohort model based on the Pan-Asian Resuscitation Outcome Study.

Chang H(1)(2), Kim JW(3), Jung W(4), Heo S(1), Lee SU(1), Kim T(1), Hwang SY(1), Do Shin S(5), Cha WC(6)(7)(8)(9); Pan-Asian Resuscitation Outcomes Study Clinical Research Network investigators.

ABSTRACT

To save time during transport, where resuscitation quality can degrade in a moving ambulance, it would be prudent to continue the resuscitation on scene if there is a high likelihood of ROSC occurring at the scene. We developed the pre-hospital real-time cardiac arrest outcome prediction (PReCAP) model to predict ROSC at the scene using prehospital input variables with time-adaptive cohort. The patient survival at discharge from the emergency department (ED), the 30-day survival rate, and the final Cerebral Performance Category (CPC) were secondary prediction outcomes in this study. The Pan-Asian Resuscitation Outcome Study (PAROS) database, which includes out-of-hospital cardiac arrest (OHCA) patients transferred by emergency medical service in Asia between 2009 and 2018, was utilized for this study. From the variables available in the PAROS database, we selected relevant variables to predict OHCA outcomes. Light gradient-boosting machine (LightGBM) was used to build the PReCAP model. Between 2009 and 2018, 157,654 patients in the PAROS database were

enrolled in our study. In terms of prediction of ROSC on scene, the PReCAP had an AUROC score between 0.85 and 0.87. The PReCAP had an AUROC score between 0.91 and 0.93 for predicting survived to discharge from ED, and an AUROC score between 0.80 and 0.86 for predicting the 30-day survival. The PReCAP predicted CPC with an AUROC score ranging from 0.84 to 0.91. The feature importance differed with time in the PReCAP model prediction of ROSC on scene. Using the PAROS database, PReCAP predicted ROSC on scene, survival to discharge from ED, 30-day survival, and CPC for each minute with an AUROC score ranging from 0.8 to 0.93. As this model used a multi-national database, it might be applicable for a variety of environments and populations.

4. Circ J. 2023 Nov 18. doi: 10.1253/circj.CJ-23-0177. Online ahead of print.
Wider Dissemination of Simplified Chest Compression-Only Cardiopulmonary Resuscitation Training Combined With Conventional Cardiopulmonary Resuscitation Training and 10-Year Trends in Cardiopulmonary Resuscitation Performed by Bystanders in a City.
Kawai S(1), Kobayashi D(2), Nishiyama C(3), Shimamoto T(1), Kiyohara K(4), Kitamura T(5), Tanaka K(6), Kinashi K(6), Koyama N(6), Sakamoto T(7), Marukawa S(8), Iwami T(1).
ABSTRACT
BACKGROUND: Little is known about how to effectively increase bystander cardiopulmonary resuscitation (CPR), so we evaluated the 10-year trend of the proportion of bystander CPR in an area with wide dissemination of chest compression-only CPR (CCCPR) training combined with conventional CPR training. Methods and Results: We conducted a descriptive study after a community intervention, using a prospective cohort from September 2010 to December 2019. The intervention consisted of disseminating CCCPR training combined with conventional CPR training in Toyonaka City since 2010. We analyzed all non-traumatic out-of-hospital cardiac arrest (OHCA) patients resuscitated by emergency medical service personnel. The primary outcome was the trend of the proportion of bystander CPR. We conducted multivariate logistic regression models and assessed the adjusted odds ratio (AOR) using a 95% confidence interval (CI) to determine bystander CPR trends. Since 2010, we have trained 168,053 inhabitants (41.9% of the total population of Toyonaka City). A total of 1,508 OHCA patients were included in the analysis. The proportion of bystander CPR did not change from 2010 (43.3%) to 2019 (40.0%; 1-year incremental AOR 1.02 [95% CI: 0.98-1.05]). CONCLUSIONS: The proportion of bystander CPR did not increase even after wider dissemination of CPR training. In addition to continuing wider dissemination of CPR training, other strategies such as the use of technology are necessary to increase bystander CPR.

5. Am Heart J. 2023 Dec;266:106-119. doi: 10.1016/j.ahj.2023.09.004. Epub 2023 Sep 12.
A cross-stakeholder approach to improving out-of-hospital cardiac arrest survival.
Guetterman TC(1), Forman J(2), Fouche S(3), Simpson K(4), Fetters MD(5), Nelson C(6), Mendel P(6), Hsu A(7), Flohr JA(3), Domeier R(8), Rahim R(9), Nallamothu BK(10), Abir M(11).
ABSTRACT
BACKGROUND: Out-of-hospital cardiac arrest (OHCA) affects over 300,000 individuals per year in the United States with poor survival rates overall. A remarkable 5-fold difference in survival-to-hospital discharge rates exist across United States communities. METHODS: We conducted a study using qualitative research methods comparing the system of care across sites in Michigan communities with varying OHCA survival outcomes, as measured by return to spontaneous circulation with pulse upon emergency department arrival. RESULTS: Major themes distinguishing higher performing sites were (1) working as a team, (2) devoting resources to coordination across agencies, and (3) developing a continuous quality improvement culture. These themes spanned the chain of survival framework for OHCA. By examining the unique processes, procedures, and characteristics of higher- relative to lower-performing sites, we gleaned lessons learned that appear to distinguish higher

performers. The higher performing sites reported being the most collaborative, due in part to facilitation of system integration by progressive leadership that is willing to build bridges among stakeholders. CONCLUSIONS: Based on the distinguishing features of higher performing sites, we provide recommendations for toolkit development to improve survival in prehospital systems of care for OHCA.

6. J Formos Med Assoc. 2023 Nov 22:S0929-6646(23)00435-7. doi: 10.1016/j.jfma.2023.10.017. Online ahead of print.
Comparing the effects of blended learning and traditional instruction on basic life support for laypersons: A randomized controlled trial.
Ko YC(1), Lin HY(2), Chiang WC(3), Yang CW(4), Hsieh MJ(5), Ma MH(3).
ABSTRACT
BACKGROUND/PURPOSE: Blended learning offers the advantages of both instructor-led and self-instruction methods in basic life support (BLS). Our study aims to compare the effects of blended learning with those of traditional instructor-led methods on the performance of laypersons taking BLS courses. METHODS: A total of 108 participants were randomly assigned to three groups: traditional instruction (group A, n = 36), blended learning with two rounds of practice (group B, n = 36), and blended learning with three rounds of practice (group C, n = 36). Group A received a 90-min lecture and a 30-min hands-on practice session using a manikin and a metronome. Participants in groups B and C received 18-min standardized online video lessons and performed hands-on practice twice and thrice, respectively. The primary outcome was chest compression at a correct speed (100-120 compressions per min) after the training course. Secondary outcomes included knowledge test scores, attitudes and confidence, and individual skill performance after training. RESULTS: Patient characteristics were similar between the groups. Blended learning with practicing thrice resulted in the highest compressions at a correct speed (group A vs. B vs. C, 68.09 vs 80.03 vs 89.42, $p = 0.015$) and the shortest average hands-off time (group A vs. B vs. C, 1.12 vs 0.86 vs 0.17 s, $p = 0.015$). Both blended groups performed better in confirming environmental safety ($p < 0.001$). No differences in scores of the knowledge test, attitude, or confidence were noted among the three groups. CONCLUSION: Blended learning with three rounds of hands-on practice may be considered an alternative teaching method.

POST-CARDIAC ARREST TREATMENTS

1. Crit Care Clin. 2024 Jan;40(1):57-72. doi: 10.1016/j.ccc.2023.06.005. Epub 2023 Sep 7.
Management of Patients After Cardiac Arrest.
Smith D(1), Kenigsberg BB(2).
ABSTRACT
Cardiac arrest remains a significant cause of morbidity and mortality, although contemporary care now enables potential survival with good neurologic outcome. The core acute management goals for survivors of cardiac arrest are to provide organ support, sustain adequate hemodynamics, and evaluate the underlying cause of the cardiac arrest. In this article, the authors review the current state of knowledge and clinical intensive care unit practice recommendations for patients after cardiac arrest, particularly focusing on important areas of uncertainty, such as targeted temperature management, neuroprognostication, coronary evaluation, and hemodynamic targets.

TARGETED TEMPERATURE MANAGEMENT

No articles identified.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

No articles identified.

PEDIATRICS AND CHILDREN

1. Pediatr Crit Care Med. 2023 Nov 20. doi: 10.1097/PCC.0000000000003406. Online ahead of print.
Death by Neurologic Criteria in Children Undergoing Extracorporeal Cardiopulmonary Resuscitation: Retrospective Extracorporeal Life Support Organization Registry Study, 2017-2021.
Joye R(1), Cousin VL(2), Wacker J(1), Hoskote A(3), Gebistorf F(2), Tonna JE(4)(5), Rycus PT(6), Thiagarajan RR(7), Polito A(2).

ABSTRACT
OBJECTIVES: To determine factors associated with brain death in children treated with extracorporeal cardiopulmonary resuscitation (E-cardiopulmonary resuscitation). DESIGN: Retrospective database study. SETTINGS: Data reported to the Extracorporeal Life Support Organization (ELSO), 2017-2021. PATIENTS: Children supported with venoarterial extracorporeal membrane oxygenation (ECMO) for E-cardiopulmonary resuscitation. INTERVENTION: None. MEASUREMENTS AND MAIN RESULTS: Data from the ELSO Registry included patient characteristics, blood gas values, support therapies, and complications. The primary outcome was brain death (i.e., death by neurologic criteria [DNC]). There were 2,209 children (≥ 29 d to < 18 yr of age) included. The reason for ECMO discontinuation was DNC in 138 patients (6%), and other criteria for death occurred in 886 patients (40%). Recovery occurred in 1,109 patients (50%), and the remaining 76 patients (4%) underwent transplantation. Fine and Gray proportional subdistribution hazards' regression analyses were used to examine the association between variables of interest and DNC. Age greater than 1 year ($p < 0.001$), arterial blood carbon dioxide tension (Paco2) greater than 82 mm Hg ($p = 0.022$), baseline lactate greater than 15 mmol/L ($p = 0.034$), and lactate 24 hours after cannulation greater than 3.8 mmol/L ($p < 0.001$) were independently associated with greater hazard of subsequent DNC. In contrast, the presence of cardiac disease was associated with a lower hazard of subsequent DNC (subdistribution hazard ratio 0.57 [95% CI, 0.39-0.83] $p = 0.004$). CONCLUSIONS: In children undergoing E-cardiopulmonary resuscitation, older age, pre-event hypercarbia, higher before and during ECMO lactate levels are associated with DNC. Given the association of DNC with hypercarbia following cardiac arrest, the role of Paco2 management in E-cardiopulmonary resuscitation warrants further studies.

2. Pediatr Crit Care Med. 2023 Nov 20. doi: 10.1097/PCC.0000000000003412. Online ahead of print.
Mortality and Timing of Withdrawal of Life-Sustaining Therapies After Out-of-Hospital Cardiac Arrest: Two-Center Retrospective Pediatric Cohort Study.
Vassar R(1), Mehta N(1)(2), Epps L(3), Jiang F(4), Amorim E(5)(6), Wietstock S(1)(7).

ABSTRACT
OBJECTIVES: Pediatric out-of-hospital cardiac arrest (OHCA) is associated with substantial morbidity and mortality. Limited data exist to guide timing and method of neurologic prognostication after pediatric OHCA, making counseling on withdrawal of life-sustaining therapies (WLSTs) challenging. This study investigates the timing and mode of death after pediatric OHCA and factors associated with mortality. Additionally, this study explores delayed recovery after comatose examination on day 3 postarrest. DESIGN: This is a retrospective, observational study based on data collected

from hospital databases and chart reviews. SETTING: Data collection occurred in two pediatric academic hospitals between January 1, 2016, and December 31, 2020. PATIENTS: Patients were identified from available databases and electronic medical record queries for the International Classification of Diseases, 10th Edition (ICD-10) code I46.9 (Cardiac Arrest). Patient inclusion criteria included age range greater than or equal to 48 hours to less than 18 years, OHCA within 24 hours of admission, greater than or equal to 1 min of cardiopulmonary resuscitation, and return-of-spontaneous circulation for greater than or equal to 20 min. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: One hundred thirty-five children (65% male) with a median age of 3 years (interquartile range 0.6-11.8) met inclusion criteria. Overall, 63 of 135 patients (47%) died before hospital discharge, including 34 of 63 patients (54%) after WLST. Among these, 20 of 34 patients underwent WLST less than or equal to 3 days postarrest, including 10 of 34 patients who underwent WLST within 1 day. WLST occurred because of poor perceived neurologic prognosis in all cases, although 7 of 34 also had poor perceived systemic prognosis. Delayed neurologic recovery from coma on day 3 postarrest was observed in 7 of 72 children (10%) who ultimately survived to discharge. CONCLUSIONS: In our two centers between 2016 and 2020, more than half the deaths after pediatric OHCA occurred after WLST, and a majority of WLST occurred within 3 days postarrest. Additional research is warranted to determine optimal timing and predictors of neurologic prognosis after pediatric OHCA to better inform families during goals of care discussions.

3. J Matern Fetal Neonatal Med. 2023 Dec;36(2):2276042. doi: 10.1080/14767058.2023.2276042. Epub 2023 Nov 19.

Effective ventilation and chest compressions during neonatal resuscitation - the role of the respiratory device.

Restin T(1)(2), Hönes M(3), Hummler HD(3)(4), Bryant MB(1)(3)(5).

ABSTRACT

BACKGROUND: The success of cardiopulmonary resuscitation (CPR) in newborns largely depends on effective lung ventilation; however, a direct randomized comparison using different available devices has not yet been performed. METHODS: Thirty-six professionals were exposed to a realistic newborn CPR scenario. Ventilation with either a bag-valve mask (BVM), T-piece, or ventilator was applied in a randomized manner during CPR using a Laerdal manikin. The primary outcome was the number of unimpaired inflations, defined as the peak of the inflation occurring after chest compression and lasting at least 0.35 s before the following chest compression takes place. The secondary outcomes were tidal volume delivered and heart compression rate. To simulate potential distractions, the entire scenario was performed with or without a quiz. Statistically, a mixed model assessing fixed effects for experience, profession, device, and distraction was used to analyze the data. For direct comparison, one-way ANOVA with Bonferroni's correction was applied. RESULTS: The number of unimpaired inflations was highest in health care professionals using the BVM with a mean ± standard deviation of 12.8 ± 2.8 (target: 15 within 30 s). However, the tidal volumes were too large in this group with a tidal volume of 42.5 ± 10.9 ml (target: 25-30 ml). The number of unimpaired breaths with the mechanical ventilator and the T-piece system were 11.6 (±3.6) and 10.1 (±3.7), respectively. Distraction did not change these outcomes, except for the significantly lower tidal volumes with the T-piece during the quiz. CONCLUSIONS: In summary, for our health care professionals, ventilation using the mechanical ventilator seemed to provide the best approach during CPR, especially in a population of preterm infants prone to volutrauma.

EXTRACORPOREAL LIFE SUPPORT

1. Artif Organs. 2023 Nov 23. doi: 10.1111/aor.14671. Online ahead of print.

First experience with the new extracorporeal membrane oxygenation system Colibrì.
Saemann L(1), Stiller M(1), Willsch J(1), Schultze T(1), Matin M(1), Veres G(1), Szabó G(1)(2).
ABSTRACT
INTRODUCTION: Extracorporeal membrane oxygenation (ECMO) is increasingly used for circulatory or pulmonary support not only in-hospital but also out-of-hospital. Small dimensions and a lightweight design are important, especially for out-of-hospital use but also for intra-hospital transportation of patients who require ECMO support. We share our first experience with the new Colibrì ECMO system. PATIENTS AND METHODS: From December 2022 to January 2023, we used the new Colibrì extracorporeal circulation (ECC) system in six patients with cardiac or pulmonary failure. RESULTS: The Colibrì system was used in-hospital in six patients with post-cardiac surgery low output syndrome, respiratory failure due to influenza or acute respiratory distress syndrome, cardiogenic shock, pulmonary embolism, and failed weaning from cardiopulmonary bypass. The system was implanted in venovenous (VV) and venoarterial (VA) fashion in 3 patients, respectively. In one patient, the configuration was switched from VA to VV after cardiac recovery. One patient received left-ventricular unloading using the IMPELLA®5.5. ECMO run time was 1 to 13 days. We did not notice any ECC system-associated complications. No ECMO system changes were required. CONCLUSION: Our case series concludes that the new Colibrì system is safe and effective for in-hospital ECMO indications. The small dimensions and lightweight design are very beneficial for the transportation of patients. It might be especially helpful for out-of-hospital situations.

EXPERIMENTAL RESEARCH

1. J Vis Exp. 2023 Nov 3;(201). doi: 10.3791/63957.
Technical Refinement of a Bilateral Renal Ischemia-Reperfusion Mouse Model for Acute Kidney Injury Research.
Ku HC(1), Huang CW(1), Lee SY(2).
ABSTRACT
Cardiac arrest poses a large public health burden. Acute kidney injury (AKI) is an adverse marker in survivors of cardiac arrest following the return of spontaneous circulation (ROSC) after successful cardiopulmonary resuscitation. Conversely, recovery of kidney function from AKI is a predictor of favorable neurological outcomes and hospital discharge. However, an effective intervention to prevent kidney damage caused by cardiac arrest after ROSC is lacking, suggesting that additional therapeutic strategies are required. Renal hypoperfusion and reperfusion are two pathophysiological mechanisms that cause AKI after cardiac arrest. Animal models of ischemia-reperfusion-induced AKI (IR-AKI) of both kidneys are comparable with patients with AKI following ROSC in a clinical setting. However, IR-AKI of both kidneys is technically challenging to analyze because the model is associated with high mortality and wide variation in kidney damage, which may affect the analysis. Lightweight mice were chosen, placed under general anesthesia with isoflurane, subjected to surgery with a dorsolateral approach, and their body temperature maintained during operation, thereby reducing tissue damage and establishing a reproducible acute renal IR-AKI research protocol.

2. Children (Basel). 2023 Nov 13;10(11):1804. doi: 10.3390/children10111804.
Femoral Occlusion during Neonatal Cardiopulmonary Resuscitation Improves Outcomes in an Ovine Model of Perinatal Cardiac Arrest.
Rawat M(1), Mani S(2), Gugino SF(1), Koenigsknecht C(1), Helman J(1), Nielsen L(1), Nair J(3), Munshi U(4), Chandrasekharan P(1), Lakshminrusimha S(5).
ABSTRACT
BACKGROUND: The goal of chest compressions during neonatal resuscitation is to increase cerebral and coronary blood flow leading to the return of spontaneous circulation (ROSC). During chest

compressions, bilateral femoral occlusion may increase afterload and promote carotid and coronary flow, an effect similar to epinephrine. Our objectives were to determine the impact of bilateral femoral occlusion during chest compressions on the incidence and timing of ROSC and hemodynamics. METHODOLOGY: In this randomized study, 19 term fetal lambs in cardiac arrest were resuscitated based on the Neonatal Resuscitation Program guidelines and randomized into two groups: femoral occlusion or controls. Bilateral femoral arteries were occluded by applying pressure using two fingers during chest compressions. RESULTS: Seventy percent (7/10) of the lambs in the femoral occlusion group achieved ROSC in 5 ± 2 min and three lambs (30%) did not receive epinephrine. ROSC was achieved in 44% (4/9) of the controls in 13 ± 6 min and all lambs received epinephrine. The femoral occlusion group had higher diastolic blood pressures, carotid and coronary blood flow. CONCLUSION: Femoral occlusion resulted in faster and higher incidence of ROSC, most likely due to attaining increased diastolic pressures, coronary and carotid flow. This is a low-tech intervention that can be easily adapted in resource limited settings, with the potential to improve survival and neurodevelopmental outcomes.

3. J Clin Med. 2023 Nov 13;12(22):7054. doi: 10.3390/jcm12227054.

The Impact of Head Position on Neurological and Histopathological Outcome Following Controlled Automated Reperfusion of the Whole Body (CARL) in a Pig Model.

Damjanovic D(1), Pooth JS(2), Liu Y(1), Frensch F(1), Wolkewitz M(3), Haberstroh J(4), Doostkam S(5), Cristina Schmitz HR(4), Foerster K(6), Taunyane I(1), Neubert T(1), Scherer C(1), Diel P(1), Benk C(1), Beyersdorf F(1), Trummer G(1).

ABSTRACT

Introduction: Based on extracorporeal circulation, targeted reperfusion strategies have been developed to improve survival and neurologic recovery in refractory cardiac arrest: Controlled Automated Reperfusion of the whoLe Body (CARL). Furthermore, animal and human cadaver studies have shown beneficial effects on cerebral pressure due to head elevation during conventional cardiopulmonary resuscitation. Our aim was to evaluate the impact of head elevation on survival, neurologic recovery and histopathologic outcome in addition to CARL in an animal model. Methods: After 20 min of ventricular fibrillation, 46 domestic pigs underwent CARL, including high, pulsatile extracorporeal blood flow, pH-stat acid-base management, priming with a colloid, mannitol and citrate, targeted oxygen, carbon dioxide and blood pressure management, rapid cooling and slow rewarming. N = 25 were head-up (HUP) during CARL, and N = 21 were supine (SUP). After weaning from ECC, the pigs were extubated and followed up in the animal care facility for up to seven days. Neuronal density was evaluated in neurohistopathology. Results: More animals in the HUP group survived and achieved a favorable neurological recovery, 21/25 (84%) versus 6/21 (29%) in the SUP group. Head positioning was an independent factor in neurologically favorable survival ($p < 0.00012$). Neurohistopathology showed no significant structural differences between HUP and SUP. Distinct, partly transient clinical neurologic deficits were blindness and ataxia. Conclusions: Head elevation during CARL after 20 min of cardiac arrest independently improved survival and neurologic outcome in pigs. Clinical follow-up revealed transient neurologic deficits potentially attributable to functions localized in the posterior perfusion area, whereas histopathologic findings did not show corresponding differences between the groups. A possible explanation of our findings may be

venous congestion and edema as modifiable contributing factors of neurologic injury following prolonged cardiac arrest.

CASE REPORTS

1. JACC Cardiovasc Interv. 2023 Nov 2:S1936-8798(23)01374-2. doi: 10.1016/j.jcin.2023.10.013. Online ahead of print.
A Case of Successful Balloon Aortic Valvuloplasty for Transcatheter Aortic Valve Distortion Following Cardiopulmonary Resuscitation.
Muraishi M(1), Nakama T(2), Amano H(1), Fukita K(3), Noguchi M(1), Obunai K(1), Ito J(3), Watanabe H(1).
NO ABSTRACT AVAILABLE