

This week's PubMed 17th – 23rd September 2023: articles of interest n = 44

CPR AND COVID-19

No articles identified.

CPR/MECHANICAL CHEST COMPRESSION

1. Acta Anaesthesiol Scand. 2023 Sep 19. doi: 10.1111/aas.14330. Online ahead of print.

Compliance with CPR quality guidelines and survival after 30 days following out-of-hospital cardiac arrest. A retrospective study.

Järvenpää V(1)(2), Mäki P(2), Huhtala H(3), Elo H(4), Länkimäki S(2), Setälä P(2), Hoppu S(2).

ABSTRACT

BACKGROUND: Our study assessed the quality of cardiopulmonary resuscitation (CPR) given by emergency medical services in Southern Ostrobothnia Finland, as is advised in the international guidelines. The goal was to evaluate the current quality of CPR given to patients who suffered an out-of-hospital cardiac arrest and to examine possible measures for improving emergency medical services. **METHODS:** A retrospective study was conducted on out-of-hospital cardiac arrest patients in Southern Ostrobothnia, Finland, during a three-year period. Confounding caused by each patient's individual medical history was addressed by calculating Charlson Comorbidity Index (CCI), a score describing individual's risk for death in 10 years. The Utstein analysis and the CPR metrics were acquired from the medical records hospital district in question and analysed in an orderly manner using SPSS. Descriptive statistics are presented as mean (SD) and median [IQR]. **RESULTS:** We found that of the 349 patients, 144 (41%) received ROSC, 96 (28%) survived to the hospital and 51 (15%) survived for at least 30 days. CPR metrics data were available for 181 patients. CCIs were 3.0 versus 5.0 ($p = .157$) for the ones who did and those who did not survive at least 30 days. Correspondingly, following metrics were as follows: Mean compression depth was 5.1 (1.3) versus 5.6 (0.8) cm ($p = .088$), median 28 [18;40] versus 40 [26;54]% of the compressions were in target depth ($p = .015$) and median compression rate was 113 [109;119] versus 112 [108;120] min⁻¹ ($p = .757$). The median no-flow fraction was 5.1 [2.8;7.1] versus 3.7 [2.5;5.5] s ($p = .073$). Ventricular fibrillation (OR 8.74, 95% CI 2.89-26.43, $p < .001$), public location (OR 3.163, 95% CI 1.03-9.69, $p = .044$) and compression rate of 100-110/min (OR 7.923, 95% CI 2.11-29.82, $p = .002$) were related to survival. **CONCLUSION:** Patients who suffered out-of-hospital cardiac arrest in Southern Ostrobothnia received CPR that met the international CPR quality target values. The proportion of unintentional pauses during CPR was low and the 30-day survival rate exceeded the international average.

2. Resusc Plus. 2023 Sep 12;16:100472. doi: 10.1016/j.resplu.2023.100472. eCollection 2023 Dec.

Cardiac Arrest Bundle of cARE Trial (CABARET) survey of current UK neuroprotective CPR practice.

Raitt J(1), Maxwell E(1), Plumb J(2)(3), Brown M(4), Pocock H(4), Hannah J(2)(3), Deakin C(3)(4).

ABSTRACT

Despite low out of hospital cardiac arrest (OOHCA) survival rates within the UK, animal studies hint at improved cerebral blood flow via a bundled neuroprotective CPR approach. The CABARET study introduces three key devices: the Head Up Position (HUP), Active Compression/Decompression (ACD) CPR, and the Impedance Threshold Device (ITD). A survey involving 27 UK pre-hospital critical care services indicated none are using these interventions widely, either alone or bundled. The CABARET team is now initiating a pilot study to investigate the feasibility of this CPR bundle, aiming to fill the prevailing evidence void in resuscitation research.

3. Diving Hyperb Med. 2023 Sep 30;53(3):172-180. doi: 10.28920/dhm53.3.172-180.

Delivering manual cardiopulmonary resuscitation (CPR) in a diving bell: an analysis of head-to-chest and knee-to-chest compression techniques.

Johnson G(1)(2)(3), Bryson P(4), Tilbury N(1), McGregor B(4), Wesson A(5), Hughes GD(1), Hughes GR(1), Tabner A(1)(2).

ABSTRACT

INTRODUCTION: Chest compression often cannot be administered using conventional techniques in a diving bell. Multiple alternative techniques are taught, including head-to-chest and both prone and seated knee-to-chest compressions, but there are no supporting efficacy data. This study evaluated the efficacy, safety and sustainability of these techniques. **METHODS:** Chest compressions were delivered by a team of expert cardiopulmonary resuscitation (CPR) providers. The primary outcome was proportion of chest compressions delivered to target depth compared to conventional CPR. Techniques found to be safe and potentially effective by the study team were further trialled by 20 emergency department staff members. **RESULTS:** Expert providers delivered a median of 98% (interquartile range [IQR] 1.5%) of chest compressions to the target depth using conventional CPR. Only 32% (IQR 60.8%) of head-to-chest compressions were delivered to depth; evaluation of the technique was abandoned due to adverse effects. No study team member could register sustained compression outputs using prone knee-to-chest compressions. Seated knee-to-chest were delivered to depth 12% (IQR 49%) of the time; some compression providers delivered > 90% of compressions to depth. **CONCLUSIONS:** Head-to-chest compressions have limited efficacy and cause harm to providers; they should not be taught or used. Prone knee-to-chest compressions are ineffective. Seated knee-to-chest compressions have poor overall efficacy but some providers deliver them well. Further research is required to establish whether this technique is feasible, effective and sustainable in a diving bell setting, and whether it can be taught and improved with practise.

4. Diving Hyperb Med. 2023 Sep 30;53(3):181-188. doi: 10.28920/dhm53.3.181-188.

An evaluation of the NUI Compact Chest Compression Device (NCCD), a mechanical CPR device suitable for use in the saturation diving environment.

Tabner A(1)(2)(3), Bryson P(4), Tilbury N(1), McGregor B(4), Wesson A(4), Hughes GD(1), Hughes GR(1), Johnson G(1)(2).

ABSTRACT

INTRODUCTION: Provision of manual chest compressions in a diving bell using a conventional technique is often impossible, and alternative techniques are poorly evidenced in terms of efficacy and sustainability. The first mechanical cardiopulmonary resuscitation (CPR) device suitable for use in this environment, the NUI Compact Chest Compression Device (NCCD), has recently been designed and manufactured. This study assessed both the efficacy of the device in delivering chest compressions to both prone and seated manikins, and the ability of novice users to apply and operate it. **METHODS:** Compression efficacy was assessed using a Resusi Anne QCPR intelligent manikin, and the primary outcome was the proportion of compressions delivered to target depth (50-60 mm). The gold standard was that achieved by expert CPR providers delivering manual CPR; the LUCAS 3 mCPR device was a further comparator. **RESULTS:** The NCCD delivered 100% of compressions to target depth compared to 98% for the gold standard (interquartile range 1.5%) and 98% for the LUCAS 3 when applied to both supine and seated manikins. The NCCD sometimes became dislodged and had to be reapplied when used with a seated manikin. **CONCLUSIONS:** The NCCD can deliver chest compressions at target rate and depth to both supine and seated manikins with efficacy equivalent to manual CPR and the LUCAS 3. It can become dislodged when applied to a

seated manikin; its design has now been altered to prevent this. New users can be trained in use of the NCCD quickly, but practise is required to ensure effective use.

5. Am J Emerg Med. 2023 Aug 28;74:9-13. doi: 10.1016/j.ajem.2023.08.039. Online ahead of print.
Comparison of chest compression quality between the overlapping hands and interlocking hands techniques: A randomised cross-over trial.

Marquis A(1), Douillet D(2), Morin F(3), Chauvat D(4), Sechet A(4), Lacour H(4), Poiroux L(5), Savary D(6).

ABSTRACT

BACKGROUND: Performing quality chest compressions is fundamental to the management of cardiopulmonary arrest. The aim of this study was to compare the efficacy of two hand positions: overlapping versus interlocking for performing chest compressions during cardiopulmonary arrest. **METHODS:** The HP2C (for Hands Position and Chest Compression) was a prospective, randomised, open-label, cross-over, single-centre study. Participants were recruited from the Emergency Medical Service (EMS) teams and the prehospital firefighter teams. They were randomised to start chest compressions either with overlapping or interlocking hands and then performed the other technique after a washout period. The judgement criteria were the overall chest compressions success score generated by software in accordance with ILCOR recommendations, the quality of compression, release, rate and subjective intensity measured with the Borg scale. **RESULTS:** A total of 100 participants were included in the study. The mean age of the caregivers was 38 ± 9.3 years. The median CPR score was 79.5% IQR [48.5-94.0] in the overlapping hands group and 71% IQR [38.0-92.8] in the interlocking hands group (p -value = 0.37). There was no significant difference for the other criteria, especially no difference in term of intensity of effort. However, there was a trend towards better results with overlapping hands. **CONCLUSIONS:** This study failed to demonstrate a difference in effectiveness between overlapping and interlocking hand chest compressions during cardiopulmonary resuscitation.

REGISTRIES, REVIEWS AND EDITORIALS

1. High Alt Med Biol. 2023 Sep 22. doi: 10.1089/ham.2023.0068. Online ahead of print.

Termination of Cardiopulmonary Resuscitation in Mountain Rescue: A Scoping Review and ICAR MedCom 2023 Recommendations.

Lugnet V(1)(2)(3), McDonough M(1)(4), Gordon L(1)(5)(6), Galindez M(1)(7)(8), Mena Reyes N(1)(9)(10)(11), Sheets A(1)(12)(13), Zafren K(1)(14)(15)(16), Paal P(1)(17).

ABSTRACT

Background: In 2012, the International Commission for Mountain Emergency Medicine (ICAR MedCom) published recommendations for termination of cardiopulmonary resuscitation (CPR) in mountain rescue. New developments have necessitated an update. This is the 2023 update for termination of CPR in mountain rescue. **Methods:** For this scoping review, we searched the PubMed and Cochrane libraries, updated the recommendations, and obtained consensus approval within the writing group and the ICAR MedCom. **Results:** We screened a total of 9,102 articles, of which 120 articles met the inclusion criteria. We developed 17 recommendations graded according to the strength of recommendation and level of evidence. **Conclusions:** Most of the recommendations from 2012 are still valid. We made minor changes regarding the safety of rescuers and responses to primary or traumatic cardiac arrest. The criteria for termination of CPR remain unchanged. The principal changes include updated recommendations for mechanical chest compression, point of care ultrasound (POCUS), extracorporeal life support (ECLS) for hypothermia, the effects of water temperature in drowning, and the use of burial times in avalanche rescue.

2. Lancet Public Health. 2023 Sep 15:S2468-2667(23)00173-1. doi: 10.1016/S2468-2667(23)00173-1. Online ahead of print.

Incidence, process of care, and outcomes of out-of-hospital cardiac arrest in China: a prospective study of the BASIC-OHCA registry.

Zheng J(1), Lv C(2), Zheng W(1), Zhang G(3), Tan H(4), Ma Y(5), Zhu Y(6), Li C(7), Han X(6), Yan S(3), Pan C(1), Zhang J(1), Hou Y(1), Wang C(1), Bian Y(1), Liu R(1), Cheng K(1), Ma J(1), Zheng Z(1), Song R(1), Wang M(1), Gu J(1), McNally B(8), Ong MEH(9), Chen Y(1), Xu F(10); BASIC-OHCA Coordinators and Investigators.

ABSTRACT

BACKGROUND: Out-of-hospital cardiac arrest (OHCA) is an important global public health issue, but its epidemiology and outcomes in low-income and middle-income countries remain largely unknown. We aim to comprehensively describe the incidence, process of care, and outcomes of OHCA in China. **METHODS:** In the prospective, multicentre, population-based Baseline Investigation of Out-of-hospital Cardiac Arrest (BASIC-OHCA) registry study, participating sites were selected from both urban and rural areas in all seven geographical regions across China. All patients with OHCA assessed by emergency medical service (EMS) staff were consecutively enrolled from Aug 1, 2019, to Dec 31, 2020. Patients with suspected cardiac arrest assessed by bystanders whose return of spontaneous circulation was achieved without the need for defibrillation or EMS personnel cardiopulmonary resuscitation were excluded. Patients with all key variables missing were excluded, including resuscitation attempt, age, sex, witnessed status, cause, all process of care indicators, and all outcome measures. In this analysis, we included data for EMS agencies serving 25 monitoring sites (20 urban and five rural) that included the entire serving population, data for the whole of 2020, and at least 50 OHCA patients in 2020. Data were collected and reported using the Utstein template. We calculated the crude incidence of EMS-assessed OHCA in 2020. We also report data on baseline characteristics (including sex, cause, location of OHCA, and presence of shockable rhythm), process of care (including EMS response time, cardiopulmonary resuscitation, defibrillation, and advanced life support), and outcomes of non-traumatic OHCA between Aug 1, 2019, and Dec 31, 2020, including survival and survival with favourable neurological outcomes at discharge or 30 days, and at 6 and 12 months. **FINDINGS:** Of 115·1 million people served by the 25 participating sites, 132 262 EMS-assessed patients with OHCA were enrolled, and resuscitation was attempted for 42 054 (31·8%) patients between Aug 1, 2019, and Dec 31, 2020. The crude incidence of EMS-assessed OHCA was 95·7 per 100 000 population (95% CI 95·6-95·8) in 2020. Among 38 227 individuals with non-traumatic OHCA, 25 958 (67·9%) were male, 30 282 (79·2%) had a cardiac arrest at home, 32 523 (85·1%) had a presumed cardiac cause, and 2297 (6·0%) presented with an initial shockable rhythm. 4049 (11·5%) of 35 090 patients with an unwitnessed or bystander-witnessed OHCA received dispatcher-assisted cardiopulmonary resuscitation and 7121 (20·3%) received bystander cardiopulmonary resuscitation; only 14 (<0·1%) patients were assessed by bystanders with an automated external defibrillator. The median EMS response time was 12 min (IQR 9-16). At hospital discharge or 30 days, 441 (1·2%) of 38 227 survived, 304 (0·8%) survived up to 6 months, and 269 (0·7%) up to 12 months. At hospital discharge or 30 days, 309 (0·8%) survived with favourable neurological outcomes, 257 (0·7%) had favourable neurological outcomes at 6 months, and 236 (0·6%) at 12 months. **INTERPRETATION:** Our findings revealed a high burden of EMS-assessed OHCA with a low proportion of resuscitation attempts. The suboptimal implementation of chain of survival and unsatisfactory prognosis call for national efforts to improve the care and outcomes of patients with OHCA in China.

3. J Am Heart Assoc. 2023 Sep 19;12(18):e031000. doi: 10.1161/JAHA.123.031000. Epub 2023 Sep 18.

Out-of-Hospital Cardiac Arrests: Adding to the Complexity.

Joyner BL Jr(1).

NO ABSTRACT AVAILABLE

4. Lancet Public Health. 2023 Sep 15:S2468-2667(23)00208-6. doi: 10.1016/S2468-2667(23)00208-6. Online ahead of print.

Establishing an out-of-hospital cardiac arrest registry in China: a key first step to improving outcomes.

Mellett-Smith A(1), Couper K(2).

NO ABSTRACT AVAILABLE

5. Circ Arrhythm Electrophysiol. 2023 Sep;16(9):e012129. doi: 10.1161/CIRCEP.123.012129. Epub 2023 Aug 11.

Myocarditis and Sudden Cardiac Death in the Community: Clinical and Pathological Insights From a National Registry in the United Kingdom.

Bhatia RT(#)(1)(2), Finocchiaro G(#)(1), Westaby J(1)(3), Chatrath N(1), Behr ER(1), Papadakis M(1), Sharma S(1), Sheppard MN(1)(3).

NO ABSTRACT AVAILABLE

IN-HOSPITAL CARDIAC ARREST

1. BMJ Open Qual. 2023 Sep;12(3):e002220. doi: 10.1136/bmjopen-2022-002220.

Empowering telemetry technicians and enhancing communication to improve in-hospital cardiac arrest survival.

McCoy C(1), Keshvani N(2), Warsi M(3), Brown LS(4), Girod C(5)(6), Chu ES(6)(7), Hegde AA(8)(7).

ABSTRACT

Delays in treatment of in-hospital cardiac arrests (IHCAs) are associated with worsened survival. We sought to assess the impact of a bundled intervention on IHCA survival in patients on centralised telemetry. A retrospective quality improvement study was performed of a bundled intervention which incorporated (1) a telemetry hotline for telemetry technicians to reach nursing staff; (2) empowerment of telemetry technicians to directly activate the IHCA response team and (3) a standardised escalation system for automated critical alerts within the nursing mobile phone system. In the 4-year study period, there were 75 IHCAs, including 20 preintervention and 55 postintervention. Cox proportional hazard regression predicts postintervention individuals have a 74% reduced the risk of death (HR 0.26, 95% CI 0.08 to 0.84) during a code and a 55% reduced risk of death (HR 0.45, 95% CI 0.23 to 0.89) prior to hospital discharge. Overall code survival improved from 60.0% to 83.6% (p=0.031) with an improvement in ventricular tachycardia/ventricular fibrillation (VT/VF) code survival from 50.0% to 100.0% (p=0.035). There was no difference in non-telemetry code survival preintervention and postintervention (71.4% vs 71.3%, p=0.999). The bundled intervention, including improved communication between telemetry technicians and nurses as well as empowerment of telemetry technicians to directly activate the IHCA response team, may improve IHCA survival, specifically for VT/VF arrests.

2. J Patient Saf. 2023 Oct 1;19(7):478-483. doi: 10.1097/PTS.0000000000001145. Epub 2023 Jul 26.

Rapid Response System Components and In-Hospital Cardiac Arrests Rates 21 Years After Introduction Into an Australian Teaching Hospital.

Jones D(1), Pearsell J, Wadeson E, See E, Bellomo R; Austin Health DPC investigators.

ABSTRACT

OBJECTIVES: The aims of the study are: (1) to evaluate the epidemiology of in-hospital cardiac arrests (IHCAs) 21 years after implementing a rapid response teams (RRTs); and (2) to summarize policies, procedures, and guidelines related to a national standard pertaining to recognition of and response to clinical deterioration in hospital. **METHODS:** The study used a prospective audit of IHCA (commencement of external cardiac compressions) in ward areas between February 1, 2021, and January 31, 2022. Collation, summary, and presentation of material related to 8 "essential elements" of the Australian Commission for Safety and Quality in Health Care consensus statement on clinical deterioration. **RESULTS:** There were 3739 RRT calls and 244 respond blue calls. There were 20 IHCAs in clinical areas, with only 10 occurring in general wards (0.36/1000 admissions). The median (interquartile range) age was 69.5 years (60-77 y), 90% were male, and comorbidities were relatively uncommon. Only 5 patients had a shockable rhythm. Survival was 65% overall, and 80% and 50% in patients on the cardiac and general wards, respectively. Only 4 patients had RRT criteria in the 24 hours before IHCA. A detailed summary is provided on policies and guidelines pertaining to measurement and documentation of vital signs, escalation of care, staffing and oversight of RRTs, communication for safety, education and training, as well as evaluation, audit, and feedback, which underpinned such findings. **CONCLUSIONS:** In our mature RRT, IHCAs are very uncommon, and few are preventable. Many of the published barriers encountered in successful RRT use have been addressed by our policies and guidelines.

INJURIES AND CPR

No articles identified.

CAUSE OF THE ARREST

1. J Cardiol. 2023 Sep 19:S0914-5087(23)00228-9. doi: 10.1016/j.jcc.2023.09.006. Online ahead of print.

Prevalence of atrial septal defects and patent foramen ovale in a cohort of sudden cardiac death patients undergoing autopsy.

Fahy L(1), Rowe S(2), Nehme Z(3), Stub D(4), Zentner D(5), James P(5), Pflaumer A(6), Connell V(7), Semsarian C(8), Ingles J(9), La Gerche A(10), Paratz ED(10).

ABSTRACT

BACKGROUND: Patent foramen ovale (PFO) and atrial septal defects (ASD) have been described in up to 30 % of subjects in autopsy series but contemporary data are scarce. It is important to confirm the prevalence of ASD/PFO in the general population given the potential associated stroke risk and the increasing availability of intervention via PFO closure. **METHODS:** A state-wide prospective out-of-hospital cardiac arrest registry (OHCA) identified all patients aged 1 to 50 years who experienced OHCA in Victoria, Australia from April 2019 to April 2022 and subsequently underwent autopsy with a cardiac cause of death identified. Autopsy was performed including visual description of any ASD and identification of probe patency of foramen ovale. **RESULTS:** A total of 517 patients underwent autopsy in the setting of sudden cardiac death; 36 patients (6.9 %) had a probe-patent foramen ovale, 2 patients (0.4 %) had secundum ASD, and 2 patients (0.4 %) had both a PFO and ASD (1 of whom had undergone percutaneous repair of both lesions). Twelve patients (2.3 %) had a prior history of cerebrovascular accident either recorded on medical history or detected on neuropathological examination; however none of these patients had a PFO or ASD. **CONCLUSIONS:** The combined rate of PFO and ASD in a cohort of 517 patients undergoing autopsy was 7.9 %. None of these patients had experienced a cerebrovascular accident. This rate of PFOs appears lower than

earlier reports and raises the possibility that the relative risk of an associated stroke could be higher than previously estimated.

2. Am J Cardiol. 2023 Sep 16;206:277-284. doi: 10.1016/j.amjcard.2023.08.145. Online ahead of print.

Predictors and Outcomes of Sudden Cardiac Arrest in Heart Failure With Preserved Ejection Fraction: A Nationwide Inpatient Sample Analysis.

Garg M(1), Gupta M(2), Patel NN(3), Bansal K(4), Lam PH(5), Sheikh FH(6).

ABSTRACT

Sudden cardiac arrest (SCA) is the leading cause of cardiovascular mortality in heart failure with preserved ejection fraction (HFpEF), contributing to around 25% of deaths observed in pivotal HFpEF trials. However, predictors and outcomes of in-hospital SCA in HFpEF have not been well characterized. We queried the Nationwide Inpatient Sample (2016 to 2017) to identify adult hospitalizations with a diagnosis of HFpEF. Patients with acute or chronic conditions associated with SCA (e.g., acute myocardial infarction, acute pulmonary embolism, sarcoidosis) were excluded. We ascertained whether SCA occurred during these hospitalizations, identified predictors of SCA using multivariate logistic regression, and determined outcomes of SCA in HFpEF. Of 2,909,134 hospitalizations, SCA occurred in 1.48% (43,105). The mean age of the SCA group was 72.3 ± 12.4 years, 55.8% were women, and 66.4% were White. Presence of third-degree atrioventricular block (odds ratio [OR] 5.95, 95% confidence interval [CI] 5.31 to 6.67), left bundle branch block (OR 1.96, 95% CI 1.72 to 2.25), and liver disease (OR 1.87, 95% CI 1.73 to 2.02) were the leading predictors of SCA in HFpEF. After excluding patients with do-not-resuscitate status, the SCA group versus those without SCA had higher mortality (25.9% vs 1.6%), major bleeding complications (4.1% vs 1.7%), increased use of percutaneous coronary intervention (2.5% vs 0.7%), and mechanical circulatory assist device (1.2% vs 0.1%). These observational inpatient data suggest identifiable risk factors for SCA in HFpEF including cardiac arrhythmias. Further research is warranted to identify the best tools to risk-stratify patients with HFpEF to implement targeted SCA prevention strategies.

END-TIDAL CO₂

No articles identified.

ORGAN DONATION

No articles identified.

FEEDBACK

No articles identified.

DRUGS

No articles identified.

TRAUMA

1. World J Surg. 2023 Sep 22. doi: 10.1007/s00268-023-07180-5. Online ahead of print.

The Role of Open Cardiopulmonary Resuscitation in Chest Trauma Patients with No Sign of Life: A National Trauma Data Bank Study.

Chang YR(1), Kuo LW(2), Hsu TA(1), Tee YS(3)(4), Fu CY(1)(2), Bajani F(2), Mis J(2), Poulakidas S(2), Bokhari F(2).

ABSTRACT

PURPOSE: The effectiveness of open cardiopulmonary resuscitation (OCPR) remains controversial for trauma patients. In this current study, the role of OCPR in managing chest trauma patients is evaluated using nationwide real-world data. **METHODS:** From 2014 to 2015, the National Trauma Data Bank was retrospectively queried for chest trauma patients with out-of-hospital cardiac arrest status. The emergency department (ED) and overall survival of patients without signs of life were analyzed. Multivariate logistic regression (MLR) analysis was performed to evaluate independent factors of mortality for the target group. Furthermore, a subset group of patients who survived after the ED were studied, focusing on the duration of survival after leaving the ED. **RESULTS:** A total of 911 patients were enrolled in this study (OCPR vs. non-OCPR: 161 patients vs. 750 patients). The average overall mortality rate was 98.6% (N = 898). Among penetrating chest trauma patients, non-survivors in the ED had significantly higher proportions of gunshot injuries (83.9% vs. 69.7%, $p = 0.001$) and lower proportions of OCPR (20.7% vs. 44.4%, $p < 0.001$). MLR analysis showed that gunshot injuries and non-OCPR were significantly related to ED mortality in penetrating trauma patients without signs of life (odds ratio = 2.039, $p = 0.006$ and odds ratio = 2.900, $p < 0.001$, respectively). However, the overall survival rate of patients after ED survival ($n = 99$) was 9.9%, and only 21.2% ($n = 21$) of them survived more than 1 day after leaving the ED. **CONCLUSION:** OCPR could be considered in situations where appropriate indications exist. The survival benefit was observed in critically ill patients with penetrating chest trauma who show no signs of life. By enhancing ED survival, OCPR may also contribute to overall survival improvement.

VENTILATION

1. Arq Bras Cardiol. 2023 Sep 18;120(7):e20230492. doi: 10.36660/abc.20230492. eCollection 2023.

Ventilation and Respiratory Parameters in CPR: Where are We and Next Steps!

[Article in English, Portuguese]

NO ABSTRACT AVAILABLE

2. BMJ Open. 2023 Sep 15;13(9):e074475. doi: 10.1136/bmjopen-2023-074475.

Early restricted oxygen therapy after resuscitation from cardiac arrest (ER-OXYTRAC): protocol for a stepped-wedge cluster randomised controlled trial.

Yamamoto R(1), Yamakawa K(2), Endo A(3), Homma K(4), Sato Y(5), Takemura R(5), Yamagiwa T(6), Shimizu K(7), Kaito D(4), Yagi M(8), Yonemura T(9), Shibusawa T(10), Suzuki G(11), Shoji T(12), Miura N(13), Takahashi J(14), Narita C(15), Kurata S(16), Minami K(17), Wada T(18), Fujinami Y(19), Tsubouchi Y(20), Natsukawa M(21), Nagayama J(22), Takayama W(23), Ishikura K(24), Yokokawa K(25), Fujita Y(26), Nakayama H(27), Tokuyama H(28), Shinada K(29), Taira T(30), Fukui S(31), Ushio N(2), Nakane M(32), Hoshiyama E(33), Tampo A(34), Sageshima H(35), Takami H(36), Iizuka S(37), Kikuchi H(38), Hagiwara J(39), Tagami T(40), Funato Y(41), Sasaki J(4)(42)(43), Er-Oxytrac SG(44).

ABSTRACT

INTRODUCTION: Cardiac arrest is a critical condition, and patients often experience postcardiac arrest syndrome (PCAS) even after the return of spontaneous circulation (ROSC). Administering a restricted amount of oxygen in the early phase after ROSC has been suggested as a potential therapy

for PCAS; however, the optimal target for arterial partial pressure of oxygen or peripheral oxygen saturation (SpO₂) to safely and effectively reduce oxygen remains unclear. Therefore, we aimed to validate the efficacy of restricted oxygen treatment with 94%-95% of the target SpO₂ during the initial 12 hours after ROSC for patients with PCAS. **METHODS AND ANALYSIS:** ER-OXYTRAC (early restricted oxygen therapy after resuscitation from cardiac arrest) is a nationwide, multicentre, pragmatic, single-blind, stepped-wedge cluster randomised controlled trial targeting cases of non-traumatic cardiac arrest. This study includes adult patients with out-of-hospital or in-hospital cardiac arrest who achieved ROSC in 39 tertiary centres across Japan, with a target sample size of 1000. Patients whose circulation has returned before hospital arrival and those with cardiac arrest due to intracranial disease or intoxication are excluded. Study participants are assigned to either the restricted oxygen (titration of a fraction of inspired oxygen with 94%-95% of the target SpO₂) or the control (98%-100% of the target SpO₂) group based on cluster randomisation per institution. The trial intervention continues until 12 hours after ROSC. Other treatments for PCAS, including oxygen administration later than 12 hours, can be determined by the treating physicians. The primary outcome is favourable neurological function, defined as cerebral performance category 1-2 at 90 days after ROSC, to be compared using an intention-to-treat analysis. **ETHICS AND DISSEMINATION:** This study has been approved by the Institutional Review Board at Keio University School of Medicine (approval number: 20211106). Written informed consent will be obtained from all participants or their legal representatives. Results will be disseminated via publications and presentations.

CEREBRAL MONITORING

1. *IBRO Neurosci Rep.* 2023 Sep 6;15:179-185. doi: 10.1016/j.ibneur.2023.09.002. eCollection 2023 Dec.

Measurement of thalamus and cortical damages in hypoxic ischemic encephalopathy.

Sohn G(1), Kim SE(1).

ABSTRACT

BACKGROUND: The thalamic gray-white matter ratios (GWRs) on CT and quantitative suppression ratios (SRs) of background activities on EEG may reflect damages in the thalamus and cerebral hemispheres in patients with hypoxic-ischemic encephalopathy (HIE). **METHODS:** The inclusion criteria were (1) cardiac arrest patients over the age of 20 years from March 2010 to March 2020, and (2) patients who had both EEG and brain CT within 7 days after cardiac arrest. The thalamic GWRs were semi-quantitatively measured by using the region of interest (ROI). SRs of background were analyzed with the installed software (Persyst® v13) in EEG machine. **RESULTS:** 175 patients were included among 686 patients with HIE and the thalamic GWRs of 168 patients were successfully measured. 155 patients (89 %) showed poor outcomes. The poor outcome group revealed not only higher SRs, but also lower thalamic GWRs. The thalamic GWRs showed a negative correlation to the SRs (ρ (rho) = -0.36, $p < 0.0001$ for right side, ρ (rho) = -0.31, $p < 0.0001$ for left side). The good outcome group showed neither beyond the cut-off values of thalamic GWRs nor SRs [40 % (59/148) VS 0 % (0/20) in right side, $p = 0.0005$ %, and 28 % (42/148) VS 0 % (0/20) in left side, $p = 0.0061$]. **CONCLUSION:** The thalamic GWRs and SRs may reflect the damage in the thalamus and cerebral hemispheres in patients with HIE. Insults in the thalamocortical circuit (TCC) or the thalamus might be responsible for the poor outcome.

2. *J Cereb Blood Flow Metab.* 2023 Sep 20:271678X231197392. doi: 10.1177/0271678X231197392. Online ahead of print.

Increased task-relevant fMRI responsiveness in comatose cardiac arrest patients is associated with improved neurologic outcomes.

Dhakal K(1), Rosenthal ES(2), Kulpanowski AM(1), Dodelson JA(1), Wang Z(1), Cudemus-Deseda G(3), Villien M(1), Edlow BL(1)(2), Presciutti AM(4), Januzzi JL(5), Ning M(2), Taylor Kimberly W(2), Amorim E(2), Brandon Westover M(6), Copen WA(7), Schaefer PW(7), Giacino JT(8), Greer DM(9), Wu O(1).

ABSTRACT

Early prediction of the recovery of consciousness in comatose cardiac arrest patients remains challenging. We prospectively studied task-relevant fMRI responses in 19 comatose cardiac arrest patients and five healthy controls to assess the fMRI's utility for neuroprognostication. Tasks involved instrumental music listening, forward and backward language listening, and motor imagery. Task-specific reference images were created from group-level fMRI responses from the healthy controls. Dice scores measured the overlap of individual subject-level fMRI responses with the reference images. Task-relevant responsiveness index (Rindex) was calculated as the maximum Dice score across the four tasks. Correlation analyses showed that increased Dice scores were significantly associated with arousal recovery ($P < 0.05$) and emergence from the minimally conscious state (EMCS) by one year ($P < 0.001$) for all tasks except motor imagery. Greater Rindex was significantly correlated with improved arousal recovery ($P = 0.002$) and consciousness ($P = 0.001$). For patients who survived to discharge ($n = 6$), the Rindex's sensitivity was 75% for predicting EMCS ($n = 4$). Task-based fMRI holds promise for detecting covert consciousness in comatose cardiac arrest patients, but further studies are needed to confirm these findings. Caution is necessary when interpreting the absence of task-relevant fMRI responses as a surrogate for inevitable poor neurological prognosis.

ULTRASOUND AND CPR

No articles identified.

ORGANISATION AND TRAINING

1. Circulation. 2023 Sep 18. doi: 10.1161/CIR.0000000000001161. Online ahead of print.

2023 American Heart Association Focused Update on the Management of Patients With Cardiac Arrest or Life-Threatening Toxicity Due to Poisoning: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.

Lavonas EJ, Akpunonu PD, Arens AM, Babu KM, Cao D, Hoffman RS, Hoyte CO, Mazer-Amirshahi ME, Stolbach A, St-Onge M, Thompson TM, Wang GS, Hoover AV, Drennan IR; American Heart Association.

ABSTRACT

In this focused update, the American Heart Association provides updated guidance for resuscitation of patients with cardiac arrest, respiratory arrest, and refractory shock due to poisoning. Based on structured evidence reviews, guidelines are provided for the treatment of critical poisoning from benzodiazepines, β -adrenergic receptor antagonists (also known as β -blockers), L-type calcium channel antagonists (commonly called calcium channel blockers), cocaine, cyanide, digoxin and related cardiac glycosides, local anesthetics, methemoglobinemia, opioids, organophosphates and carbamates, sodium channel antagonists (also called sodium channel blockers), and sympathomimetics. Recommendations are also provided for the use of venoarterial extracorporeal membrane oxygenation. These guidelines discuss the role of atropine, benzodiazepines, calcium, digoxin-specific immune antibody fragments, electrical pacing, flumazenil, glucagon, hemodialysis, hydroxocobalamin, hyperbaric oxygen, insulin, intravenous lipid emulsion, lidocaine, methylene

blue, naloxone, pralidoxime, sodium bicarbonate, sodium nitrite, sodium thiosulfate, vasodilators, and vasopressors for the management of specific critical poisonings.

2. Sci Rep. 2023 Sep 23;13(1):15884. doi: 10.1038/s41598-023-43210-x.

Machine learning-based analysis of regional differences in out-of-hospital cardiopulmonary arrest outcomes and resuscitation interventions in Japan.

Kawai Y(1), Yamamoto K(2), Miyazaki K(2), Asai H(2), Fukushima H(2).

ABSTRACT

Refining out-of-hospital cardiopulmonary arrest (OHCA) resuscitation protocols for local emergency practices is vital. The lack of comprehensive evaluation methods for individualized protocols impedes targeted improvements. Thus, we employed machine learning to assess emergency medical service (EMS) records for examining regional disparities in time reduction strategies. In this retrospective study, we examined Japanese EMS records and neurological outcomes from 2015 to 2020 using nationwide data. We included patients aged ≥ 18 years with cardiogenic OHCA and visualized EMS activity time variations across prefectures. A five-layer neural network generated a neurological outcome predictive model that was trained on 80% of the data and tested on the remaining 20%. We evaluated interventions associated with changes in prognosis by simulating these changes after adjusting for time factors, including EMS contact to hospital arrival and initial defibrillation or drug administration. The study encompassed 460,540 patients, with the model's area under the curve and accuracy being 0.96 and 0.95, respectively. Reducing transport time and defibrillation improved outcomes universally, while combining transport time and drug administration showed varied efficacy. In conclusion, the association of emergency activity time with neurological outcomes varied across Japanese prefectures, suggesting the need to set targets for reducing activity time in localized emergency protocols.

3. Eur Heart J Qual Care Clin Outcomes. 2023 Sep 19:qcad053. doi: 10.1093/ehjqcco/qcad053.

Online ahead of print.

Association of socioeconomic status with 30-day survival following out-of-hospital cardiac arrest in Scotland, 2011-2020.

Bijman LAE(1)(2), Chamberlain RC(1), Clegg G(1)(2)(3), Kent A(2), Halbesma N(1)(2)(3).

ABSTRACT

BACKGROUND AND AIMS: The aim of this study was to investigate the crude and adjusted association of socioeconomic status with 30-day survival after out-of-hospital cardiac arrest (OHCA) in Scotland and to assess whether the effect of this association differs by sex or age. **METHODS:** This is a population-based, retrospective cohort study, including non-traumatic, non-Emergency Medical Services witnessed patients with OHCA where resuscitation was attempted by the Scottish Ambulance Service, between April 1, 2011 and March 1, 2020. Socioeconomic status was defined using the Scottish Index of Multiple Deprivation (SIMD). The primary outcome was 30-day survival after OHCA. Crude and adjusted associations of SIMD quintile with 30-day survival after OHCA were estimated using logistic regression. Effect modification by age and sex was assessed by stratification. **RESULTS:** Crude analysis showed lower odds of 30-day survival in the most deprived quintile relative to least deprived (OR 0.74, 95%CI 0.63-0.88). Adjustment for age, sex and urban/rural residency decreased the relative odds of survival further (OR 0.56, 95%CI 0.47-0.67). The strongest association was observed in males < 45 years old. Across quintiles of increasing deprivation, evidence of decreasing trends in the proportion of those presenting with shockable initial cardiac rhythm, those receiving bystander cardiopulmonary resuscitation and 30-day survival after OHCA were found.

CONCLUSIONS: Socioeconomic status is associated with 30-day survival after OHCA in Scotland, favouring people living in the least deprived areas. This was not explained by confounding due to age, sex or urban/rural residency. The strongest association was observed in males < 45 years old.

4. Resusc Plus. 2023 Sep 13;16:100473. doi: 10.1016/j.resplu.2023.100473. eCollection 2023 Dec.

Temporal trends in out-of-hospital cardiac arrest with an initial non-shockable rhythm in Singapore.

Lim SL(1)(2)(3), Chan SP(2)(4), Shahidah N(3)(5), Ng QX(6), Ho AFW(3)(5), Arulanandam S(7), Leong BS(8), Ong MEH(5)(9); Singapore PAROS Investigators.

ABSTRACT

AIM: Out-of-hospital cardiac arrest (OHCA) with an initial non-shockable rhythm is the predominant form of OHCA in adults. We evaluated its 10-year trends in epidemiology and management in Singapore. METHODS: Using the national OHCA registry we studied the trends of 20,844 Emergency Medical Services-attended adult OHCA from April 2010 to December 2019. Survival to hospital discharge was the primary outcome. Trends and outcomes were analyzed using linear and logistic regression, respectively. RESULTS: Incidence rates of adult OHCA increased during the study period, driven by non-shockable OHCA. Compared to shockable OHCA, non-shockable OHCA were significantly older, had more co-morbidities, unwitnessed and residential arrests, longer no-flow time, and received less bystander cardiopulmonary resuscitation (CPR) and in-hospital interventions ($p < 0.001$). Amongst non-shockable OHCA, age, co-morbidities, residential arrests, no-flow time, time to patient, bystander CPR and epinephrine administration increased during the study period, while presumed cardiac etiology decreased ($p < 0.05$). Unlike shockable OHCA, survival for non-shockable OHCA did not improve ($p < 0.001$ for trend difference). The likelihood of survival for non-shockable OHCA significantly increased with witnessed arrest (adjusted odds ratio (aOR) 2.02) and bystander CPR (aOR 3.25), but decreased with presumed cardiac etiology (aOR 0.65), epinephrine administration (aOR 0.66), time to patient (aOR 0.93) and age (aOR 0.98). Significant two-way interactions were observed for no-flow time and residential arrest with bystander CPR (aOR 0.96 and 0.40 respectively). CONCLUSION: The incidence of non-shockable OHCA increased between 2010 and 2019. Despite increased interventions, survival did not improve for non-shockable OHCA, in contrast to the improved survival for shockable OHCA.

5. Aging Male. 2023 Dec;26(1):2255013. doi: 10.1080/13685538.2023.2255013. Epub 2023 Sep 19.

Investigation of mortality rates and the factors affecting survival in out-of-hospital cardiac arrest patients.

Ayyıldız A(1), Ayyıldız FA(2), Yıldırım ÖT(3), Yıldız G(2).

ABSTRACT

BACKGROUND: It is known that even if spontaneous circulation returns after cardiopulmonary resuscitation(CPR) in geriatric out-of-hospital cardiac arrests(OHCA), the overall one-year survival rate of these patients is very low. In our study, we aimed to investigate the factors affecting survival in OHCA cases. METHODS: OHCA patients over 18 years of age were examined in two different groups as 18-64 years old and over 65 years old. Demographic data, comorbidities, cardiac arrest rhythms and minutes, and the number of days they were hospitalized in the intensive care unit were recorded. RESULTS: The mean age was 65.9 ± 15.8 years and 39.9% ($n = 110$) of the patients were female. The number of intensive care unit stays was significantly higher in the over-65 age group ($p = 0.011$). The mortality rate and one-year survival rate were significantly lower in the over-65 age group ($p < 0.001$). Median CPR time was 21 min (IQR:14-32) in the entire patient population. The duration of CPR was 22 min (IQR:14-35) in patients with in-hospital mortality, and 15 min (IQR:13-25) in patients discharged from the hospital. In this comparison, the difference is statistically significant

($p = 0.008$). **CONCLUSION:** In our study, it was determined that especially over 65 years of age, coronary artery disease, and post-arrest CPR duration were determinant and predictive factors in in-hospital and long-term survival.

6. J Am Heart Assoc. 2023 Sep 19;12(18):e030087. doi: 10.1161/JAHA.123.030087. Epub 2023 Jul 26. **Comparison of Out-of-Hospital Cardiac Arrest Outcomes Between Asian and White Individuals in the United States.**

Gupta K(1)(2), Raj R(3), Asaki SY(4), Kennedy K(1), Chan PS(1)(2).

ABSTRACT

Background Disparities in bystander cardiopulmonary resuscitation (CPR) and survival have been reported for Black and Hispanic individuals with out-of-hospital cardiac arrest (OHCA). Whether Asian individuals have lower rates of bystander CPR and survival for OHCA, as compared with White individuals, remains unknown. Methods and Results Within the US-based CARES (Cardiac Arrest Registry to Enhance Survival), we identified 278 989 OHCA in Asian and White individuals during 2013 to 2021. Using hierarchical Poisson logistic regression with emergency medical service agency modeled as a random effect and patient and OHCA characteristics as fixed effects, we compared rates of bystander CPR, survival to discharge, and favorable neurological survival between Asian and White individuals with OHCA. Overall, 14 835 (5.3%) OHCA occurred in Asian individuals. Compared with White individuals with OHCA, Asian individuals were older (67.0 ± 17.6 versus 62.8 ± 16.9 years) and were less likely to have drug overdose as the cause of OHCA (1.3% versus 6.6%) and a shockable arrest rhythm (19.2% versus 22.4%). Layperson bystander CPR rates were similar between Asian and White individuals (42.6% versus 42.1%; adjusted relative risk for Asian individuals, 0.99 [95% CI, 0.97-1.02]; $P=0.69$). However, rates of survival to discharge were lower in Asian individuals with OHCA (8.2% versus 10.3%; adjusted relative risk 0.92 [0.86-0.98] $P=0.006$). Similarly, the rate of favorable neurological survival was lower for Asian individuals (6.5% versus 8.7%; adjusted relative risk, 0.85 [0.79-0.91]; $P<0.001$). Conclusions Despite similar rates of bystander CPR, Asian individuals with OHCA have lower survival rates than White individuals with OHCA. The reasons for the lower survival rate deserve further study to determine whether there are disparities in resuscitation care between Asian and White individuals with OHCA.

7. Medicine (Baltimore). 2023 Sep 15;102(37):e35057. doi: 10.1097/MD.00000000000035057.

A model study for the classification of high-risk groups for cardiac arrest in general ward patients using simulation techniques.

Song SY(1), Choi WK(2), Kwak S(3).

ABSTRACT

Currently, many hospitals use vital signs-based criteria such as modified early warning score (MEWS) and national early warning score (NEWS) to classify high-risk patients for cardiac arrest, but there are limitations in selecting high-risk patients with a possibility of cardiac arrest. The purpose of this study is to develop a cardiac arrest classification model to identify patients at high risk of cardiac arrest based on the patient family and past history, and blood test results after hospitalization, rather than vital signs. This study used electronic medical record (EMR) data from A university hospital, and patients in the high-risk group for cardiac arrest were defined as those who underwent cardio-pulmonary resuscitation (CPR) after cardiac arrest. Considering the use of the rapid response team of A university hospital, patients hospitalized in intensive care units (ICU), emergency medicine departments, psychiatric departments, pediatric departments, cardiology departments, and palliative care wards were excluded. This study included 325,534 patients, of which 3291 low-risk and 382 high-risk patients were selected for study. Data were split into training and validation data sets and univariate analysis was performed for 13 candidate risk factors. Then, multivariate analysis

was performed using a bivariate logistic regression model, and an optimal model was selected using simulation analysis. In the training data set, it was calculated as sensitivity 75.25%, precision 21.59%, specificity 66.89%, accuracy 67.79%, F1 score 33.56, area under curve (AUC) 71.1 (95% confidence interval [CI] = 68.9-73.1 P value=<.001). In the validation data set, sensitivity 73.37%, precision 25.81%, specificity 75.03%, accuracy 74.86%, F1 score 38.19, AUC 74.2 (95% CI = 72.1-76.2, P value=<.001) were calculated. A model for classifying the high-risk group of cardiac arrest should be developed from various perspectives. In the future, in order to classify patients with high risk of cardiac arrest, a prospective study on the combined use of the model developed by this study and NEWS or MEWS should be conducted.

8. Resuscitation. 2023 Sep 18;109973. doi: 10.1016/j.resuscitation.2023.109973. Online ahead of print.

Virtual Reality, Augmented Reality, Augmented Virtuality, or Mixed Reality in Cardiopulmonary Resuscitation: Which Extended Reality am I Using for Teaching Adult Basic Life Support?

Fijačko N(1), Metličar Š(2), Kleesiek J(3), Egger J(4), Chang TP(5).

NO ABSTRACT AVAILABLE

POST-CARDIAC ARREST TREATMENTS

1. BMC Ophthalmol. 2023 Sep 21;23(1):386. doi: 10.1186/s12886-023-03137-3.

Clinical features of retinopathy after cardiopulmonary resuscitation.

Park SH(1)(2), Kim SY(1)(2), Park SW(3)(4), Byon I(3)(4), Lee SM(5)(6).

ABSTRACT

PURPOSE: To evaluate the clinical patterns of retinopathy in patients who received cardiopulmonary resuscitation (CPR) using wide-field fundus photography and slit-lamp fundus examination.

METHODS: The medical records of patients aged ≥ 18 years who survived after receiving CPR and underwent wide-field fundus photography and slit-lamp fundus examination within 3 months were retrospectively analyzed. Fundus findings, including retinal hemorrhage and cotton wool spots, were investigated. The subjects were categorized into the retinopathy and non-retinopathy groups based on the presence of fundus findings. Systemic and CPR-related factors were analyzed to compare the two groups. **RESULTS:** Twenty eyes (10 patients) and 28 eyes (14 patients) were included in the retinopathy and non-retinopathy groups, respectively. The retinopathy group had longer CPR time than the non-retinopathy group (15 ± 11 min vs. 6 ± 5 min, $p = 0.027$). In the retinopathy group, retinal nerve fiber layer hemorrhage was observed in all eyes, and intraretinal hemorrhage was observed in 55% of the eyes. 80% of hemorrhages were located in the peripapillary or posterior pole. There were no interval changes in visual acuity, intraocular pressure, and central retinal thickness for 6 months. The average remission periods of retinal hemorrhage and cotton wool spots were 6.8 ± 2.6 month and 5.6 ± 2.1 months, respectively. No retinopathy progression was observed. **CONCLUSION:** The signs of retinopathy, such as retinal hemorrhages and cotton wool spots, which are found after CPR, mainly occur in patients who receive longer time of CPR and improve over time.

TARGETED TEMPERATURE MANAGEMENT

1. Circulation. 2023 Sep 19;148(12):982-988. doi: 10.1161/CIR.0000000000001164. Epub 2023 Aug 16.

Temperature Management for Comatose Adult Survivors of Cardiac Arrest: A Science Advisory From the American Heart Association.

Perman SM, Bartos JA, Del Rios M, Donnino MW, Hirsch KG, Jentzer JC, Kudenchuk PJ, Kurz MC, Maciel CB, Menon V, Panchal AR, Rittenberger JC, Berg KM; American Heart Association Emergency

Cardiovascular Care Committee, Council on Cardiovascular Surgery and Anesthesia; Council on Clinical Cardiology; Council on Cardiovascular and Stroke Nursing; Council on Peripheral Vascular Disease; Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation, and Stroke Council.

ABSTRACT

Targeted temperature management has been a cornerstone of post-cardiac arrest care for patients remaining unresponsive after return of spontaneous circulation since the initial trials in 2002 found that mild therapeutic hypothermia improves neurological outcome. The suggested temperature range expanded in 2015 in response to a large trial finding that outcomes were not better with treatment at 33° C compared with 36° C. In 2021, another large trial was published in which outcomes with temperature control at 33° C were not better than those of patients treated with a strategy of strict normothermia. On the basis of these new data, the International Liaison Committee on Resuscitation and other organizations have altered their treatment recommendations for temperature management after cardiac arrest. The new American Heart Association guidelines on this topic will be introduced in a 2023 focused update. To provide guidance to clinicians while this focused update is forthcoming, the American Heart Association's Emergency Cardiovascular Care Committee convened a writing group to review the TTM2 trial (Hypothermia Versus Normothermia After Out-of-Hospital Cardiac Arrest) in the context of other recent evidence and to present an opinion on how this trial may influence clinical practice. This science advisory was informed by review of the TTM2 trial, consideration of other recent influential studies, and discussion between cardiac arrest experts in the fields of cardiology, critical care, emergency medicine, and neurology. Conclusions presented in this advisory statement do not replace current guidelines but are intended to provide an expert opinion on novel literature that will be incorporated into future guidelines and suggest the opportunity for reassessment of current clinical practice.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

1. Ann Emerg Med. 2023 Sep 19:S0196-0644(23)00645-5. doi: 10.1016/j.annemergmed.2023.08.006. Online ahead of print.

Sudden Cardiac Death at Home: Potential Lives Saved With Fully Automated External Defibrillators.

Gessman LJ(1), Schacknow PN(2), Brindis RG(3).

ABSTRACT

Sudden cardiac death from ventricular arrhythmia kills about 350,000 people annually in the United States. This number has not improved since the widespread public availability of semi-automated external defibrillators (AEDs) and the teaching of nonbreathing cardiopulmonary resuscitation (CPR) procedures. When an out-of-hospital cardiac arrest occurs in a public space, lay witnesses do CPR in 40% of the cases and use AEDs on only 7.4% of the victims before emergency medical services (EMS) arrive. About 70% of sudden cardiac death occurs at home, where an AED is usually unavailable until EMS appears. The time from a 911 call to shock averages approximately 7 minutes in urban areas and is more than 14.5 minutes in rural environments. Because arrest onset is often not observed, arrest onset to shock times may be even longer. Survival from cardiac arrest decreases by approximately 7 to 10% per minute of ventricular arrhythmia. A prearrest protocol is proposed for the at-home use of fully automated external defibrillators in select cardiac patients, which should reduce the arrest-to-shock interval to under 1 minute and may eliminate the need for CPR in some cases.

2. Ned Tijdschr Geneeskd. 2023 Sep 18;167:D7592.

[Defibrillation techniques in persistent ventricular fibrillation: which is the most effective?].

[Article in Dutch]

Taverne LF(1), Koster RW(2), de Jong JSSG(1)(3).

ABSTRACT

A recent study in NEJM (DOSE-VF) showed that administering two consecutive defibrillation shocks with two separate defibrillators improves outcomes for patients with out-of-hospital cardiac arrest (OHCA). This approach was used when a shockable rhythm persisted after three standard shocks, raising the question of new strategies to improve survival for patients with persistent ventricular fibrillation (VF). In the Netherlands, there are around 8,000 OHCA cases annually, with 49% attributed to shockable rhythms. Prompt defibrillation is crucial, but some patients do not respond effectively to it. They may experience rapid VF recurrence or refractory VF, both associated with reduced survival rates. The current European resuscitation protocol emphasizes high-quality chest compressions, early defibrillation, and addressing reversible causes. The DOSE-VF study demonstrated the effectiveness of double sequential external defibrillation (DSED) in improving survival, spontaneous circulation, and neurological outcomes. Techniques such as changing pad positions, increasing initial shock energy, and pad compression can enhance energy transfer. However, implementing double sequential shocks in practice is challenging, requiring two separate defibrillators. The limited effect of this intervention may not warrant changes to extensively trained resuscitation protocols.

PEDIATRICS AND CHILDREN

1. Eur J Pediatr. 2023 Sep 19. doi: 10.1007/s00431-023-05199-3. Online ahead of print.

Unveiling pseudo-pulseless electrical activity (pseudo-PEA) in ultrasound-integrated infant resuscitation.

Chan B(1)(2), Sieg S(3), Singh Y(4)(5).

ABSTRACT

Point-of-care ultrasound (POCUS) holds immense potential to manage critically deteriorating infants within the neonatal intensive care unit (NICU) and is increasingly used in neonatal clinical practice worldwide. Recent ultrasound-based protocols such as the Sonographic Assessment of liFe-threatening Emergencies-Revised (SAFE-R) and Crashing Neonate Protocol (CNP) offer step-by-step guidance for diagnosing and addressing reversible causes of cardiorespiratory collapse. Traditionally, pulseless electrical activity (PEA) has been diagnosed solely based on absent pulses on clinical examination, disregarding myocardial activity. However, integrating POCUS into resuscitation unveils the concept of pseudo-PEA, where cardiac motion activity is observed visually on the ultrasound but fails to generate a detectable pulse due to inadequate cardiac output. Paradoxically, existing neonatal resuscitation protocols lack directives for identifying and effectively leveraging pseudo-PEA insights in infants, limiting their potential to enhance outcomes. Pseudo-PEA is extensively described in adult literature owing to routine POCUS use in resuscitation. This review article comprehensively evaluates the adult pseudo-PEA literature to glean insights adaptable to neonatal care. Additionally, we propose a simple strategy to integrate POCUS during neonatal resuscitation, especially in infants who do not respond to routine measures. CONCLUSION: Pseudo-PDA is a newly recognized diagnosis in infants with the use of POCUS during resuscitation. This article highlights the importance of cross-disciplinary learning in tackling emerging challenges within neonatal medicine. WHAT IS KNOWN: • Point-of-Care ultrasound (POCUS) benefits adult cardiac arrest management, particularly in distinguishing true Pulseless Electrical Activity (PEA) from pseudo-PEA. • Pseudo-PEA is when myocardial motion can be seen on ultrasound but fails to generate palpable pulses or sustain circulation despite evident cardiac electrical activity. WHAT IS NEW: • Discuss recognition and

management of pseudo-PEA in infants. • A proposed algorithm to integrate POCUS into active neonatal cardiopulmonary resuscitation (CPR) procedures.

2. Resuscitation. 2023 Sep 15:109968. doi: 10.1016/j.resuscitation.2023.109968. Online ahead of print.

Disparities within pediatric out-of-hospital cardiac arrest: a call to action.

Blewer AL(1), Okubo M(2).

NO ABSTRACT AVAILABLE

EXTRACORPOREAL LIFE SUPPORT

1. Scand J Trauma Resusc Emerg Med. 2023 Sep 19;31(1):49. doi: 10.1186/s13049-023-01119-4.

Feasibility of HEMS performed prehospital extracorporeal-cardiopulmonary resuscitation in paediatric cardiac arrests; two case reports.

Mommers L(1)(2), Slagt C(3)(4), Rn FC(3), van der Crabben R(5)(6), Moors X(5)(6), Dos Reis Miranda D(6)(7).

ABSTRACT

INTRODUCTION: A broad range of pathophysiologic conditions can lead to cardiopulmonary arrest in children. Some of these children suffer from refractory cardiac arrest, not responding to basic and advanced life support. Extracorporeal-Cardiopulmonary Resuscitation (E-CPR) might be a life-saving option for this group. Currently this therapy is only performed in-hospital, often necessitating long transport times, thereby negatively impacting eligibility and chances of survival. We present the first two cases of prehospital E-CPR in children performed by regular Helicopter Emergency Medical Services (HEMS). **CASE PRESENTATIONS:** The first patient was a previously healthy 7 year old boy who was feeling unwell for a couple of days due to influenza. His course deteriorated into a witnessed collapse. Direct bystander CPR and subsequent ambulance advanced life support was unsuccessful in establishing a perfusing rhythm. While doing chest compressions, the patient was seen moving both his arms and making spontaneous breathing efforts. Echocardiography however revealed a severe left ventricular impairment (near standstill). The second patient was a 15 year old girl, known with bronchial asthma and poor medication compliance. She suffered yet another asthmatic attack, so severe that she progressed into cardiac arrest in front of the attending ambulance and HEMS crews. Despite maximum bronchodilator therapy, intubation and the exclusion of tension pneumothoraxes and dynamic hyperinflation, no cardiac output was achieved. **INTERVENTION:** After consultation with the nearest paediatric E-CPR facilities, both patients were on-scene cannulated by regular HEMS. The femoral artery and vein were cannulated (15-17Fr and 21Fr respectively) under direct ultrasound guidance using an out-of-plane Seldinger approach. Extracorporeal Life Support flow of 2.1 and 3.8 l/min was established in 20 and 16 min respectively (including preparation and cannulation). Both patients were transported uneventfully to the nearest paediatric intensive care with spontaneous breathing efforts and reactive pupils during transport. **CONCLUSION:** This case-series shows that a properly trained regular HEMS crew of only two health care professionals (doctor and flight nurse) can establish E-CPR on-scene in (older) children. Ambulance transport with ongoing CPR is challenging, even more so in children since transportation times tend to be longer compared to adults and automatic chest compression devices are often unsuitable and/or unapproved for children. Prehospital cannulation of susceptible E-CPR candidates has the potential to reduce low-flow time and offer E-CPR therapy to a wider group of children suffering refractory cardiac arrest.

2. Resusc Plus. 2023 Jul 7;15:100424. doi: 10.1016/j.resplu.2023.100424. eCollection 2023 Sep.

A recommended preclinical extracorporeal cardiopulmonary resuscitation model for neurological outcomes: A scoping review.

Kook Kang J(1), Kalra A(1)(2), Ameen Ahmad S(3), Kumar Menta A(1), Rando HJ(1), Chinedozi I(1), Darby Z(1), Spann M(4), Keller SP(5), J R Whitman G(1), Cho SM(1)(3)(5).

ABSTRACT

BACKGROUND: Despite the high prevalence of neurological complications and mortality associated with extracorporeal cardiopulmonary resuscitation (ECPR), neurologically-focused animal models are scarce. Our objective is to review current ECPR models investigating neurological outcomes and identify key elements for a recommended model. **METHODS:** We searched PubMed and four other engines for animal ECPR studies examining neurological outcomes. Inclusion criteria were: animals experiencing cardiac arrest, ECPR/ECMO interventions, comparisons of short versus long cardiac arrest times, and neurological outcomes. **RESULTS:** Among 20 identified ECPR animal studies (n = 442), 13 pigs, 4 dogs, and 3 rats were used. Only 10% (2/20) included both sexes. Significant heterogeneity was observed in experimental protocols. 90% (18/20) employed peripheral VA-ECMO cannulation and 55% (11/20) were survival models (median survival = 168 hours; ECMO duration = 60 minutes). Ventricular fibrillation (18/20, 90%) was the most common method for inducing cardiac arrest with a median duration of 15 minutes (IQR = 6-20). In two studies, cardiac arrests exceeding 15 minutes led to considerable mortality and neurological impairment. Among seven studies utilizing neuromonitoring tools, only four employed multimodal devices to evaluate cerebral blood flow using Transcranial Doppler ultrasound and near-infrared spectroscopy, brain tissue oxygenation, and intracranial pressure. None examined cerebral autoregulation or neurovascular coupling. **CONCLUSIONS:** The substantial heterogeneity in ECPR preclinical model protocols leads to limited reproducibility and multiple challenges. The recommended model includes large animals with both sexes, standardized pre-operative protocols, a cardiac arrest time between 10-15 minutes, use of multimodal methods to evaluate neurological outcomes, and the ability to survive animals after conducting experiments.

EXPERIMENTAL RESEARCH

1. Am J Emerg Med. 2023 Sep 12;74:14-16. doi: 10.1016/j.ajem.2023.09.010. Online ahead of print. **Evaluation of esophageal injuries after defibrillation with transesophageal ultrasound probe in the mid-esophagus in pigs.**

Krulowitz N(1), Levin NM(2), Youngquist S(3), Kelly C(3), Hoareau G(3), Johnson MA(3), Ockerse P(3).

ABSTRACT

OBJECTIVE: Transesophageal echocardiography (TEE) is becoming increasingly utilized by emergency medicine providers during cardiac arrest. Intra-arrest, TEE confers several benefits including shorter pauses in chest compressions and direct visualization of cardiac compressions. Many ultrasound probe manufacturers recommend against performing defibrillation with the TEE probe in the mid-esophagus for fear of causing esophageal injury or damage to the probe, however no literature exists that has investigated this concern. To assess this, we performed cardiopulmonary resuscitation (CPR) and multiple defibrillations in 8 swine with a TEE probe in place. **METHODS:** We performed TEE on 8 adult swine during CPR and performed multiple 200 J defibrillations with the TEE probe in the mid-esophagus. Post-mortem, esophagi were dissected and inspected for evidence of injury. **RESULTS:** On macroscopic inspection of 8 esophagi, no evidence of hematoma, thermal injury, or perforation was noted. **CONCLUSION:** Our study suggests that performing defibrillation during CPR with a TEE probe in place in the mid-esophagus is likely safe and low risk for significant

esophageal injury. This further bolsters the use of TEE in CPR and would enable continuous visualization of cardiac activity without the need to remove the TEE probe for defibrillation.

2. PLoS One. 2023 Sep 15;18(9):e0291598. doi: 10.1371/journal.pone.0291598. eCollection 2023.

Nicotinamide restores tissue NAD⁺ and improves survival in rodent models of cardiac arrest.

Zhu X(1), Li J(1), Wang H(1), Gasior FM(2), Lee C(1), Lin S(1), Justice CN(1)(2), O'Donnell JM(2), Vanden Hoek TL(1).

ABSTRACT

Metabolic suppression in the ischemic heart is characterized by reduced levels of NAD⁺ and ATP. Since NAD⁺ is required for most metabolic processes that generate ATP, we hypothesized that nicotinamide restores ischemic tissue NAD⁺ and improves cardiac function in cardiomyocytes and isolated hearts, and enhances survival in a mouse model of cardiac arrest. Mouse cardiomyocytes were exposed to 30 min simulated ischemia and 90 min reperfusion. NAD⁺ content dropped 40% by the end of ischemia compared to pre-ischemia. Treatment with 100 μM nicotinamide (NAM) at the start of reperfusion completely restored the cellular level of NAD⁺ at 15 min of reperfusion. This rescue of NAD⁺ depletion was associated with improved contractile recovery as early as 10 min post-reperfusion. In a mouse model of cardiac arrest, 100 mg/kg NAM administered IV immediately after cardiopulmonary resuscitation resulted in 100% survival at 4 h as compared to 50% in the saline group. In an isolated rat heart model, the effect of NAM on cardiac function was measured for 20 min following 18 min global ischemia. Rate pressure product was reduced by 26% in the control group following arrest. Cardiac contractile function was completely recovered with NAM treatment given at the start of reperfusion. NAM restored tissue NAD⁺ and enhanced production of lactate and ATP, while reducing glucose diversion to sorbitol in the heart. We conclude that NAM can rapidly restore cardiac NAD⁺ following ischemia and enhance glycolysis and contractile recovery, with improved survival in a mouse model of cardiac arrest.

3. Pediatr Res. 2023 Sep 23. doi: 10.1038/s41390-023-02827-4. Online ahead of print.

Comparison of hemodynamic effects of chest compression delivered via machine or human in asphyxiated piglets.

O'Reilly M(1)(2), Lee TF(1)(2), Cheung PY(1)(2), Schmölzer GM(3)(4).

ABSTRACT

BACKGROUND: High-quality chest compressions (CC) are an important factor of neonatal resuscitation. Mechanical CC devices may provide superior CC delivery and improve resuscitation outcomes. We aimed to compare the hemodynamic effects of CC delivered by machine and human using a neonatal piglet model. **METHODS:** Twelve asphyxiated piglets were randomized to receive CC during resuscitation using an automated mechanical CC device ("machine") or the two-thumb encircling technique ("human"). CC was superimposed with sustained inflations. **RESULTS:** Twelve newborn piglets (age 0-3 days, weight 2.12 ± 0.17 kg) were included in the study. Machine-delivered CC resulted in an increase in stroke volume, and minimum and maximum rate of left ventricle pressure change (dp/dt_{min} and dp/dt_{max}) compared to human-delivered CC. **CONCLUSIONS:** During machine-delivered CC, stroke volume and left ventricular contractility were significantly improved. Mechanical CC devices may provide improved cardiopulmonary resuscitation outcomes in neonatal cardiac arrest induced by asphyxia. **IMPACT:** Machine chest compression leads to changes in hemodynamic parameters during resuscitation of asphyxiated neonatal piglets, namely greater stroke volume and left ventricular contractility, compared with standard two-thumb compression

technique. Mechanical chest compression devices may provide improved cardiopulmonary resuscitation outcomes in neonatal and pediatric asphyxia-induced cardiac arrest.

CASE REPORTS

1. Ther Hypothermia Temp Manag. 2023 Sep 19. doi: 10.1089/ther.2023.0041. Online ahead of print.

Successful Therapeutic Hypothermia in a Patient with Drug-Induced J Waves and Cardiac Arrest: A Case Report.

Sato J(1), Yagi T(2), Shimada E(2), Kobori M(2), Watanabe K(2), Kuwana T(1), Chiba N(1), Saito T(1), Kinoshita K(1).

ABSTRACT

A 50-year-old man was admitted to our hospital with hypotension and bradycardia after receiving high doses of atenolol, amlodipine, and etizolam. He had a drug-induced J wave on electrocardiography and subsequently underwent cardiac arrest. The patient was successfully rescued by venoarterial extracorporeal membrane oxygenation (VA-ECMO) and a good neurological outcome was achieved with therapeutic hypothermia (TH). In patients with J waves, TH is thought to increase the J waves and cause fatal arrhythmias, but in this case, rapid cooling with VA-ECMO allowed the patient to successfully complete TH.

2. Am J Obstet Gynecol. 2023 Sep 16:S0002-9378(23)00615-4. doi: 10.1016/j.ajog.2023.09.009. Online ahead of print.

Peripartum extracorporeal cardiopulmonary resuscitation and rescue aspiration pulmonary embolectomy.

Antonini MV(1), Circelli A(2), Tarantino FF(3), Bissoni L(2), Pini R(2), Antonazzo PG(4), Agnoletti V(2).

NO ABSTRACT AVAILABLE

3. Ann Emerg Med. 2023 Oct;82(4):524-529. doi: 10.1016/j.annemergmed.2023.05.004.

A Woman With Sudden Cardiac Arrest After Caesarean Delivery.

Lin IC(1), Kuo YS(1), Chiu PW(1).

NO ABSTRACT AVAILABLE

4. Cureus. 2023 Aug 21;15(8):e43847. doi: 10.7759/cureus.43847. eCollection 2023 Aug.

A Case of Cardiac Arrest Due to Transcatheter Aortic Valve Infolding.

Mohammed F(1), Gubitosa JC(2), Huffman TR(2), Abdul-Waheed M(3), Rafeedheen R(4).

ABSTRACT

Prosthetic valvular infolding during transcatheter aortic valve implantation (TAVI) is an under-recognized yet significant complication that can occur. Here, we describe the case of a 61-year-old male with a history of heart failure with reduced ejection fraction (HFrEF) and low-flow, low-gradient severe aortic valve stenosis of a bicuspid aortic valve who presented to undergo TAVI. During the procedure, repositioning of the valve resulted in prosthetic valvular infolding and resultant severe aortic regurgitation (AR), culminating in cardiac arrest. Swift balloon valvuloplasty corrected the valve geometry and eliminated any AR, allowing hemodynamic recovery and completion of the procedure. Our case and review highlight methods, both angiographic and echocardiographic, to recognize prosthetic valvular infolding the moment it presents, as well as strategies to correct the infolding with minimal detriment to the patient.

5. Case Rep Crit Care. 2023 Sep 11;2023:1132406. doi: 10.1155/2023/1132406. eCollection 2023.

Cardiac Oscillations Complicating Brain Death Diagnosis.

Bolt B(1), Muakkassa F(2), Bruening L(3), Marcus C(4), Cunningham B(5), Pawlak E(3), Gandee R(1)(3), Newey C(1)(6).

ABSTRACT

Death by neurologic criteria (DNC) or brain death is a clinical diagnosis. It is often complicated by variations in policies as well as confounders on examination. We discuss here the case of a 27-year-old male who had a cardiac arrest following toxic gaseous exposure. He ultimately progressed to brain death but was identified as having cardiac oscillations during clinical assessments that complicated the diagnosis. We discuss the case as well as the maneuvers used to clarify that the "triggered breaths" on the ventilator were indeed cardiac oscillations.

6. Ther Drug Monit. 2023 Sep 12. doi: 10.1097/FTD.0000000000001133. Online ahead of print.

Ceftriaxone Pharmacokinetics and Pharmacodynamics in 2 Pediatric Patients on Extracorporeal Membrane Oxygenation Therapy.

Cervantes FC(1), Mizuno T(2)(3), Dong M(2)(3), Tang P(2)(4), Arbough T(1), Vinks AA(2)(3), Kaplan JM(2)(5), Tang Girdwood SC(2)(3)(6).

ABSTRACT

BACKGROUND: Critically ill patients with cardiac or respiratory failure may require extracorporeal membrane oxygenation (ECMO). Antibiotics are frequently administered when the suspected cause of organ failure is an infection. Ceftriaxone, a β -lactam antibiotic, is commonly used in patients who are critically ill. Although studies in adults on ECMO have suggested minimal impact on ceftriaxone pharmacokinetics, limited research exists on ceftriaxone pharmacokinetics/pharmacodynamics (PK/PD) in pediatric ECMO patients. We report the PK profiles and target attainment of 2 pediatric patients on ECMO who received ceftriaxone. **METHODS:** Ceftriaxone concentrations were measured in 2 pediatric patients on ECMO using scavenged opportunistic sampling. PK profiles were generated and individual PK parameters were estimated using measured free ceftriaxone concentrations and a published population PK model in children who are critically ill, using Bayesian estimation. **RESULTS:** Patient 1, an 11-year-old boy on venovenous ECMO for respiratory failure received 2 doses of 52 mg/kg ceftriaxone 12 hours apart while on ECMO and additional doses every 12 hours off ECMO. On ECMO, ceftriaxone clearance was 13.0 L/h/70 kg compared with 7.6 L/h/70 kg off ECMO, whereas the model-predicted mean clearance in children who are critically ill without ECMO support was 6.54 L/h/70 kg. Patient 2, a 2-year-old boy on venoarterial ECMO due to cardiac arrest received 50 mg/kg ceftriaxone every 12 hours while on ECMO for >7 days. Only clearance while on ECMO could be estimated (9.1 L/h/70 kg). Trough concentrations in both patients were >1 mg/L (the breakpoint for *Streptococcus pneumoniae*) while on ECMO. **CONCLUSIONS:** ECMO increased ceftriaxone clearance above the model-predicted clearances in the 2 pediatric patients studied. Twelve-hour dosing allowed concentrations to remain above the breakpoint for commonly targeted bacteria but not 4 times the breakpoint in one patient, suggesting that precision dosing may be beneficial to ensure target attainment in children on ECMO.