This week's PubMed 12th – 18th November 2023: articles of interest n = 55

CPR AND COVID-19

1. Resuscitation. 2023 Nov 10:110043. doi: 10.1016/j.resuscitation.2023.110043. Online ahead of print.

The impact of COVID-19 pandemic on out-of-hospital cardiac arrest: an individual patient data meta-analysis.

Baldi E(1), Klersy C(2), Chan P(3), Elmer J(4), Ball J(5), Counts CR(6), Rosell Ortiz F(7), Fothergill R(8), Auricchio A(9), Paoli A(10), Karam N(11), McNally B(12), Martin-Gill C(4), Nehme Z(13), Drucker CJ(14), Ignacio Ruiz Azpiazu J(7), Mellett-Smith A(8), Cresta R(15), Scquizzato T(16), Jouven X(11), Primi R(17), Al-Araji R(18), Guyette FX(4), Sayre MR(6), Daponte Codina A(19), Benvenuti C(20), Marijon E(11), Savastano S(17); OHCA-COVID study group.

ABSTRACT

AIM: Prior studies have reported increased out-of-hospital cardiac arrests (OHCA) incidence and lower survival during the COVID-19 pandemic. We evaluated how the COVID-19 pandemic affected OHCA incidence, bystander CPR rate and patients' outcomes, accounting for regional COVID-19 incidence and OHCA characteristics. METHODS: individual patient data meta-analysis of studies which provided a comparison of OHCA incidence during the first pandemic wave (COVID-period) with a reference period of the previous year(s) (pre-COVID period). We computed COVID-19 incidence per 100,000 inhabitants in each of 97 regions per each week and divided it into its quartiles. RESULTS: we considered a total of 49,882 patients in 10 studies. OHCA incidence increased significantly compared to previous years in regions where weekly COVID-19 incidence was in the fourth quartile (>136/100,000/week), and patients in these regions had a lower odds of bystander CPR (OR 0.49, 95%CI 0.29-0.81,p=0.005). Overall, the COVID-period was associated with an increase in medical etiology (89.2% vs 87.5%,p<0.001) and OHCAs at home (74.7% vs 67.4%,p<0.001), and a decrease in shockable initial rhythm (16.5% vs 20.3%,p<0.001). The COVID-period was independently associated with pre-hospital death (OR 1.73, 95%CI 1.55-1.93,p<0.001) and negatively associated with survival to hospital admission (OR 0.68, 95%CI 0.64-0.72,p<0.001) and survival to discharge (OR 0.50, 95%CI 0.46-0.54,p<0.001). CONCLUSIONS: During the first COVID-19 pandemic wave, there was higher OHCA incidence and lower bystander CPR rate in regions with a high-burden of COVID-19. COVID-19 was also associated with a change in patient characteristics and lower survival independently of COVID-19 incidence in the region where OHCA occurred.

CPR/MECHANICAL CHEST COMPRESSION

No articles identified.

REGISTRIES, REVIEWS AND EDITORIALS

1. Anaesthesia. 2023 Nov 17. doi: 10.1111/anae.16180. Online ahead of print.

Can lessons be learned from reviewing peri-operative cardiac arrests?

Scott DA(1)(2), Phan TD(1)(2).

NO ABSTRACT AVAILABLE

2. Resusc Plus. 2023 Nov 1;16:100491. doi: 10.1016/j.resplu.2023.100491. eCollection 2023 Dec.

Artificial intelligence to support out-of-hospital cardiac arrest care: A scoping review.
Toy J(1)(2)(3)(4), Bosson N(2)(3)(4), Schlesinger S(2)(4), Gausche-Hill M(2)(3)(4), Stratton S(1)(5).
ABSTRACT
BACKGROUND: Artificial intelligence (AI) has demonstrated significant potential in supporting emergency medical services personnel during out-of-hospital cardiac arrest (OHCA) care; however, the extent of research evaluating this topic is unknown. This scoping review examines the breadth of literature on the application of AI in early OHCA care. METHODS: We conducted a search of PubMed®, Embase, and Web of Science in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews guidelines. Articles focused on non-traumatic OHCA and published prior to January 18th, 2023 were included. Studies were excluded if they did not use an AI intervention (including machine learning, deep learning, or natural language processing), or did not utilize data from the prehospital phase of care. RESULTS: Of 173 unique articles identified, 54 (31%) were included after screening. Of these studies, 15 (28%) were from the year 2022 and with an increasing trend annually starting in 2019. The majority were carried out by multinational collaborations (20/54, 38%) with additional studies from the United States (10/54, 19%), Korea (5/54, 10%), and Spain (3/54, 6%). Studies were classified into three major categories including ECG waveform classification and outcome prediction (24/54, 44%), early dispatch-level detection and outcome prediction (7/54, 13%), return of spontaneous circulation and survival outcome prediction (15/54, 20%), and other (9/54, 16%). All but one study had a retrospective design. CONCLUSIONS: A small but growing body of literature exists describing the use of AI to augment early OHCA care.

3. Catheter Cardiovasc Interv. 2023 Nov;102(5):917-918. doi: 10.1002/ccd.30835. Epub 2023 Sep 12.
DRACULA-A mnemonic for unfavorable resuscitation features in cardiac arrest patients.
Rab T(1).
NO ABSTRACT AVAILABLE

4. Eur J Med Res. 2023 Nov 16;28(1):522. doi: 10.1186/s40001-023-01517-5.
Correction: Skeletal muscle oxygenation during cardiopulmonary resuscitation as a predictor of return of spontaneous circulation: a pilot study.
Košir M(1)(2), Možina H(1)(3), Podbregar M(4)(5).
NO ABSTRACT AVAILABLE

IN-HOSPITAL CARDIAC ARREST

1. Aust Crit Care. 2023 Nov;36(6):1059-1066. doi: 10.1016/j.aucc.2023.01.011. Epub 2023 Apr 12.
Antecedents to and outcomes for in-hospital cardiac arrests in Australian hospitals with mature medical emergency teams: A multicentre prospective observational study.
ANZ-CODE Investigators(7).
ABSTRACT
BACKGROUND: The epidemiology and predictability of in-hospital cardiac arrests (IHCAs) in hospitals with established medical emergency teams (METs) is underinvestigated. OBJECTIVES: We categorised IHCAs into three categories: "possible suboptimal end-of-life planning" (possible SELP), "potentially predictable", or "sudden and unexpected" using age, Charlson Comorbidity Index, place of residence, functional independence, along with documented vital signs, K+ and HCO3 in the period prior to the IHCA. We also described the differences in characteristics and outcomes amongst these three categories of IHCAs. METHODS: This was a prospective observational study (1st July 2017 to 9th August 2018) of adult (18 years) IHCA patients in wards of seven Australian hospitals with well-established METs. RESULTS: Amongst 152 IHCA patients, 145 had complete data. The

number (%) classified as possible SELP, potentially predictable, and sudden and unexpected IHCA was 50 (34.5%), 52 (35.8%), and 43 (29.7%), respectively. Amongst the 52 potentially predictable patients, six (11.5%) had missing vital signs in the preceding 6 hr, 18 (34.6%) breached MET criteria in the prior 24 hr but received no MET call, and 6 (11.5%) had a MET call but remained on the ward. Abnormal K+ and HCO3 was present in 15 of 51 (29.5%) and 13 of 51 (25.5%) of such patients, respectively. The 43 sudden and unexpected IHCA patients were mostly (97.6%) functionally independent and had the lowest median Charlson Comorbidity Index. In-hospital mortality for IHCAs classified as possible SELP, potentially predictable, and sudden and unexpected was 76.0%, 61.5%, and 44.2%, respectively (p = 0.007). Only four of 12 (33.3%) possible SELP survivors had a good functional outcome. CONCLUSIONS: In seven Australian hospitals with mature METs, only one-third of IHCAs were sudden and unexpected. Improving end-of-life care in elderly comorbid patients and enhancing the response to objective signs of deterioration may further reduce IHCAs in the Australian context.

INJURIES AND CPR

No articles identified.

CAUSE OF THE ARREST

1. Anaesthesia. 2023 Nov 16. doi: 10.1111/anae.16157. Online ahead of print.
Peri-operative cardiac arrest: management and outcomes of patients analysed in the 7th National Audit Project of the Royal College of Anaesthetists.
Armstrong RA, Cook TM, Kane AD, Kursumovic E, Nolan JP, Oglesby FC, Cortes L, Taylor C, Moppett IK, Agarwal S, Cordingley J, Davies MT, Dorey J, Finney SJ, Kendall S, Kunst G, Lucas DN, Mouton R, Nickols G, Pappachan VJ, Patel B, Plaat F, Scholefield BR, Smith JH, Varney L, Wain E, Soar J; collaborators.
ABSTRACT
The 7th National Audit Project of the Royal College of Anaesthetists studied peri-operative cardiac arrest in the UK, a topic of importance to patients, anaesthetists and surgeons. We report the results of the 12-month registry phase, from 16 June 2021 to 15 June 2022, focusing on management and outcomes. Among 881 cases of peri-operative cardiac arrest, the initial rhythm was non-shockable in 723 (82%) cases, most commonly pulseless electrical activity. There were 665 (75%) patients who survived the initial event and 384 (52%) who survived to hospital discharge. A favourable functional outcome (based on modified Rankin Scale score) was reported for 249 (88%) survivors. Outcomes varied according to arrest rhythm. The highest rates of survival were seen for bradycardic cardiac arrests with 111 (86%) patients surviving the initial event and 77 (60%) patients surviving the hospital episode. The lowest survival rates were seen for patients with pulseless electrical activity, with 312 (68%) surviving the initial episode and 156 (34%) surviving to hospital discharge. Survival to hospital discharge was worse in patients at the extremes of age with 76 (40%) patients aged > 75 y and 9 (45%) neonates surviving. Hospital survival was also associated with surgical priority, with 175 (88%) elective patients and 176 (37%) non-elective patients surviving to discharge. Outcomes varied with the cause of cardiac arrest, with lower initial survival rates for pulmonary embolism (5, 31%) and bone cement implantation syndrome (9, 45%), and hospital survival of < 25% for pulmonary embolism (0), septic shock (13, 24%) and significant hyperkalaemia (1, 20%). Overall care was rated good in 464 (53%) cases, and 18 (2%) cases had overall care rated as poor. Poor care elements were present in a further 245 (28%) cases. Care before cardiac arrest was the phase most frequently rated as poor (92, 11%) with elements of poor care identified in another 186 (21%) cases. These results

describe the management and outcomes of peri-operative cardiac arrest in UK practice for the first time.

2. Europace. 2023 Nov 15:euad336. doi: 10.1093/europace/euad336. Online ahead of print.
The Genetic Basis of Apparently Idiopathic Ventricular Fibrillation - a Retrospective Overview.
Verheul LM(1), van der Ree MH(2), Groeneveld SA(1), Mulder BA(3), Christiaans I(3), Kapel GFL(4), Alings M(5), Bootsma M(6), Barge-Schaapveld DQCM(6), Balt JC(7), Yap SC(8)(9), Krapels IPC(10)(9), Ter Bekke RMA(10)(9), Volders PGA(10)(9), van der Crabben SN(11)(9), Postema PG(2)(9), Wilde AAM(2)(9), Dooijes D(1), Baas AF(1)(9), Hassink RJ(1)(9).

ABSTRACT
BACKGROUND AND AIMS: During the diagnostic work-up of patients with idiopathic ventricular fibrillation (VF), next-generation sequencing panels can be considered to identify genotypes associated with arrhythmias. However, consensus for gene panel testing is still lacking, and variants of uncertain significance (VUS) are often identified. METHODS: We investigated 419 patients with available medical records from the Dutch Idiopathic VF Registry, focussing on genetic testing. RESULTS: Genetic testing was performed in 379 (91%) patients (median age at event 39 years [27-51], 60% male). Single-gene testing was performed in 87 patients (23%) and was initiated more often in patients with idiopathic VF before 2010. Panel testing was performed in 292 patients (77%). The majority of causal (likely) pathogenic variants (LP/P, n=56, 15%) entailed the DPP6 risk haplotype (n=39, 70%). Moreover, 10 LP/P variants were found in cardiomyopathy genes (FLNC, MYL2, MYH7, PLN(2), TTN(4), RBM20), 7 LP/P were identified in genes associated with cardiac arrhythmias (KCNQ1, SCN5A(2), RYR2(4)). For 8 patients (2%), identification of an LP/P variant resulted in a change of diagnosis. In 113 patients (30%) a VUS was identified. Broad panel testing resulted in a higher incidence of VUS in comparison to single-gene testing (38% vs. 3%, p<0.001). CONCLUSION: Almost all patients from the registry underwent, albeit not broad, genetic testing. The genetic yield of causal LP/P variants in idiopathic VF patients is 5%, increasing to 15% when including DPP6. In specific cases, the LP/P variant is the underlying diagnosis. A gene panel specifically for idiopathic VF patients is proposed.

3. Resusc Plus. 2023 Nov 1;16:100492. doi: 10.1016/j.resplu.2023.100492. eCollection 2023 Dec.
In-hospital cardiac arrest due to sepsis - Aetiologies and outcomes in a Swedish cohort study.
Bruchfeld S(1)(2), Ronnow I(1), Bergvich F(1), Brochs F(1), Fahlen M(1), Strålin K(3)(4), Djärv T(1)(2).

ABSTRACT
OBJECTIVES: Awareness of causes of cardiac arrest is essential to prevent them. A recent review found that almost every sixth in-hospital cardiac arrest is caused by infection. Few studies have explored how infections cause cardiac arrest. AIM: To describe the features, mechanisms and outcome of sepsis-related cardiac arrests. MATERIAL AND METHODS: All patients ≥18 years who suffered a cardiac arrest at Karolinska University Hospital between 2007 and 2022 with sepsis as the primary cause were included. Data were collected the Swedish Registry for Cardiopulmonary Resuscitation and medical records. The primary outcome was survival to discharge. RESULTS: Out of 2,327 in-hospital cardiac arrests, 5% (n = 123) suffered it due to sepsis, and 17% (21) survived to hospital discharge. Two thirds of patients were admitted to the hospital due to sepsis and suffered their cardiac arrest after a median of four days. About half (n = 59) had deranged vital signs before the event. Most were witnessed in general wards. In all, 47% (n = 58) had asystole and 24% (n = 30) as the first heart rhythm. The respiratory tract was the most common source of infection. Most patients were undergoing antibiotic therapy and one third had a positive microbiological culture with mixed gram-positive bacteria or Escherichia coli in the urine. CONCLUSION: Our results suggest that sepsis is an uncommon and not increasing cause of in-hospital cardiac arrest and its outcome is

in line with other non-shockable cardiac arrests. Deranged respiratory and/or circulatory vital signs precede the event.

4. Open Heart. 2023 Nov;10(2):e002308. doi: 10.1136/openhrt-2023-002308.
Comorbidities prior to out-of-hospital cardiac arrest and diagnoses at discharge among survivors.
Hjärtstam N(1), Rawshani A(2)(3), Hellsén G(2)(3), Råmunddal T(2)(3).
ABSTRACT
BACKGROUND: Out-of-hospital cardiac arrest (OHCA) has a dismal prognosis with overall survival around 10%. Previous studies have shown conflicting results regarding the prevalence and significance of comorbidities in OHCA, as well as the underlying causes. Previously, 80% of sudden cardiac arrest have been attributed to coronary artery disease. We studied comorbidities and discharge diagnoses in OHCA in all of Sweden. METHODS: We used the Swedish Registry of Cardiopulmonary Resuscitation, merged with the Inpatient Registry and Outpatient Registry to identify patients with OHCA from 2010 to 2020 and to collect all their comorbidities as well as discharge diagnoses (among those admitted to hospital). Patient characteristics were described using means, medians and SD. Survival curves were performed among hospitalised patients with acute myocardial infarction (AMI) as well as heart failure. RESULTS: A total of 54 484 patients with OHCA were included, of whom 35 894 (66%) were men. The most common comorbidities prior to OHCA were hypertension (43.6%), heart failure (23.6%), chronic ischaemic heart disease (23.6%) and atrial fibrillation (22.0%). Previous AMI was prevalent in 14.8% of men and 10.9% of women. Among women, 18.0% had type 2 diabetes, compared with 19.6% of the men. Among hospitalised patients, 30% were diagnosed with AMI, 27% with hypertension, 20% with ischaemic heart disease and 18% with heart failure as discharge diagnoses. CONCLUSION: In summary, we find evidence that nowadays a minority of cardiac arrests are due to coronary artery disease and AMIs and its complications. Only 30% of all cases of OHCA admitted to hospital were diagnosed with AMI. Coronary artery disease is now likely in the minority with regard to causes of OHCA.

END-TIDAL CO_2

No articles identified.

ORGAN DONATION

No articles identified.

FEEDBACK

1. Sci Rep. 2023 Nov 13;13(1):19852. doi: 10.1038/s41598-023-46862-x.
Chest compression quality and patient outcomes with the use of a CPR feedback device: A retrospective study.
Leo WZ(1), Chua D(2), Tan HC(3), Ho VK(4).
ABSTRACT
Feedback devices were developed to guide resuscitations as targets recommended by various guidelines are difficult to achieve. Yet, there is limited evidence to support their use for in-hospital cardiac arrests (IHCA), and they did not correlate with patient outcomes. Therefore, this study has investigated the compression quality and patient outcomes in IHCA with the use of a feedback

device via a retrospective study of inpatient code blue activations in a Singapore hospital over one year. The primary outcome was compression quality and secondary outcomes were survival, downtime and neurological status. 64 of 110 (58.2%) cases were included. Most resuscitations (71.9%) met the recommended chest compression fraction (CCF, defined as the proportion of time spent on compressions during resuscitation) despite overall quality being suboptimal. Greater survival to discharge and better neurological status in resuscitated patients respectively correlated with higher median CCF ($p = 0.040$ and 0.026 respectively) and shorter downtime ($p < 0.001$ and 0.001 respectively); independently, a higher CCF correlated with a shorter downtime ($p = 0.014$). Overall, this study demonstrated that reducing interruptions is crucial for good outcomes in IHCA. However, compression quality remained suboptimal despite feedback device implementation, possibly requiring further simulation training and coaching. Future multicentre studies incorporating these measures should be explored.

DRUGS

No articles identified.

TRAUMA

No articles identified.

VENTILATION

1. Resuscitation. 2023 Nov 15:110048. doi: 10.1016/j.resuscitation.2023.110048. Online ahead of print.
Using the oxygen reserve index to titrate oxygen administration in cardiac arrest patients in the prehospital setting.
Skrifvars MB(1).
NO ABSTRACT AVAILABLE

2. Crit Care Med. 2023 Nov 13. doi: 10.1097/CCM.0000000000006112. Online ahead of print.
Supraglottic Airway Versus Tracheal Intubation for Airway Management in Out-of-Hospital Cardiac Arrest: A Systematic Review, Meta-Analysis, and Trial Sequential Analysis of Randomized Controlled Trials.
Forestell B(1), Ramsden S(1), Sharif S(1)(2)(3)(4)(5)(6)(7)(8), Centofanti J(2)(4), Al Lawati K(1)(2), Fernando SM(5), Welsford M(1), Nichol G(6), Nolan JP(7)(8), Rochwerg B(2)(3).
ABSTRACT
OBJECTIVES: Given the uncertainty regarding the optimal approach for airway management for adult patients with out-of-hospital cardiac arrest (OHCA), we conducted a systematic review and meta-analysis to compare the use of supraglottic airways (SGAs) with tracheal intubation for initial airway management in OHCA. DATA SOURCES: We searched MEDLINE, PubMed, Embase, Cochrane Library, as well as unpublished sources, from inception to February 7, 2023. STUDY SELECTION: We included randomized controlled trials (RCTs) of adult OHCA patients randomized to SGA compared with tracheal intubation for initial prehospital airway management. DATA EXTRACTION: Reviewers screened abstracts, full texts, and extracted data independently and in duplicate. We pooled data using a random-effects model. We used the modified Cochrane risk of bias 2 tool and assessed certainty of evidence using the Grading Recommendations Assessment, Development, and Evaluation approach. We preregistered the protocol on PROSPERO (CRD42022342935). DATA

SYNTHESIS: We included four RCTs (n = 13,412 patients). Compared with tracheal intubation , SGA use probably increases return of spontaneous circulation (ROSC) (relative risk [RR] 1.09; 95% CI, 1.02-1.15; moderate certainty) and leads to a faster time to airway placement (mean difference 2.5 min less; 95% CI, 1.6-3.4 min less; high certainty). SGA use may have no effect on survival at longest follow-up (RR 1.06; 95% CI, 0.84-1.34; low certainty), has an uncertain effect on survival with good functional outcome (RR 1.11; 95% CI, 0.82-1.50; very low certainty), and may have no effect on risk of aspiration (RR 1.04; 95% CI, 0.94 to 1.16; low certainty). CONCLUSIONS: In adult patients with OHCA, compared with tracheal intubation, the use of SGA for initial airway management probably leads to more ROSC, and faster time to airway placement, but may have no effect on longer-term survival outcomes or aspiration events.

3. Circulation. 2023 Nov 12. doi: 10.1161/CIRCULATIONAHA.123.065561. Online ahead of print.
Bag-Valve-Mask Ventilation and Survival from Out-of-Hospital Cardiac Arrest: A Multicenter Study.
Idris AH(1), Aramendi Ecenarro E(2), Leroux B(3), Jaureguibeitia X(2), Yang BY(1), Shaver S(1), Chang MP(1), Rea T(3), Kudenchuk P(3), Christenson J(4), Vaillancourt C(5), Callaway CW(6), Salcido D(6), Carson J(3), Blackwood J(7), Wang HE(8).

ABSTRACT

Background: Few studies have measured ventilation during early cardiopulmonary resuscitation (CPR) before advanced airway placement. Resuscitation guidelines recommend pauses after every 30 chest compressions to deliver ventilations. The effectiveness of bag-valve-mask ventilation delivered during the pause in chest compressions is unknown. We sought to determine: (1) the incidence of lung inflation with bag-valve-mask ventilation during 30:2 CPR; and (2) the association of ventilation with outcomes after out-of-hospital cardiac arrest. Methods: We studied patients with out-of-hospital cardiac arrest from 6 sites of the Resuscitation Outcomes Consortium CCC study (Trial of Continuous Compressions versus Standard CPR in Patients with Out-of-Hospital Cardiac Arrest). We analyzed patients assigned to the 30:2 CPR arm with ≥2 minutes of thoracic bioimpedance signal recorded with a cardiac defibrillator/monitor. Detectable ventilation waveforms were defined as having a bioimpedance amplitude ≥0.5 Ω (corresponding to ≥250 mL VT) and a duration ≥1 s. We defined a chest compression pause as a 3- to 15-s break in chest compressions. We compared the incidence of ventilation and outcomes in 2 groups: patients with ventilation waveforms in <50% of pauses (group 1) versus those with waveforms in ≥50% of pauses (group 2). Results: Among 1976 patients, the mean age was 65 years; 66% were male. From the start of chest compressions until advanced airway placement, mean±SD duration of 30:2 CPR was 9.8±4.9 minutes. During this period, we identified 26861 pauses in chest compressions; 60% of patients had ventilation waveforms in <50% of pauses (group 1, n=1177), and 40% had waveforms in ≥50% of pauses (group 2, n=799). Group 1 had a median of 12 pauses and 2 ventilations per patient versus group 2, which had 12 pauses and 12 ventilations per patient. Group 2 had higher rates of prehospital return of spontaneous circulation (40.7% versus 25.2%; P<0.0001), survival to hospital discharge (13.5% versus 4.1%; P<0.0001), and survival with favorable neurological outcome (10.6% versus 2.4%; P<0.0001). These associations persisted after adjustment for confounders. Conclusions: In this study, lung inflation occurred infrequently with bag-valve-mask ventilation during 30:2 CPR. Lung inflation in ≥50% of pauses was associated with improved return of spontaneous circulation, survival, and survival with favorable neurological outcome.

4. J Clin Med. 2023 Nov 3;12(21):6918. doi: 10.3390/jcm12216918.
The Role of Chest Compressions on Ventilation during Advanced Cardiopulmonary Resuscitation.
Azcarate I(1)(2), Urigüen JA(1)(2), Leturiondo M(1), Sandoval CL(3), Redondo K(1), Gutiérrez JJ(1), Russell JK(4), Wallmüller P(5), Sterz F(5), Daya MR(4), Ruiz de Gauna S(1).

ABSTRACT

Background: There is growing interest in the quality of manual ventilation during cardiopulmonary resuscitation (CPR), but accurate assessment of ventilation parameters remains a challenge.

Waveform capnography is currently the reference for monitoring ventilation rate in intubated patients, but fails to provide information on tidal volumes and inspiration-expiration timing. Moreover, the capnogram is often distorted when chest compressions (CCs) are performed during ventilation compromising its reliability during CPR. Our main purpose was to characterize manual ventilation during CPR and to assess how CCs may impact on ventilation quality. Methods: Retrospective analysis were performed of CPR recordings fromtwo databases of adult patients in cardiac arrest including capnogram, compression depth, and airway flow, pressure and volume signals. Using automated signal processing techniques followed by manual revision, individual ventilations were identified and ventilation parameters were measured. Oscillations on the capnogram plateau during CCs were characterized, and its correlation with compression depth and airway volume was assessed. Finally, we identified events of reversed airflow caused by CCs and their effect on volume and capnogram waveform. Results: Ventilation rates were higher than the recommended 10 breaths/min in 66.7% of the cases. Variability in ventilation rates correlated with the variability in tidal volumes and other ventilatory parameters. Oscillations caused by CCs on capnograms were of high amplitude (median above 74%) and were associated with low pseudo-volumes (median 26 mL). Correlation between the amplitude of those oscillations with either the CCs depth or the generated passive volumes was low, with correlation coefficients of -0.24 and 0.40, respectively. During inspiration and expiration, reversed airflow events caused opposed movement of gases in 80% of ventilations. Conclusions: Our study confirmed lack of adherence between measured ventilation rates and the guideline recommendations, and a substantial dispersion in manual ventilation parameters during CPR. Oscillations on the capnogram plateau caused by CCs did not correlate with compression depth or associated small tidal volumes. CCs caused reversed flow during inspiration, expiration and in the interval between ventilations, sufficient to generate volume changes and causing oscillations on capnogram. Further research is warranted to assess the impact of these findings on ventilation quality during CPR.

CERERBRAL MONITORING

No articles identified.

ULTRASOUND AND CPR

1. Sci Rep. 2023 Nov 16;13(1):20085. doi: 10.1038/s41598-023-46684-x.

Feasibility of resuscitative transesophageal echocardiography at out-of-hospital emergency scenes of cardiac arrest.

Krammel M(1)(2), Hamp T(3)(4), Hafner C(5), Magnet I(6), Poppe M(6), Marhofer P(5).

ABSTRACT

Guidelines recommend the use of ultrasound in cardiac arrest. Transthoracic echocardiography, has issues with image quality and by increasing hands-off times during resuscitation. We assessed the feasibility of transesophageal echocardiography (TEE), which does not have both problems, at out-of-hospital cardiac arrest (OHCA) emergency scenes. Included were 10 adults with non-traumatic OHCA in Vienna, Austria. An expert in emergency ultrasound was dispatched to the scenes in addition to the resuscitation team. Feasibility was defined as the ability to collect specific items of information by TEE within 10 min. Descriptive statistics were compiled and hands-off times were compared to a historical control group. TEE examinations were feasible in 9 of 10 cases and prompted changes in clinical management in 2 cases (cardiac tamponade: n = 1; right ventricular dilatation: n = 1). Their mean time requirement was 5.1 ± 1.7 (2.8-8.0) min, and image quality was invariably rated as excellent or good during both compressions and pauses. No TEE-related complications, or interferences with activities of advanced life support were observed. The hands-off

times during resuscitation were comparable to a historical control group not involving ultrasound (P = 0.24). Given these feasibility results, we expect that TEE can be used routinely at OHCA emergency scenes.

2. CJEM. 2023 Nov;25(11):862-864. doi: 10.1007/s43678-023-00557-4. Epub 2023 Jul 12.
Just the facts: transesophageal echocardiography in cardiac arrest.
Hanna C(1), Gottlieb M(2), Burns K(3)(4), Jelic T(5).
NO ABSTRACT AVAILBLE

ORGANISATION AND TRAINING

1. Scand J Trauma Resusc Emerg Med. 2023 Nov 17;31(1):82. doi: 10.1186/s13049-023-01117-6.
Is dispatcher-assisted cardiopulmonary resuscitation affected by a bystander's emotional stress state in out-of-hospital cardiac arrest?
Tuffley RH(1), Folke F(2)(3)(4), Ersbøll AK(5), Blomberg SNF(2), Linderoth G(2)(6).
ABSTRACT
AIM: The study aimed to investigate whether a bystander's emotional stress state affects dispatcher-assisted cardiopulmonary resuscitation (DA-CPR) in out-of-hospital cardiac arrest (OHCA). The primary outcome was initiation of chest compressions (Yes/No). Secondarily we analysed time until chest compressions were initiated and assessed how dispatchers instructed CPR. METHOD: The study was a retrospective, observational study of OHCA emergency calls from the Capital Region of Denmark. Recorded calls were evaluated by five observers using a pre-defined code catalogue regarding the variables wished investigated. RESULTS: Included were 655 OHCA emergency calls, of which 211 callers were defined as emotionally stressed. When cardiac arrest was recognized, chest compressions were initiated in, respectively, 76.8% of cases with an emotionally stressed caller and 73.9% in cases with a not emotionally stressed caller (2.18 (0.80-7.64)). Cases with an emotionally stressed caller had a longer time until chest compressions were initiated compared to cases with a not emotionally stressed caller, however non-significant (164 s. vs. 146 s.; P = 0.145). The dispatchers were significantly more likely to be encouraging and motivating, and to instruct on speed and depth of chest compressions in cases with an emotionally stressed caller compared to cases with a not emotionally stressed caller (1.64 (1.07-2.56); 1.78 (1.13-2.88)). Barriers to CPR were significantly more often reported in cases with an emotionally stressed caller compared to cases with a not emotionally stressed caller (1.83 (1.32-2.56)). CONCLUSION: There was no significant difference in initiation of chest compressions or in time until initiation of chest compressions in the two groups. However, the dispatchers were overall more encouraging and motivating, and likely to instruct on speed and depth of chest compressions when the caller was emotionally stressed. Furthermore, barriers to CPR were more often reported in cases with an emotionally stressed caller compared to cases with a not emotionally stressed caller.

2. Scand J Trauma Resusc Emerg Med. 2023 Nov 17;31(1):81. doi: 10.1186/s13049-023-01144-3.
A simulation-based randomized trial of ABCDE style cognitive aid for emergency medical services CHecklist In Prehospital Settings: the CHIPS-study.
Droege H(1)(2), Trentzsch H(3), Zech A(3), Prückner S(3), Imach S(4).
ABSTRACT
BACKGROUND: Checklists are a powerful tool for reduction of mortality and morbidity. Checklists structure complex processes in a reproducible manner, optimize team interaction, and prevent errors related to human factors. Despite wide dissemination of the checklist, effects of checklist use in the prehospital emergency medicine are currently unclear. The aim of the study was to

demonstrate that participants achieve higher adherence to guideline-recommended actions, manage the scenario more time-efficient, and thirdly demonstrate better adherence to the ABCDE-compliant workflow in a simulated ROSC situation. METHODS: CHIPS was a prospective randomized case-control study. Professional emergency medical service teams were asked to perform cardiopulmonary resuscitation on an adult high-fidelity patient simulator achieving ROSC. The intervention group used a checklist which transferred the ERC guideline statements of ROSC into the structure of the 'ABCDE' mnemonic. Guideline adherence (performance score, PS), utilization of process time (items/minute) and workflow were measured by analyzing continuous A/V recordings of the simulation. Pre- and post-questionnaires addressing demographics and relevance of the checklist were recorded. Effect sizes were determined by calculating Cohen's d. The level of significance was defined at $p < 0.05$. RESULTS: Twenty scenarios in the intervention group (INT) and twenty-one in the control group (CON) were evaluated. The average time of use of the checklist (CU) in the INT was 6.32 min (2.39-9.18 min; SD = 2.08 min). Mean PS of INT was significantly higher than CON, with a strong effect size ($p = 0.001$, $d = 0.935$). In the INT, significantly more items were completed per minute of scenario duration (INT, 1.48 items/min; CON, 1.15 items/min, difference: 0.33/min (25%), $p = 0.001$), showing a large effect size ($d = 1.11$). The workflow did not significantly differ between the groups ($p = 0.079$), although a medium effect size was shown ($d = 0.563$) with the tendency of the CON group deviating stronger from the ABCDE than the INT. CONCLUSION: Checklists can have positive effects on outcome in the prehospital setting by significantly facilitates adherence to guidelines. Checklist use may be time-effective in the prehospital setting. Checklists based on the 'ABCDE' mnemonic can be used according to the 'do verify' approach. Team Time Outs are recommended to start and finish checklists.

3. Prehosp Emerg Care. 2023 Nov 17:1-32. doi: 10.1080/10903127.2023.2283885. Online ahead of print.

Prehospital Intervention Improves Outcomes for Patients Presenting in Atrial Fibrillation with Rapid Ventricular Response.

Fornage LB(1), O'Neil C(2), Dowker SR(3), Wanta ER(4), Lewis RS(5), Brown LH(6)(7)(8).

ABSTRACT

OBJECTIVE: To compare outcomes of patients presenting to emergency medical services (EMS) with atrial fibrillation with rapid ventricular response (AF-RVR) who did and did not receive prehospital advanced life support (ALS) rate or rhythm control intervention(s). METHODS: This retrospective cohort study used the 2021 ESO Data Collaborative (Austin, TX) dataset. We identified 9-1-1 scene responses for patients aged 16 to 100 years old presenting with AF and an initial heart rate ≥ 110 beats per minute (bpm). Prehospital ALS interventions for AF-RVR included medications (e.g., calcium channel blockers, beta blockers, etc.) or electrical cardioversion. Outcome measures included prehospital rate control (i.e., final prehospital heart rate < 110 bpm), emergency department (ED) discharge to home, ED and hospital length of stay, and mortality. We also evaluated prehospital adverse events-specifically bradycardia, hypotension, and cardiac arrest. We used propensity score matching to compare outcomes among treated and untreated patients with similar demographic and clinical characteristics. We determined the average treatment effect on the treated (ATET) with 95% confidence intervals (CI) and the number needed to treat (NNT). RESULTS: After propensity score matching, prehospital outcomes were available for 4,859 treated patients matched with 4,859 similar untreated patients. Prehospital rate control was more frequent for treated than for untreated patients (41.0% vs. 18.2%, ATET +22.8%, CI: +21.1%; +24.6%, NNT = 5). Hospital outcomes were available for 1,347 treated patients matched with 1,347 similar untreated patients. Treated patients were more likely to be discharged from the ED (37.9% vs. 34.0%, ATET +3.9%, CI: +0.2%; +7.5%, NNT = 26) and less likely to die (4.3% vs. 6.7%, ATET -2.5%, CI: -4.2%; -0.8%,

NNT = 40) compared to untreated patients. Hypotension occurred more often in treated patients (ATET +2.6%, CI: +1.5%; +3.7%), but resolved before ED arrival in 73% of affected patients. Otherwise, adverse event rates did not significantly differ for the two groups. CONCLUSIONS: In this propensity score matched study of patients presenting to EMS with AF-RVR, prehospital ALS interventions were associated with more frequent prehospital rate control, more frequent discharge to home from the ED, and lower mortality.

4. Scand J Trauma Resusc Emerg Med. 2023 Nov 14;31(1):79. doi: 10.1186/s13049-023-01147-0.
Professional prehospital clinicians' experiences of ethical challenges associated with the collaboration with organised voluntary first responders: a qualitative study.
Sørensen OB(1)(2), Milling L(2)(3)(4), Laerkner E(5)(6), Mikkelsen S(7)(8)(9), Bruun H(2)(3)(10).
ABSTRACT
BACKGROUND: Volunteer First Responders are used worldwide. In the Region of Southern Denmark, two types of programs have been established. One of these programs consists of voluntary responders without any requirements of education or training who are summoned to prehospital cardiac arrests. The other type of program is established primarily in the rural areas of the region and consists of volunteers with some mandatory education in first aid. These volunteers are summoned to all urgent cases along with the ambulances. Cooperation between professional healthcare workers and nonprofessionals summoned through official channels may be challenging. This study aimed to explore prehospital clinicians' experiences of ethical challenges in cooperation with volunteer first responders. METHODS: We conducted 16 semi-structured interviews at four different ambulance stations in the Region of Southern Denmark. Five emergency physicians and 11 emergency medical technicians/paramedics were interviewed. The interviews were transcribed, and the data were analysed using systematic text condensation. RESULTS: The study's 16 interviews resulted in the identification of some specific categories that challenged the cooperation between the two parties. We identified three main categories: 1. Beneficence, the act of doing good, 2. The risk of harming patients' autonomy 3. Non-maleficence, which is the obligation not to inflict harm on others. CONCLUSION: This study provides an in-depth insight into the ethical challenges between prehospital clinicians and voluntary first responders from the perspective of the prehospital clinicians. Both programs are considered to have value but only when treating patients with cardiac arrest. Our study highlights potential areas of improvement in the two Danish voluntary programs in their current form.

5. J Clin Med. 2023 Oct 28;12(21):6815. doi: 10.3390/jcm12216815.
Emergency Medicine Perspectives: The Importance of Bystanders and Their Impact on On-Site Resuscitation Measures and Immediate Outcomes of Out-of-Hospital Cardiac Arrest.
Bednarz K(1), Goniewicz K(2), Al-Wathinani AM(3), Goniewicz M(1).
ABSTRACT
INTRODUCTION: Out-of-hospital cardiac arrests (OHCAs) represent critical medical emergencies in which timely interventions can make a significant difference in patient outcomes. Despite their importance, the role of on-scene witnesses during such events remains relatively unexplored. AIM OF THE STUDY: This research seeks to shed light on the influence of witnesses, especially family members, during OHCAs and the effect of their interventions, or the absence thereof, on outcomes. Drawing from existing literature, our working hypothesis suggests that the presence of a witness, particularly one who is knowledgeable about CPR, can increase the likelihood of obtaining the return of spontaneous circulation (ROSC), potentially enhancing overall survival rates. METHODS: Using a retrospective analytical method, we thoroughly reviewed medical records from the Lublin Voivodeship between 2014-2017. Out of 5111 events identified using ICD-10 diagnosis codes and

ICD-9 medical procedure codes, 4361 cases specifically related to sudden cardiac arrest were chosen. Concurrently, 750 events were excluded based on predefined criteria. RESULTS: Both basic and advanced EMS teams showed higher rates of CPR initiation and an increased likelihood of obtaining ROSC. Notably, the presence of a trained EMS professional as a witness significantly increased the chances of CPR initiation. The presenting rhythms most often detected were ventricular tachycardia (VT) and ventricular fibrillation (VF). Different urgency codes were directly linked to varying ROSC outcomes. When witnesses, especially family members, began chest compressions, the use of amiodarone was notably higher. A significant finding was that 46.85% of OHCA patients died without witnesses, while family members were present in 23.87% of cases. Actions taken by witnesses, especially chest compressions, generally extended the overall duration of patient care. CONCLUSION: The crucial influence of witnesses, particularly family members, on OHCA outcomes is evident. Therefore, it is essential to increase public awareness of CPR techniques and rapid intervention strategies to improve outcomes in emergency situations.

6. Int J Gen Med. 2023 Nov 6;16:5089-5096. doi: 10.2147/IJGM.S442167. eCollection 2023.
Application of Automated External Defibrillators Among the Public: A Cross-Sectional Study of Knowledge, Attitude, Practice, and Barriers of Use in Saudi Arabia.
AlRadini FA(1), Sabbagh AY(2), Alamri FA(3), Almuzaini Y(4), Alsofayan YM(5), Alahmari AA(4), Khan AA(6), Amer SA(7), Alanazi RC(8), Alanazi IF(8), Shubayli AA(9), Alkenani RM(10), Mzahim B(11), Maghraby N(12), Salamah AM(13), Aljahany M(1).
ABSTRACT
BACKGROUND: The likelihood of survival of an out-of-hospital cardiac arrest quadruples with the rapid application of basic life support (BLS). The public's ability to perform cardiopulmonary resuscitation (CPR) and use automated external defibrillators (AEDs) is extremely important. This study aimed to assess the public knowledge, attitudes, and practices (KAP) of utilizing AEDs and to understand barriers to AED application. METHODS: We conducted a cross-sectional study from March 1-30, 2022. An electronic questionnaire was constructed and validated to measure the KAP for public AED utilization and its barriers. RESULTS: Of the 406 participants, 244 (60.10%) were males. Male respondents had 17% less knowledge and poorer attitude towards using an AED as compared to female respondents. Knowledge and attitudes on using AEDs were low (70.7%) among Saudi nationals compared to those of foreign nationals. Those who were BLS/CPR trained had a 2.5 times greater understanding and willingness to use AEDs in public than those who were not. Barriers to AEDs in CPR/BLS-trained participants were: (1) accidentally hurting the victim (14.3%), (2) duty as a bystander to just call the ambulance and wait for help (12.1%), (3) never taught what to do (n = 41, 18.4%), (4) did not want to be scolded if performed wrong (3.1%), and (5) never witnessed such a situation (51.6%). CONCLUSION: There is a strong association between knowledge of and willingness to use AEDs in emergency situations among the public. Misconceptions about AEDs hinder their use. This calls for urgent training programs through accessible technology to reach the public.

7. Rev Infirm. 2023 Nov;72(295):42-44. doi: 10.1016/j.revinf.2023.09.012. Epub 2023 Oct 24.
[Ethical issues surrounding death in pre-hospital medicine]. [Article in French]
Hugenschmitt D(1), Le Coz P(2), Lefort H(3), Tazarourte K(4), Douplat M(5).
ABSTRACT
Mobile emergency and resuscitation teams are confronted with death on a daily basis. In the home, the management of a death is complex. It raises ethical questions and sometimes destabilizes personal or collective values. Our single-center qualitative survey, conducted over a one-month period (2022), questioned 64/154 caregivers about the moral burden and challenges of such situations. The consequences of operational experience are discussed: time, fatigue, emotions and

training. The quality of presence is an alternative to the success or failure of cardiac arrest care at home.

8. Resuscitation. 2023 Nov 10:110044. doi: 10.1016/j.resuscitation.2023.110044. Online ahead of print.

Out-of-Hospital Cardiac Arrest Outcomes when Law Enforcement Arrives Before Emergency Medical Services.

Lupton JR(1), Johnson E(2), Prigmore B(2), Daya MR(2), Jui J(2), Thompson K(2), Nuttall J(3), Neth MR(2), Sahni R(2), Newgard CD(2).

ABSTRACT

BACKGROUND: Law enforcement (LE) professionals are often dispatched to out-of-hospital cardiac arrests (OHCA) to provide early cardiopulmonary resuscitation (CPR) and automated external defibrillator (AED) application with mixed evidence of a survival benefit. Our objective was to comprehensively evaluate LE care in OHCA. METHODS: This is a secondary analysis of adults with non-traumatic OHCA not witnessed by EMS and without bystander AED use from 2018-2021. Our primary outcome was survival with Cerebral Perfusion Category score ≤2 (functional survival). Our exposures included: LE On-scene Only (without providing care); LE CPR Only (without applying an AED); LE Ideal Care (ensuring CPR and AED application). Our control group had no LE arrival before EMS. We performed multivariable logistic regression analyses adjusting for confounders and stratified our analyses by patients with and without bystander CPR. RESULTS: There were 2569 adult, non-traumatic OHCAs from 2018-2021 meeting inclusion criteria. There were no differences in the odds of functional survival for LE On-scene Only (adjusted odds ratio [95% CI]: 1.28 [0.47-3.45]), LE CPR Only (1.26 [0.80-1.99]), or LE Ideal Care (1.36 [0.79-2.33]). In patients without bystander CPR, LE Ideal Care had significantly higher odds of functional survival (2.01 [1.06-3.81]) compared to no LE on-scene, with no significant associations for LE On-scene Only or LE CPR Only. There were no significant differences by LE care in patients already receiving bystander CPR. CONCLUSIONS: LE arrival before EMS and ensuring both CPR and AED application is associated with significantly improved functional survival in OHCA patients not already receiving bystander CPR.

9. Gerontol Geriatr Med. 2023 Nov 8;9:23337214231208824. doi: 10.1177/23337214231208824. eCollection 2023 Jan-Dec.

"If I Become a Vegetable, Then no": A Thematic Analysis of How Patients and Physicians Refer to Prognosis When Discussing Cardiopulmonary Resuscitation.

Sterie AC(1), Castillo C(1), Jox RJ(1), Büla CJ(1), Rubli Truchard E(1).

ABSTRACT

Background: Documenting decisions about the relevance cardiopulmonary resuscitation (CPR) is a standard practice at hospital admission yet a complex task. Objective: Our aim was to explore how physicians approach and discuss CPR prognosis with older patients recently admitted to a post-acute care unit. Method: We recorded 43 conversations between physicians and patients about the relevancy of CPR that took place at admission at the geriatric rehabilitation service of a Swiss university hospital. Thematic analysis determined (i) who initiated the talk about CPR prognosis, (ii) at what point in the conversation, and (iii) how prognosis was referred to. Results: Prognosis was mentioned in 65% of the conversations. We categorized the content of references to CPR prognosis in five themes: factors determining the prognosis (general health, age, duration of maneuvers); life (association of CPR with life, survival); proximal adverse outcomes (broken ribs, intensive care); long-term adverse outcomes (loss of autonomy, suffering a stroke, pain, generic, uncertainty); and being a burden. Discussion and conclusion: Discussing CPR is important to all patients, including those for whom it is not recommended. Information about CPR prognosis is essential to empower and support

patients in expressing their expectations from life-prolonging interventions and attain shared decision-making.

10. Comput Biol Med. 2023 Nov 8;167:107672. doi: 10.1016/j.compbiomed.2023.107672. Online ahead of print.
Prompt-enhanced hierarchical transformer elevating cardiopulmonary resuscitation instruction via temporal action segmentation.
Liu Y(1), Zhong X(2), Zhai S(2), Du Z(2), Gao Z(3), Huang Q(4), Zhang CY(1), Jiang B(5), Pandey VK(2), Han S(1), Wang R(1), Han Y(6), Wang C(7), Qin P(8).
ABSTRACT
The vast majority of people who suffer unexpected cardiac arrest are performed cardiopulmonary resuscitation (CPR) by passersby in a desperate attempt to restore life, but endeavors turn out to be fruitless on account of disqualification. Fortunately, many pieces of research manifest that disciplined training will help to elevate the success rate of resuscitation, which constantly desires a seamless combination of novel techniques to yield further advancement. To this end, we collect a specialized CPR video dataset in which trainees make efforts to behave resuscitation on mannequins independently in adherence to approved guidelines, promoting an auxiliary toolbox to assist supervision and rectification of intermediate potential issues via modern deep learning methodologies. Our research empirically views this problem as a temporal action segmentation (TAS) task in computer vision, which aims to segment an untrimmed video at a frame-wise level. Here, we propose a Prompt-enhanced hierarchical Transformer (PhiTrans) that integrates three indispensable modules, including a textual prompt-based Video Features Extractor (VFE), a transformer-based Action Segmentation Executor (ASE), and a regression-based Prediction Refinement Calibrator (PRC). The backbone preferentially derives from applications in three approved public datasets (GTEA, 50Salads, and Breakfast) collected for TAS tasks, which experimentally facilitates the model excavation on the CPR dataset. In general, we probe into a feasible pipeline that elevates the CPR instruction qualification via action segmentation equipped with novel deep learning techniques. Associated experiments on the CPR dataset advocate our resolution with surpassing 91.0% on Accuracy, Edit score, and F1 score.

11. Am J Emerg Med. 2023 Nov 10;76:18-23. doi: 10.1016/j.ajem.2023.11.009. Online ahead of print.
Comparisons of the vertical one-handed chest compressions according to the rescuer's handedness.
Kim J(1), Oh JH(2), Min K(3), Kim DH(4).
ABSTRACT
OBJECTIVE: The vertical one-handed chest compression (OHCC) technique has demonstrated superior compression power and chest compression depth (CCD) compared to conventional OHCC. This study aimed to determine if a rescuer's handedness influences the CCD during the vertical OHCC. METHODS: This prospective randomized crossover simulation trial included 59 medical doctors. Each performed a 2-min single-rescuer cardiopulmonary resuscitation (CPR) on a pediatric manikin using the vertical OHCC, once with the dominant hand (Test 1) and once with the non-dominant hand (Test 2). CPR parameters were recorded in real-time via sensors in the manikin, and the compression force exerted by each hand was measured using a force plate. RESULTS: The mean and adequate CCD did not differ significantly between Test 1 and 2 (mean depth: 52 mm (interquartile range [IQR]: 49-57) in Test 1 vs. 52 mm (IQR: 49-57) in Test 2, P = 0.625; adequate depth: 97% (IQR: 37-100) in Test 1 vs. 92% (IQR: 51-99) in Test 2, P = 0.619). The mean compression force was significantly greater in the dominant hand compared to the non-dominant hand (23.1 kg ± 4.9 in dominant hand vs. 21.7 kg ± 4.1 in non-dominant hand, P < 0.001). Other

parameters showed no significant differences between Tests 1 and 2. CONCLUSIONS: While vertical OHCC with a dominant hand generated greater force, the rescuer's handedness did not affect the CCD during the vertical OHCC.

12. J Clin Med. 2023 Nov 5;12(21):6939. doi: 10.3390/jcm12216939.
Attitudes of Asian and Polish Adolescents towards the Use of Ecological Innovations in CPR Training.
Jaskiewicz F(1), Timler D(1).
ABSTRACT
BACKGROUND: The potential use of manikins made of environmentally friendly materials (biodegradable or easily recycled) could be a milestone in promoting cardiac arrest awareness and mass resuscitation training without the threat of generating large amounts of unprocessable waste. The main aim of the study was to compare the attitude of young adults from Asia and Poland towards cardiopulmonary resuscitation training forms and to evaluate the innovative concept of an ecological resuscitation manikin; Methods: This was a survey-based study conducted during two events in Thailand and Poland in 2023; Results: A total of 226 questionnaires were included in the final analysis. Asian respondents were significantly more likely to choose traditional training than Polish participants (78% vs. 58%, respectively). A manikin that is mainly biodegradable was the most common choice across the entire study group. Young Asians were significantly more likely to choose a traditional stationary course, while Polish respondents were highly significantly more likely to opt for hybrid training (online with practical training provided at the student's home). CONCLUSIONS: In the total study group, young people from Poland and parts of Asia are most likely to participate in traditional on-site instructor-led training, but a comparison across groups showed a significant tendency for young Poles to choose a hybrid training option, i.e., a combination of online and hands-on training. Despite some differences, both study groups showed a strong interest in pro-environmental behavior and the use of more ecofriendly solutions than previously used in resuscitation training.

13. Eur Heart J. 2023 Nov 14;44(43):4497-4498. doi: 10.1093/eurheartj/ehad492.
Challenges in treatment of cardiac arrest in low- and low middle-income countries.
Aleksic M(1).
NO ABSTRACT AVAILBLE

14. Eur J Prev Cardiol. 2023 Nov 9;30(16):e66-e68. doi: 10.1093/eurjpc/zwad076.
Incidence of out-of-hospital cardiac arrest according to age and sex: a surprising stability.
Lavignasse D(1), Sideris G(1)(2), Jost D(3), Dumas F(1)(4), Cariou A(1)(4), Marijon E(1)(2), Jouven X(1)(2).
NO ABSTRACT AVAILABLE

15. Ann Emerg Med. 2023 Nov 14:S0196-0644(23)01234-9. doi: 10.1016/j.annemergmed. 2023.09.016. Online ahead of print.
Teaching Cardiopulmonary Resuscitation to Later Elementary School Students.
McGlinchey Ford M(1), Rogotzke CD(2), Bencik SL(2), Billian JR(3), Young JL(4), Bencik CD(5), Mastenbrook JD(2).
ABSTRACT
STUDY OBJECTIVE: Bystander cardiopulmonary resuscitation (CPR) rates remain low in the United States. Training children is a proposed method to increase this rate, but data on the compression

efficacy of US elementary school-aged children are scarce. We hypothesized that fourth and fifth graders could learn how to respond to cardiac arrests and provide effective chest compressions. METHODS: We conducted a nonrandomized before-and-after study with fourth- and fifth-grade elementary students. Two 2-hour CPR educational sessions were held. Two weeks later, skills were assessed using a de novo checklist, and manikin-analyzed compression effectiveness (dichotomized at 50% efficacy) was analyzed using Chi-squared tests. We used paired t tests to evaluate knowledge change on identical pre- and post-tests. Secondary analysis evaluated associations between compression effectiveness and grade, age, sex, and body mass index (BMI) using Chi-squared tests. RESULTS: Three hundred fifty-six students completed the study. The mean change in test scores measuring CPR knowledge increased from 8.2 to 9.3 (1.1, 95% confidence interval [CI] 0.9 to 1.2). Self-reported adequate CPR knowledge increased from 44% to 97% (odds ratio [OR] 44.17, 95% CI 12.62 to 154.62). Seventy-two percent of students completed >7/11 predefined resuscitation steps, and 76% delivered ≥50% effective compressions. Grade was significantly associated with achieving ≥50% effective compression (OR 2.02, 95% CI, 1.19 to 3.43). Age, BMI, and sex were not significantly associated with greater compression efficacy. CONCLUSION: Most students were able to learn hands-only CPR, apply their knowledge during a simulated cardiac arrest scenario, and deliver effective chest compressions. Students' confidence and willingness to perform CPR increased after the intervention.

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.

2. BMC Health Serv Res. 2023 Nov 15;23(1):1258. doi: 10.1186/s12913-023-10147-w.
Standardizing post-cardiac arrest care across rural-urban settings - qualitative findings on proposed post-cardiac arrest learning community intervention.
May TL(1)(2), Siladi S(3), Daley AL(4), Riker R(5)(4), Zanichkowsky R(4), Burla M(6), Swan E(7), Talbot JA(3).
ABSTRACT
BACKGROUND: Standardization of post-cardiac arrest care between emergency department arrival and intensive care unit admission can be challenging, particularly for rural centers, which can experience significant delays in interfacility transfer. One approach to addressing this issue is to form a post-cardiac arrest learning community (P-CALC) consisting of emergency department (ED) and intensive care unit (ICU) physicians and nurses who use data, shared resources, and collaboration to improve post-cardiac arrest care. MaineHealth, the largest regional health system in Maine, launched its P-CALC in 2022. OBJECTIVE: To explore P-CALC participants' perspectives on current post-cardiac arrest care, attitudes toward implementing a P-CALC intervention, perceived barriers and facilitators to intervention implementation, and implementation strategies. METHODS: We conducted semi-structured, individual, qualitative interviews with 16 staff from seven system EDs

spanning the rural-urban spectrum. Directed content analysis was used to discern key themes in transcribed interviews. RESULTS: Participants highlighted site- and system-level factors influencing current post-cardiac arrest care. They expressed both positive attitudes and concerns about the P-CALC intervention. Multiple facilitators and barriers were identified in regard to the intervention implementation. Five proposed implementation strategies emerged as important factors to move the intervention forward. CONCLUSIONS: Implementation of a P-CALC intervention to effect system-wide improvements in post-cardiac arrest care is complex. Understanding providers' perspectives on current care practices, feasibility of quality improvement, and potential intervention impacts is essential for program development.

3. Cardiovasc Drugs Ther. 2023 Nov 14. doi: 10.1007/s10557-023-07524-2. Online ahead of print.
Possible Cardioprotective Effects of Lactate Infusion After Cardiac Arrest or Prolonged Myocardial Ischemia.
Koyama T(1).
NO ABSTRACT AVAILABLE

4. World J Emerg Med. 2023;14(6):477-480. doi: 10.5847/wjem.j.1920-8642.2023.092.
The effects of hyperbaric oxygen therapy on paroxysmal sympathetic hyperactivity after cardiopulmonary resuscitation: a case series.
Wang H(1)(2)(3), Li Y(1)(3), Zhao M(2), Ren C(4), Zhang S(1)(2)(3).
NO ABSTRACT AVAILABLE

TARGETED TEMPERATURE MANAGEMENT

No articles identified.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

1. CJEM. 2023 Nov 17. doi: 10.1007/s43678-023-00610-2. Online ahead of print.
Regional variation in accessibility of automated external defibrillators in British Columbia.
Li ZH(#)(1), Heidet M(#)(2)(3)(4), Bal J(5), Ly S(6), Yan T(7), Scheuermeyer F(4)(8)(9), Stambulic M(10), Deakin J(4)(11), Chakrabarti S(9)(12), MacPherson A(4)(8)(11), Christenson J(4)(8)(9), Grunau B(13)(14)(15)(16).
ABSTRACT
OBJECTIVES: Bystander-applied Automated External Defibrillators (AED) improve outcomes for out-of-hospital cardiac arrest. AED placement is often driven by private enterprise or non-for-profit agencies, which may result in inequitable access. We sought to compare AED availability between four regions in British Columbia (BC). METHODS: We identified AEDs (confirmed to be operational) and emergency medical system (EMS)-treated out-of-hospital cardiac arrests (OHCA) from provincial registries. We compared AED availability between BC's four most populous regions. The primary outcome was the total regional weekly accessible AED-hours per 100,000 population. We also examined: AEDs per 100,000 population and per km2, the ratio of AEDs to OHCA, and the distance from each OHCA to the closest AED. RESULTS: From provincial registries, we included 879 AEDs from BC's four most populous regions, where 9333 EMS-treated OHCA occurred over a 5-year period. The most common AED location types were stores, public community centres, and office buildings. Ten percent of AEDs were accessible for all hours. Weekly accessible AED-hours/100,000 population in the four regions were: 3845, 1734, 1594, and 1299. AEDs/100,000 population ranged from 22 to 48, and AEDs/km2 ranged from 0.0048 to 0.20. The number of OHCAs per AED per year ranged from 1.1 to 2.8. The median OHCA-to-closest AED distance ranged from 503 (IQR 244, 947) to 925 (IQR 455,

1501) metres. The regional mean accessibility of individual AEDs ranged between 59 and 79 h per week. CONCLUSION: BC's four most populous regions demonstrate substantial variability in AED accessibility. Further benefit could be derived from AEDs if placed in locations accessible all hours. Our data may encourage community planning efforts to use data-based strategies to systematically place AEDs in optimal locations with strategies to maximize accessibility.

2. Resuscitation. 2023 Nov 14:110049. doi: 10.1016/j.resuscitation.2023.110049. Online ahead of print.

Electroencephalogram-based Machine Learning Models to Predict Neurologic Outcome after Cardiac Arrest: A Systematic Review.

Chen CC(1), Massey SL(2), Kirschen MP(3), Yuan I(4), Padiyath A(4), Simpao AF(4), Tsui FR(5).

ABSTRACT

AIM: of the review: The primary aim of this systematic review was to investigate the most common electroencephalogram (EEG)-based machine learning (ML) model with the highest Area Under Receiver Operating Characteristic Curve (AUC) in two ML categories, conventional ML and Deep Neural Network (DNN), to predict the neurologic outcomes after cardiac arrest; the secondary aim was to investigate common EEG features applied to ML models. METHODS: Systematic search of medical literature from PubMed and engineering literature from Compendex up to June 2, 2023. One reviewer screened studies that used EEG-based ML models to predict the neurologic outcomes after cardiac arrest. Four reviewers validated that the studies met selection criteria. Nine variables were manually extracted. The top-five common EEG features were calculated. We evaluated each study's risk of bias using the Quality in Prognosis Studies guideline. RESULTS: Out of 351 identified studies, 17 studies met the inclusion criteria. Random Forest (RF) (n=7) was the most common ML model in the conventional ML category (n=11), followed by Convolutional Neural Network (CNN) (n=4) in the DNN category (n=6). The AUCs for RF ranged between 0.8 and 0.97, while CNN had AUCs between 0.7 and 0.92. The top-three commonly used EEG features were band power (n=12), Shannon's Entropy (n=11), burst-suppression ratio (n=9). CONCLUSIONS: RF and CNN were the two most common ML models with the highest AUCs for predicting the neurologic outcomes after cardiac arrest. Using a multimodal model that combines EEG features and electronic health record data may further improve prognostic performance.

3. Comput Methods Programs Biomed. 2023 Dec;242:107809. doi: 10.1016/j.cmpb. 2023.107809. Epub 2023 Sep 23.

Electrical-mechanical dynamical coupling between electrocardiographic and photoplethysmographic signals during cardiopulmonary resuscitation.

Chen S(1), Jiang L(2), Xu F(2), Pang J(2), Pan C(2), Chen Y(3), Wang J(4), Li K(5).

ABSTRACT

BACKGROUND AND OBJECTIVE: Cardiac arrest (CA) remains a significant cause of death and disability. High-quality cardiopulmonary resuscitation (CPR) can improve the survival rate of CA. A challenging issue is to find physiological indicators for screening and evaluating the cardiovascular function associated with CPR. This study aimed to investigate the electrical-mechanical dynamic coupling between electrocardiographic (ECG) and photoplethysmographic (PPG) signals for indicating cardiovascular function in the progress of CPR. METHOD: The ECG and PPG signals were simultaneously collected from a porcine CA model (n = 10) induced by ventricular fibrillation, and were further divided into four periods: Baseline, CA, CPR, and recovery of spontaneous circulation (ROSC). Recurrence quantitative analysis (RQA) was applied to examine the nonlinear dynamics of the ECG and PPG signals individually, and cross recurrence quantitative analysis (CRQA) was used to examine the ECG-PPG dynamical coupling. RESULTS: The CA influenced the dynamic patterns of

electrical and mechanical activities and the electrical-mechanical coupling, which can be observed from the reduced entropy (ENTR) ($p < 0.01$), reduced determinism (DET) ($p < 0.01$) and reduced trapping time (TT) ($p < 0.01$) at CA compared to Baseline. The recurrence rate (RR), ENTR, DET, and TT at CPR were significantly lower than the parameters at ROSC but higher than those at CA. CONCLUSIONS: The electrical-mechanical dynamical coupling was sensitive to CPR and able to reflect the changes in cardiac function in the process of CPR.

PEDIATRICS AND CHILDREN

1. Resuscitation. 2023 Nov 10:110045. doi: 10.1016/j.resuscitation.2023.110045. Online ahead of print.

Trends in community response and long term outcomes from paediatric cardiac arrest: A retrospective observational study.

Albrecht M(1), de Jonge RCJ(1), Dulfer K(1), Van Gils-Frijters APJM(2), de Hoog M(1), Hunfeld M(3), Kammeraad JAE(4), Moors XRJ(5), Nadkarni VM(6), Buysse CMP(7).

ABSTRACT

AIM: This study aimed to investigate trends over time in pre-hospital factors for pediatric out-of-hospital cardiac arrest (pOHCA) and long-term neurological and neuropsychological outcomes. These have not been described before in large populations. METHODS: Non-traumatic arrest patients, 1 day-17 years old, presented to the Sophia Children's Hospital from January 2002 to December 2020, were eligible for inclusion. Favorable neurological outcome was defined as Pediatric Cerebral Performance Categories (PCPC) 1-2 or no difference with pre-arrest baseline. The trend over time was tested with multivariable logistic and linear regression models with year of event as independent variable. FINDINGS: Over a nineteen-year study period, the annual rate of long-term favorable neurological outcome, assessed at a median 2·5 years follow-up, increased significantly (OR 1·10, 95%-CI 1·03-1·19), adjusted for confounders. Concurrently, annual automated external defibrillator (AED) use and, among adolescents, initial shockable rhythm increased significantly (OR 1·21, 95% CI 1·10-1·33 and OR 1·15, 95% CI 1·02-1·29, respectively), adjusted for confounders. For generalizability purposes, only the total intelligence quotient (IQ) was considered for trend analysis of all tested domains. Total IQ scores and bystander basic life support (BLS) rate did not change significantly over time. INTERPRETATION: Long-term favorable neurological outcome, assessed at a median 2·5 years follow-up, improved significantly over the study period. Total IQ scores did not significantly change over time. Furthermore, AED use (OR 1·21, 95%CI 1.10-1·33) and shockable rhythms among adolescents (OR1·15, 95%CI 1·02-1·29) increased over time.

2. Circulation. 2023 Nov 16. doi: 10.1161/CIR.0000000000001181. Online ahead of print.

2023 American Heart Association and American Academy of Pediatrics Focused Update on Neonatal Resuscitation: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.

Yamada NK, Szyld E, Strand ML, Finan E, Illuzzi JL, Kamath-Rayne BD, Kapadia VS, Niermeyer S, Schmölzer GM, Williams A, Weiner GM, Wyckoff MH, Lee HC; American Heart Association and American Academy of Pediatrics.

ABSTRACT

This 2023 focused update to the neonatal resuscitation guidelines is based on 4 systematic reviews recently completed under the direction of the International Liaison Committee on Resuscitation Neonatal Life Support Task Force. Systematic reviewers and content experts from this task force performed comprehensive reviews of the scientific literature on umbilical cord management in preterm, late preterm, and term newborn infants, and the optimal devices and interfaces used for

administering positive-pressure ventilation during resuscitation of newborn infants. These recommendations provide new guidance on the use of intact umbilical cord milking, device selection for administering positive-pressure ventilation, and an additional primary interface for administering positive-pressure ventilation.

3. Pediatrics. 2023 Nov 16. doi: 10.1542/peds.2023-065030. Online ahead of print.
2023 American Heart Association and American Academy of Pediatrics Focused Update on Neonatal Resuscitation: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.
Yamada NK(1), Szyld E(2), Strand ML(3), Finan E(4), Illuzzi JL(5), Kamath-Rayne BD(6), Kapadia VS(7), Niermeyer S(8), Schmölzer GM(9), Williams A(10), Weiner GM(11), Wyckoff MH(7), Lee HC(12).
ABSTRACT
This 2023 focused update to the neonatal resuscitation guidelines is based on 4 systematic reviews recently completed under the direction of the International Liaison Committee on Resuscitation Neonatal Life Support Task Force. Systematic reviewers and content experts from this task force performed comprehensive reviews of the scientific literature on umbilical cord management in preterm, late preterm, and term newborn infants, and the optimal devices and interfaces used for administering positive-pressure ventilation during resuscitation of newborn infants. These recommendations provide new guidance on the use of intact umbilical cord milking, device selection for administering positive-pressure ventilation, and an additional primary interface for administering positive-pressure ventilation.

EXTRACORPOREAL LIFE SUPPORT

1. Eur Heart J Acute Cardiovasc Care. 2023 Nov 17:zuad143. doi: 10.1093/ehjacc/zuad143. Online ahead of print.
Cardiac Arrest in the Extracorporeal Life Support (ECLS)-SHOCK Trial in Perspective.
Morrow DA(1)(2), Platz E(2).
NO ABSTRACT AVAILABLE

2. Crit Care. 2023 Nov 15;27(1):442. doi: 10.1186/s13054-023-04732-y.
In-hospital extracorporeal cardiopulmonary resuscitation for patients with out-of-hospital cardiac arrest: an analysis by time-dependent propensity score matching using a nationwide database in Japan.
Okada Y(1)(2), Komukai S(3), Irisawa T(4), Yamada T(5), Yoshiya K(6), Park C(7), Nishimura T(8), Ishibe T(9), Kobata H(10), Kiguchi T(11), Kishimoto M(12), Kim SH(13), Ito Y(14), Sogabe T(15), Morooka T(16), Sakamoto H(17), Suzuki K(18), Onoe A(19), Matsuyama T(20), Nishioka N(21), Matsui S(22), Yoshimura S(21), Kimata S(21), Kawai S(21), Makino Y(21), Kiyohara K(23), Zha L(22), Ong MEH(24)(25), Iwami T(21), Kitamura T(22).
ABSTRACT
BACKGROUND: Extracorporeal cardiopulmonary resuscitation (ECPR) has been proposed as a rescue therapy for patients with refractory cardiac arrest. This study aimed to evaluate the association between ECPR and clinical outcomes among patients with out-of-hospital cardiac arrest (OHCA) using risk-set matching with a time-dependent propensity score. METHODS: This was a secondary analysis of the JAAM-OHCA registry data, a nationwide multicenter prospective study of patients with OHCA, from June 2014 and December 2019, that included adults (≥ 18 years) with OHCA. Initial cardiac rhythm was classified as shockable and non-shockable. Patients who received ECPR were sequentially matched with the control, within the same time (minutes) based on time-dependent propensity scores calculated from potential confounders. The odds ratios with 95% confidence

intervals (CI) for 30-day survival and 30-day favorable neurological outcomes were estimated for ECPR cases using a conditional logistic model. RESULTS: Of 57,754 patients in the JAAM-OHCA registry, we selected 1826 patients with an initial shockable rhythm (treated with ECPR, n = 913 and control, n = 913) and a cohort of 740 patients with an initial non-shockable rhythm (treated with ECPR, n = 370 and control, n = 370). In these matched cohorts, the odds ratio for 30-day survival in the ECPR group was 1.76 [95%CI 1.38-2.25] for shockable rhythm and 5.37 [95%CI 2.53-11.43] for non-shockable rhythm, compared to controls. For favorable neurological outcomes, the odds ratio in the ECPR group was 1.11 [95%CI 0.82-1.49] for shockable rhythm and 4.25 [95%CI 1.43-12.63] for non-shockable rhythm, compared to controls. CONCLUSION: ECPR was associated with increased 30-day survival in patients with OHCA with initial shockable and even non-shockable rhythms. Further research is warranted to investigate the reproducibility of the results and who is the best candidate for ECPR.

3. Resusc Plus. 2023 Nov 1;16:100493. doi: 10.1016/j.resplu.2023.100493. eCollection 2023 Dec.
Wolf Creek XVII Part 7: Mechanical circulatory support.
Hsu CH(1)(2), Trummer G(3), Belohlavek J(4), Yannopoulos D(5), Bartos JA(5).
ABSTRACT
INTRODUCTION: Failure to restore spontaneous circulation remains a major cause of death for cardiac arrest (CA) patients. Mechanical circulatory support, specifically extracorporeal cardiopulmonary resuscitation (ECPR), has emerged as a feasible and efficacious rescue strategy for selected refractory CA patients. METHODS: Mechanical Circulatory Support was one of six focus topics for the Wolf Creek XVII Conference held on June 14-17, 2023 in Ann Arbor, Michigan, USA. Conference invitees included international thought leaders and scientists in the field of CA resuscitation from academia and industry. Participants submitted via online survey knowledge gaps, barriers to translation and research priorities for each focus topic. Expert panels used the survey results and their own perspectives and insights to create and present a preliminary unranked list for each category that was debated, revised and ranked by all attendees to identify the top 5 for each category. RESULTS: Top 5 knowledge gaps included optimal patient selection, pre-ECPR treatments, logistical and programmatic characteristics of ECPR programs, generalizability and effectiveness of ECPR, and prevention of reperfusion injury. Top 5 barriers to translation included cost/resource limitations, technical challenges, collaboration across multiple disciplines, limited patient population, and early identification of eligible patients. Top 5 research priorities focused on comparing the outcomes of prehospital/rapid transport strategies vs in-hospital ECPR initiation, implementation of high-performing ECPR system vs standard care, rapid patient identification tools vs standard clinical judgment, post-cardiac arrest bundled care vs no bundled care, and standardized ECPR clinical protocol vs routine care. CONCLUSION: This overview can serve as an innovative guide to transform the care and outcome of patients with refractory CA.

4. J Clin Med. 2023 Oct 25;12(21):6730. doi: 10.3390/jcm12216730.
The Role of Extracorporeal Membrane Oxygenation ECMO in Accidental Hypothermia and Rewarming in Out-of-Hospital Cardiac Arrest Patients-A Literature Review.
Hymczak H(1)(2), Gołąb A(3)(4), Kosiński S(5), Podsiadło P(6), Sobczyk D(7)(8), Drwiła R(1)(9), Kapelak B(8)(9), Darocha T(10), Plicner D(8)(11).
ABSTRACT
Accidental hypothermia, defined as an unintentional drop of the body core temperature below 35 °C, is one of the causes of cardiocirculatory instability and reversible cardiac arrest. Currently, extracorporeal life support (ECLS) rewarming is recommended as a first-line treatment for hypothermic cardiac arrest patients. The aim of the ECLS rewarming is not only rapid normalization of core temperature but also maintenance of adequate organ perfusion. Veno-arterial extracorporeal membrane oxygenation (ECMO) is a preferred technique due to its lower anticoagulation requirements and potential to prolong circulatory support. Although highly efficient,

ECMO is acknowledged as an invasive treatment option, requiring experienced medical personnel and is associated with the risk of serious complications. In this review, we aimed to discuss the clinical aspects of ECMO management in severely hypothermic cardiac arrest patients.

5. Hong Kong Med J. 2023 Nov 16. doi: 10.12809/hkmj2210025. Online ahead of print.
Ten-year territory-wide trends in the utilisation and clinical outcomes of extracorporeal membrane oxygenation in Hong Kong.
Ng PY(1)(2), Chan VWS(1), Ip A(1), Ling L(3), Chan KM(3), Leung AKH(4), Chan KKC(5), So D(6), Shum HP(7), Ngai CW(2), Chan WM(2), Sin WC(2)(8).
ABSTRACT
INTRODUCTION: The utilisation of extracorporeal membrane oxygenation (ECMO) has been rapidly increasing in Hong Kong. This study examined 10-year trends in the utilisation and clinical outcomes of ECMO in Hong Kong. METHODS: We retrospectively reviewed the records of all adult patients receiving ECMO who were admitted to the intensive care units (ICUs) of public hospitals in Hong Kong between 2010 and 2019. Temporal trends across years were assessed using the Mann-Kendall test. Observed hospital mortality was compared with the Acute Physiology and Chronic Health Evaluation (APACHE) IV-predicted mortality. RESULTS: The annual number of patients receiving ECMO increased from 18 to 171 over 10 years. In total, 911 patients received ECMO during the study period: 297 (32.6%) received veno-arterial ECMO, 450 (49.4%) received veno-venous ECMO, and 164 (18.0%) received extracorporeal cardiopulmonary resuscitation. The annual number of patients aged ≥65 years increased from 0 to 47 (27.5%) [P for trend=0.001]. The median (interquartile range) Charlson Comorbidity Index increased from 1 (0-1) to 2 (1-3) [P for trend<0.001] while the median (interquartile range) APACHE IV score increased from 90 (57-112) to 105 (77-137) [P for trend =0.003]. The overall standardised mortality ratio comparing hospital mortality with APACHE IV-predicted mortality was 1.11 (95% confidence interval=1.01-1.22). Hospital and ICU length of stay both significantly decreased (P for trend=0.011 and <0.001, respectively). CONCLUSION: As ECMO utilisation increased in Hong Kong, patients put on ECMO were older, more critically ill, and had more co-morbidities. It is important to combine service expansion with adequate resource allocation and training to maintain quality of care.

EXPERIMENTAL RESEARCH

1. Sci Rep. 2023 Nov 16;13(1):20100. doi: 10.1038/s41598-023-47424-x.
Prophylactic supplement with melatonin prevented the brain injury after cardiac arrest in rats.
Hu Y(1)(2), Zhao X(2), Jiang G(2), Jin M(2), Jiang W(3), Han F(4).
ABSTRACT
Prophylactic pharmacotherapy for health care in patients with high risk of cardiac arrest (CA) is an elusive and less explored strategy. Melatonin has possibilities used as a daily nutraceutical to trigger the cellular adaptation. We sought to find the effects of long-term daily prophylactic supplement with melatonin on the victim of CA. Rats were divided into sham, CA, and melatonin + CA (Mel + CA) groups. The rats in the Mel + CA group received daily IP injection of melatonin 100 mg/kg for 14 days. CA was induced by 8 min asphyxia and followed by manual cardiopulmonary resuscitation. The endpoint was 24 h after resuscitation. Survival, neurological outcome, and hippocampal mitochondrial integrity, dynamics and function were assessed. Survival was significantly higher in the Mel + CA group than the CA group (81 vs. 42%, P = 0.04). Compared to the CA group, neurological damage in the CA1 region and the level of cytochrome c, cleaved caspase-3 and caspase-9 in the Mel + CA group were decreased (P < 0.05). Mitochondrial function and integrity were protected in the Mel + CA group compared to the CA group, according to the results of mitochondrial swelling, ΔΨm, ROS production, oxygen consumption rate, and respiratory control rate (P < 0.05). Melatonin increased SIRT3 and downregulated acetylated CypD. The mitochondrial dynamics and autophagy

were improved in the Mel + CA group ($P < 0.05$). Long-term daily prophylactic supplement with melatonin buy the time from brain injury after CA.

2. World J Emerg Med. 2023;14(6):462-470. doi: 10.5847/wjem.j.1920-8642.2023.102.
Vagus nerve stimulation protects against cerebral injury after cardiopulmonary resuscitation by inhibiting inflammation through the TLR4/NF-κB and α7nAChR/JAK2 signaling pathways.
Xu S(1), Guo L(2), Shao W(1), Liang L(3), Shu T(4), Zhang Y(5), Huang H(6), Guo G(1), Zhang Q(7), Sun P(1).

ABSTRACT
BACKGROUND: Our previous research proved that vagus nerve stimulation (VNS) improved the neurological outcome after cardiopulmonary resuscitation (CPR) by activating α7 nicotinic acetylcholine receptor (α7nAChR) in a rat model, but the underlying mechanism of VNS in neuroprotection after CPR remains unclear. METHODS: In vivo, we established a mouse model of cardiac arrest (CA)/CPR to observe the survival rate, and the changes in inflammatory factors and brain tissue after VNS treatment. In vitro, we examined the effects of α7nAChR agonist on ischemia/reperfusion (I/R)-induced inflammation in BV2 cells under oxygen-glucose deprivation/reoxygenation (OGD/R) conditions. We observed the changes in cell survival rate, the levels of inflammatory factors, and the expressions of α7nAChR/Janus kinase 2 (JAK2) and toll-like receptor 4 (TLR4) /nuclear factor-κB (NF-κB). RESULTS: In vivo, VNS preconditioning enhanced functional recovery, improved the survival rate, and reduced hippocampal CA1 cell damage, and the levels of inflammatory mediators after CA/CPR. The application of α7nAChR agonists provided similar effects against cerebral injury after the return of spontaneous circulation (ROSC), while α7nAChR antagonists reversed these neuroprotective impacts. The in vitro results mostly matched the findings in vivo. OGD/R increased the expression of tumor necrosis factor-alpha (TNF-α), TLR4 and NF-κB p65. When nicotine was added to the OGD/R model, the expression of TLR4, NF-κB p65, and TNF-α decreased, while the phosphorylation of JAK2 increased, which was prevented by preconditioning with α7nAChR or JAK2 antagonists. CONCLUSION: The neuroprotective effect of VNS correlated with the activation of α7nAChR. VNS may alleviate cerebral IR injury by inhibiting TLR4/NF-κB and activating the α7nAChR/JAK2 signaling pathway.

3. ACS Chem Neurosci. 2023 Nov 15. doi: 10.1021/acschemneuro.3c00397. Online ahead of print.
Fingerprint of Circulating Immunocytes as Biomarkers for the Prognosis of Brain Inflammation and Neuronal Injury after Cardiac Arrest.
Dou H(1), Brandon NR(2), Koper KE(2), Xu Y(3)(4).

ABSTRACT
Cardiac arrest is one of the most dangerous health problems in the world. Outcome prognosis is largely based on cerebral performance categories determined by neurological evaluations. Few systemic tests are currently available to predict survival to hospital discharge. Here, we present the results from the preclinical studies of cardiac arrest and resuscitation (CAR) in mice to identify signatures of circulating immune cells as blood-derived biomarkers to predict outcomes after CAR. Two flow cytometry panels for circulating blood lymphocytes and myeloid-derived cells, respectively, were designed to correlate with neuroinflammation and neuronal and dendritic losses in the selectively vulnerable regions of bilateral hippocampi. We found that CD4+CD25+ regulatory T cells, CD11b+CD11c- and CD11b+Ly6C+Ly6G+ myeloid-derived cells, and cells positive for the costimulatory molecules CD80 and CD86 in the blood were correlated with activation of microglia and astrocytosis, and CD4+CD25+ T cells are additionally correlated with neuronal and dendritic losses. A fingerprint pattern of blood T cells and monocytes is devised as a diagnostic tool to predict CAR outcomes. Blood tests aimed at identifying these immunocyte patterns in cardiac arrest patients

will guide future clinical trials to establish better prognostication tools to avoid unnecessary early withdrawal from life-sustaining treatment.

4. Intensive Care Med Exp. 2023 Nov 15;11(1):78. doi: 10.1186/s40635-023-00562-y.
Protective effect of canagliflozin on post-resuscitation myocardial function in a rat model of cardiac arrest.
Hua T(#)(1), Chu Y(#)(1), Wang M(1), Zhang Y(1), Shi W(1), Huang Q(1), Zhang L(1), Yang M(2).
ABSTRACT
BACKGROUND: Currently, most patients with cardiac arrest (CA) show reversible myocardial dysfunction, hemodynamic instability, systemic inflammation and other pathophysiological state in early stage of resuscitation, some patients may eventually progress to multiple organ failure. There is evidence that heart failure is the terminal stage in the development of various cardiovascular diseases. Although the cardio-protective effect of canagliflozin (CANA) has been confirmed in large clinical studies and recommended in domestic and international heart failure-related guidelines, the effectiveness of CANA after resuscitation remains unclear. In this study, we constructed a modified CA/CPR rat model to investigate whether CANA administered on post-resuscitation improves myocardial function. METHODS: Twenty-fourth healthy male Sprague-Dawley rats were randomized into four groups: (1) Sham + placebo group, (2) Sham + CANA group, (3) CPR + placebo group, and (4) CPR + CANA group. Ventricular fibrillation was induced by transcutaneous electrical stimulation on epicardium. After 6 min untreated ventricular fibrillation, chest compressions was initiated. The rats were received an injection of placebo or canagliflozin (3 ug/kg) randomly 15 min after restore of spontaneous circulation (ROSC). Electrocardiogram (ECG) and blood pressure were continuously detected in each group throughout the experiment. The rats were killed 6 h after ROSC to collected the arterial serum and myocardial tissue. Myocardial injury was estimated with concentrations of inflammatory factors, oxidative stress indexes and, apoptosis index, myocardial injury markers, echocardiography and myocardial pathological slices. RESULTS: After resuscitation, mean arterial pressure (MAP) were significantly increased after cardiopulmonary resuscitation in CANA group rats when compared with placebo group. Heart rate, body lactate returned and left ventricular ejection fraction (LVEF) to normal levels in a shorter time and the myocardial injury was obviously attenuated in CPR + CANA group. Inflammatory factors (IL-6, TNF-α) and oxidative stress indexes (MAD, SOD, CAT) were dramatically decreased with the administration of CANA. The expression of apoptosis index (BAX, caspase-3) were higher in CPR + placebo group and the expression of anti-apoptosis index (Bcl-2) was lower ($P < 0.05$). CONCLUSIONS: The administration of CANA effectively reduces myocardial ischaemia/reperfusion (I/R) injury after cardiac arrest and cardiopulmonary resuscitation (CPR), and the underlying mechanism may be related to anti-inflammation, oxidative stress and apoptosis.

5. Curr Med Sci. 2023 Nov 13. doi: 10.1007/s11596-023-2796-4. Online ahead of print.
Modified Glucose-insulin-potassium Therapy for Hemorrhage-induced Traumatic Cardiac Arrest in Rabbits.
Zhang L(#)(1), Du WQ(#)(1), Zong ZW(2)(3), Zhong X(1), Jia YJ(1), Jiang RQ(1), Ye Z(1).
ABSTRACT
OBJECTIVE: Resuscitation with whole blood is known to be better than that with saline in attaining the return of spontaneous circulation (ROSC) and improving the short-term survival rate for hemorrhage-induced traumatic cardiac arrest (HiTCA). However, the resuscitation with whole blood alone fails to address the pathophysiological abnormalities, including hyperglycemia, hyperkalemia and coagulopathy, after HiTCA. The present study aimed to determine whether the modified glucose-insulin-potassium (GIK) therapy can ameliorate the above-mentioned pathophysiological

abnormalities, enhance the ROSC, improve the function of key organs, and reduce the mortality after HiTCA. METHODS: HiTCA was induced in rabbits (n=36) by controlled hemorrhage. Following arrest, the rabbits were randomly divided into three groups (n=12 each): group A (no resuscitation), group B (resuscitation with whole blood), and group C (resuscitation with whole blood plus GIK). The GIK therapy was administered based on the actual concentration of glucose and potassium. The ROSC rate and survival rate were obtained. Hemodynamical and biochemical changes were detected. Thromboelastography (TEG) was used to measure coagulation parameters, and enzyme-linked immunosorbent assay to detect parameters related to inflammation, coagulation and the function of brain. RESULTS: All animals in groups B and C attained ROSC. Two rabbits died 24-48 h after HiTCA in group B, while no rabbits died in group C. The GIK therapy significantly reduced the levels of blood glucose, potassium, and biological markers for inflammatory reaction, and improved the heart, kidney, liver and brain function in group C when compared to group B. Furthermore, the R values of TEG were significantly lower in group C than in group B, and the maximum amplitude of TEG was slightly lower in group B than in group C, with no significant difference found. CONCLUSION: Resuscitation with whole blood and modified GIK therapy combined can ameliorate the pathophysiological disorders, including hyperglycemia, hyperkalemia and coagulopathy, and may improve the function of key organs after HiTCA.

CASE REPORTS

1. World J Emerg Med. 2023;14(6):484-487. doi: 10.5847/wjem.j.1920-8642.2023.096.
A case of pulmonary mucormycosis presented with cardiac arrest.
Zhou H(1), Qi X(1), Cai J(1), Liu W(1), Kang C(1), Zhang G(1), Wang M(1), Xie X(1), Liang C(1), Liu L(1), Gao J(1), Yuan W(1), Mei X(1), Guo S(1).
NO ABSTRACT AVAILABLE

2. World J Emerg Med. 2023;14(6):499-501. doi: 10.5847/wjem.j.1920-8642.2023.097.
Tension urinothorax as a reversible cause of cardiac arrest: a case report.
Wanchu A(1), Verma A(1), Jaiswal S(1), Khatai AA(1), Prasad N(1).
NO ABSTRACT AVAILABLE

3. J Pediatr Nurs. 2023 Nov 11:S0882-5963(23)00292-0. doi: 10.1016/j.pedn.2023.10.015. Online ahead of print.
Quality improvement developments following pediatric resuscitation and veno-arterial extracorporeal membrane oxygenation support due to a massive intentional antidepressant overdose.
Berry DL(1).
ABSTRACT
Extracorporeal Membrane Oxygenation Cardiopulmonary Resuscitation (ECPR) is the act of placing a patient on bypass at the bedside while simultaneously carrying out life-sustaining interventions such as chest compressions or epinephrine administration. This involves a team of physicians, nurses, respiratory therapists, pharmacists, extracorporeal membrane oxygenation (ECMO) trained staff, and other health professionals who must focus on cardiopulmonary resuscitation (CPR), cannulation, and initiating ECMO flow at the same time. ECPR may be considered when traditional CPR does not achieve return of spontaneous circulation (ROSC) in a patient. Limitations when thinking about using ECPR for a patient include location, timing from arrest to CPR initiation, as well as CPR initiation to successfully on bypass, trained staff available to begin the cannulation process, and pauses in

compressions during surgery. We analyzed a pediatric patient who required ECPR after an intentional drug overdose. Gaps identified in this case prompted us to assess our ECPR protocol. Through the development and use of multidisciplinary ECPR simulations, our team discovered areas of quality improvement and put those findings into practice.