This week's PubMed 11th – 17th December 2022: articles of interest n = 58

<u>CPR AND COVID-19</u>

Willingness and Predictors of Bystander CPR Intervention in the COVID-19 Pandemic: A Survey of Freshmen Enrolled in a Japanese University.
Mori Y(1)(2), Iio Y(1)(3), Aoyama Y(1)(4), Kozai H(5), Tanaka M(5), Aoike M(1), Kawamura H(1), Seguchi M(1), Tsurudome M(1)(6), Ito M(1)(3)(6).
ABSTRACT
The coronavirus disease 2019 (COVID-19) pandemic has decreased bystander cardiopulmonary resuscitation (BCPR) intervention rates. The purpose of this study was to elucidate the willingness of university freshmen to provide BCPR during the COVID-19 pandemic and the predictors thereof. A cross-sectional survey of 2789 newly enrolled university students was conducted after the end of the sixth wave of the COVID-19 epidemic in Japan; predictors of willingness to provide BCPR were assessed by regression analysis. Of the 2534 participants 1525 (60.2%) were willing to intervene and provide BCPR during the COVID-19 pandemic. Hesitancy due to the anxiety that CPR intervention might result in poor prognosis was a negative predictor of willingness. In contrast, anxiety about the possibility of infection during CPR intervention did not show a negative impact. On the other hand, interest in CPR and willingness to participate in a course, confidence in CPR skills, awareness of automated external defibrillation, and knowledge of CPR during the COVID-19 pandemic, were also positive predictors. This study suggests that the barrier to willingness to intervene with BCPR during a COVID-19 pandemic is not fear of infection, but rather hesitation due to the possibility of poor prognosis from the intervention. The significance of conducting this study during the COVID-19 epidemic is great, and there is an urgent need for measures to overcome hesitation regarding BCPR.

<u>CPR/MECHANICAL CHEST COMPRESSION</u>

Mechanical chest compression and extracorporeal life support for out-of-hospital cardiac arrest. A 30-month observational study in the metropolitan area of Milan, Italy.
Mistraletti G(1), Lancioni A(2), Bassi G(3), Nespoli F(4), Umbrello M(5), Salini S(6), Zangrillo A(7), Pappalardo F(8), Mara Scandroglio A(9), Foti G(10), Avalli L(11), Patroniti N(12), Raimondi F(13), Costantini E(14), Catena E(15), Ottolina D(16), Ruffini C(17), Migliari M(18), Sesana G(19), Fumagalli R(20), Pesenti A(21); mechCPR-ECLS investigators.
ABSTRACT
BACKGROUND: Return of spontaneous circulation (ROSC) is achieved in 25% of out-of-hospital cardiac arrest (OHCA) patients. Mechanical chest compression (mechCPR) may maintain better perfusion during transport, allowing hospital treatments like extracorporeal circulation life support (ECLS). We aim to assess the effectiveness of a pre-hospital protocol introduction. METHODS: Observational, retrospective study assessing all OHCA patients aged 12-75, with no-flow time <20 minutes in a metropolitan area (Milan, Italy, 2013-2016). PRIMARY OUTCOMES: ROSC and Cerebral Performance Category score (CPC) ≤2 at hospital discharge. Logistic regressions with multiple comparison adjustments balanced with propensity scores calculated with inverse probability of treatment weighting were performed. RESULTS: 1366 OHCA were analysed; 305 received mechCPR, 1061 manual chest compressions (manCPR), and 108 ECLS. ROSC and CPC ≤2 were associated with

low-flow minutes (odds ratio [95% confidence interval] 0.90 [0.88-0.91] and 0.90 [0.87-0.93]), shockable rhythm (2.52 [1.71-3.72] and 10.68 [5.63-20.28]), defibrillations number (1.15 [1.07-1.23] and 1.15 [1.04-1.26]), and mechCPR (1.86 [1.17-2.96] and 2.06 [1.11-3.81]). With resuscitation times >13 minutes, mechCPR achieved more frequently ROSC compared to manCPR. Among ECLS patients, 70% had time exceeding protocol: 8 (7.5%) had CPC ≤2 (half of them with low-flow times between 45 and 90 minutes), 2 (1.9%) survived with severe neurological disabilities, and 13 brain-dead (12.0%) became organ donors. CONCLUSIONS: MechCPR patients achieved ROSC more frequently than manual CPR patients; mechCPR was a crucial factor in an ECLS protocol for refractory OHCA. ECLS offered a chance of survival to patients who would otherwise die.

REGISTRIES, REVIEWS AND EDITORIALS

1. Int J Nurs Pract. 2022 Dec 11:e13120. doi: 10.1111/ijn.13120. Online ahead of print.
Factors affecting ward nurses' basic life support experiences: An integrative literature review.
Dermer J(1), James S(2), Palmer C(1), Christensen M(3), Craft J(1).

ABSTRACT
BACKGROUND: Performing cardiopulmonary resuscitation in non-critical care hospital wards is a stressful event for the registered nurse; stress may negatively affect performance. Delays in initiating basic life support and following current basic life support algorithms have been reported globally. AIM: The aim of this review was to investigate factors that can affect registered nurses' experiences of performing basic life support. METHODS: Using the five-step integrative literature review method from Whittemore and Knafl, this review searched articles published between January 2000 and June 2022 for qualitative and quantitative primary studies from the databases CINAHL Complete (EBSCO), Medline (Web of Science), Scopus and PubMed. RESULTS: Nine studies from eight countries met the inclusion criteria and were appraised here. Five themes relating to factors affecting the performance of basic life support were found during this review: staff interaction issues, confidence concerns, fear of harm and potential litigation, defibrillation concerns and basic life support training issues. CONCLUSIONS: This review revealed several concerns experienced by registered nurses in performing basic life support and highlights a lack of research. Factors affecting nurses' experiences need to be understood. This will allow education to focus on consideration of human factors, or non-technical skills during basic life support training, as well as technical skills, to improve outcomes for patients experiencing an in-hospital cardiopulmonary arrest.

2. Circ Cardiovasc Qual Outcomes. 2022 Dec 12:e008856. doi: 10.1161/CIRCOUTCOMES.121.008856. Online ahead of print.
Efforts to Improve Survival Outcomes of Out-of-Hospital Cardiac Arrest in China: BASIC-OHCA.
Xie X(#)(1)(2), Zheng J(#)(1), Zheng W(#)(1), Pan C(1), Ma Y(3), Zhu Y(4), Tan H(5), Han X(4), Yan S(6), Zhang G(6), Li C(7), Shao F(8)(9)(10), Wang C(1), Zhang J(1), Bian Y(1), Ma J(1), Cheng K(1), Liu R(1), Sang S(11), Zhang Y(1), McNally B(12), Ong MEH(13), Lv C(2), Chen Y(1), Xu F(1); BASIC-OHCA Coordinators and Investigators.

ABSTRACT
BACKGROUND: Establishing registries to collect demographic characteristics, processes of care, and outcomes of patients with out-of-hospital cardiac arrest (OHCA) can better understand epidemiological trends, measure care quality, and identify opportunities for improvement. This study aimed to describe the design, implementation, and scientific significance of a nationwide registry-the BASIC-OHCA (Baseline Investigation of Out-of-Hospital Cardiac Arrest)-in China. METHODS: BASIC-OHCA was designed as a prospective, multicenter, observational, population-based study. The BASIC-OHCA registry was developed based on Utstein templates. BASIC-OHCA

includes all OHCA patients confirmed by emergency medical services (EMS) personnel regardless of age, sex, or cause. Patients declared dead at the scene by EMS personnel for any reasons are also included. To fully characterize an OHCA event, BASIC-OHCA collects data from 3 sources-EMS, the receiving hospital, and patient follow-up-and links them to form a single record. Once data entry is completed and quality is checked, individual identifiers are stripped from the record. RESULTS: Currently, 32 EMS agencies in 7 geographic regions contribute data to BASIC-OHCA. They are distributed in the urban and rural areas, covering ≈9% of the population of mainland China. Data collection started on August 1, 2019. By July 31, 2020, a total of 92 913 EMS-assessed OHCA patients were enrolled. Among 28969 (31.18%) EMS-treated OHCAs' the mean age was 65.79±17.36 years, and 68.35% were males. The majority of OHCAs (76.85%) occurred at home or residence. A shockable initial rhythm was reported in 5.43% of patients. Any return of spontaneous circulation, survival to hospital discharge, and favorable neurological outcome at hospital discharge were 5.98%, 1.15%, and 0.83%, respectively. CONCLUSIONS: BASIC-OHCA is the first nationwide registry on OHCA in China. It can be used as a public health surveillance system and as a platform to produce evidence-based practices to help identify opportunities for improvement.

Correspondence: is there an association between centre volume and survival or neurological outcomes among out-of-hospital cardiac arrest patients?
Goh AXC(1), Ho AFW(2)(3).
ABSTRACT
This commentary discusses the findings of a study by Tsuchida et al. on the effect of annual hospital admissions of out-of-hospital cardiac arrest patients on survival and neurological outcomes in OHCA patients in the context of existing literature on the topic, and the implications on future studies investigating the volume-outcome relationship in cardiac arrest.

Full resuscitation or no resuscitation attempt: Should we have a third option?
Lauridsen KG(1), Saraiva J(2), Løfgren B(3), Djärv T(4).
NO ABSTRACT AVAILABLE

Individual socioeconomic status and risk of out-of-hospital cardiac arrest: A nationwide case-control analysis.
Lee SY(1)(2)(3), Park JH(3)(4), Choi YH(3)(5), Lee J(3), Ro YS(3)(4), Hong KJ(3)(4), Song KJ(3)(6), Shin SD(3)(4).
ABSTRACT
OBJECTIVES: Area-level socioeconomic status (SES) is associated with the incidence of out-of-hospital cardiac arrest (OHCA); however, the effects of individual-level SES on OHCA occurrence are unknown. This study investigated whether individual-level SES is associated with the occurrence of OHCA. METHODS: This case-control study used data from the nationwide OHCA registry and the National Health Information Database (NHID) in Korea. All adult patients with OHCA of a medical etiology from 2013 to 2018 were included. Four controls were matched to each OHCA patient based on age and sex. The exposure was individual-level SES measured by insurance type and premium, which is based on income in Korea. National Health Insurance (NHI) beneficiaries were divided into four groups (Q1-Q4), and medical aid beneficiaries were separately classified as the lowest SES group. The adjusted odds ratios (aORs) and 95% confidence intervals (CIs) for the outcomes were calculated. Stratified analyses were conducted according to age and sex. RESULTS: A total of 105,443

cases were matched with 421,772 controls. OHCA occurred more frequently in the lower SES groups. Compared with the highest SES group (Q1), the aORs for OHCA occurrence increased as the SES decreased (aORs [95% CI] were 1.21 [1.19-1.24] for Q2, 1.33 [1.31-1.36] for Q3, 1.32 [1.30-1.35] for Q4, and 2.08 [2.02-2.13] for medical aid). Disparity by individual-level SES appeared to be greater in males than in females and greater in the young and middle-aged adults than in older adults. CONCLUSIONS: Low individual-level SES was associated with a higher probability of OHCA occurrence. Efforts are needed to reduce SES disparities in the occurrence of OHCA.

Causes, circumstances, and potential preventability of cardiac arrest in the young: insights from a state-wide clinical and forensic registry.
Paratz ED(1)(2)(3), van Heusden A(1), Zentner D(4)(5), Morgan N(6), Smith K(7)(8)(9), Thompson T(4), James P(4), Connell V(10), Pflaumer A(10)(11)(12), Semsarian C(13), Ingles J(14)(15), Parsons S(6)(16), Stub D(1)(2)(7)(8), Gerche A(1)(2)(3).
ABSTRACT
AIMS: The causes, circumstances, and preventability of young sudden cardiac arrest remain uncertain. METHODS AND RESULTS: A prospective state-wide multi-source registry identified all out-of-hospital cardiac arrests (OHCAs) in 1-50 year olds in Victoria, Australia, from 2019 to 2021. Cases were adjudicated using hospital and forensic records, clinic assessments and interviews of survivors and family members. For confirmed cardiac causes of OHCA, circumstances and cardiac history were collected. National time-use data was used to contextualize circumstances. 1319 OHCAs were included. 725 (55.0%) cases had a cardiac aetiology of OHCA, with coronary disease (n = 314, 23.8%) the most common pathology. Drug toxicity (n = 226, 17.1%) was the most common non-cardiac cause of OHCA and the second-most common cause overall. OHCAs were most likely to occur in sleep (n = 233, 41.2%). However, when compared to the typical Australian day, OHCAs occurred disproportionately more commonly during exercise (9% of patients vs. 1.3% of typical day, P = 0.018) and less commonly while sedentary (39.6 vs. 54.6%, P = 0.047). 38.2% of patients had known standard modifiable cardiovascular risk factors. 77% of patients with a cardiac cause of OHCA had not reported cardiac symptoms nor been evaluated by a cardiologist prior to their OHCA. CONCLUSION: Approximately half of OHCAs in the young have a cardiac cause, with coronary disease and drug toxicity dominant aetiologies. OHCAs disproportionately occur during exercise. Of patients with cardiac cause of OHCA, almost two-thirds have no standard modifiable cardiovascular risk factors, and more than three-quarters had no prior warning symptoms or interaction with a cardiologist.

Out-of-hospital cardiac arrest without ST-segment elevation: an alternative focus on priorities?
Thiele H(1), Desch S(1), Freund A(1).
NO ABSTRACT AVAILABLE

Need for home care or nursing home admission after myocardial infarction complicated by cardiogenic shock and/or out-of-hospital cardiac arrest.
Lauridsen MD(1)(2), Rørth R(1), Butt JH(1), Strange JE(1)(3), Schmidt M(4)(5), Kristensen SL(1), Kragholm K(6)(7), Johnsen SP(2), Møller JE(1)(8), Hassager C(1), Køber L(1), Fosbøl EL(1).
ABSTRACT

AIMS: Myocardial infarction (MI) with cardiogenic shock (CS) and/or out-of-hospital cardiac arrest (OHCA) are conditions with potential loss of autonomy. In patients with MI, the association between CS and OHCA and need for home care or nursing home admission was examined. METHODS AND RESULTS: Danish nationwide registries identified patients with MI (2008-2019), who prior to the event lived at home without home care and discharged alive. One-year cumulative incidences and hazard ratios (HR) were reported for home care need or nursing home admission, a composite proxy for disability in activities of daily living, along with all-cause mortality. The study population consisted of 67 109 patients with MI (by groups: -OHCA/-CS: 63 644; -OHCA/+CS: 1 776; +OHCA/-CS: 968; and + OHCA/+CS: 721). The 1-year cumulative incidences of home care/nursing home were 7.1% for patients who survived to discharge with -OHCA/-CS, 20.9% for -OHCA/+CS, 5.4% for + OHCA/-CS, and 8.2% for those with + OHCA/+CS. The composite outcome was driven by home care. With the -OHCA/-CS as reference, the adjusted HRs for home care/nursing home were 2.86 (95% CI: 2.57-3.19) for patients with -OHCA/+CS; 1.31 (95% CI: 1.00-1.73) for + OHCA/-CS; and 2.18 (95% CI: 1.68-2.82) for those with + OHCA/+CS. The 1-year cumulative mortality were 5.1% for patients with -OHCA/-CS, 9.8% for -OHCA/+CS, 3.0% for + OHCA/-CS, and 3.4% for those with + OHCA/+CS. CONCLUSION: In patients discharged alive after a MI, CS, and to a lesser degree OHCA, were associated with impaired activities of daily living with a two-fold higher 1-year incidence of home care or nursing home admission compared with MI patients without CS or OHCA.

Association Between Income and Risk of Out-of-Hospital Cardiac Arrest: A Retrospective Cohort Study.

van Nieuwenhuizen BP(1), Tan HL(2)(3), Blom MT(2), Kunst AE(1), van Valkengoed IGM(1).

ABSTRACT

BACKGROUND: Previous studies have observed a higher out-of-hospital cardiac arrest (OHCA) risk among lower socioeconomic groups. However, due to the cross-sectional and ecological designs used in these studies, the magnitude of these inequalities is uncertain. This study is the first to assess the individual-level association between income and OHCA using a large-scale longitudinal study. METHODS: This retrospective cohort study followed 1 688 285 adults aged 25 and above, living in the catchment area of an OHCA registry in a Dutch province. OHCA cases (n=5493) were linked to demographic and income registries. Cox proportional hazard models were conducted to determine hazard ratios of OHCA for household and personal income quintiles, stratified by sex and age. RESULTS: The total incidence of OHCA per 100 000 person years was 30.9 in women and 87.1 in men. A higher OHCA risk was observed with lower household and personal income. Compared with the highest household income quintile, the adjusted hazard ratios from the second highest to the lowest household income quintiles ranged from 1.24 (CI=1.01-1.51) to 1.75 (CI=1.46-2.10) in women and from 0.95 (CI=0.68-1.34) to 2.30 (CI=1.74-3.05) in men. For personal income, this ranged from 0.95 (CI=0.68-1.34) to 2.30 (CI=1.74-3.05) in women and between 1.28 (CI=1.16-1.42) and 1.68 (CI=1.48-1.89) in men. Comparable household and personal income gradients were found across age groups except in the highest (>84 years) age group. For example, household income in women aged 65 to 74 ranged from 1.25 (CI=1.02-1.52) to 1.65 (CI=1.36-2.00). Sensitivity analyses assessing the prevalence of comorbidities at baseline and different lengths of follow-up yielded similar estimates. CONCLUSIONS: This study provides new evidence for a substantial increase in OHCA risk with lower income in different age and sex groups. Low-income groups are likely to be a suitable target for intervention strategies to reduce OHCA risk.

10. Circ Cardiovasc Qual Outcomes. 2022 Dec 12:e009603. doi: 10.1161/CIRCOUTCOMES. 122.009603. Online ahead of print.
Data Equity: The Foundation of Out-of-Hospital Cardiac Arrest Quality Improvement.
Del Rios M(1), Nallamothu BK(2), Chan PS(3).
NO ABSTRACT AVAILABLE

11. Eur Heart J. 2022 Dec 14;43(47):4960. doi: 10.1093/eurheartj/ehac538.
Sudden cardiac death risk prediction in arrhythmogenic right ventricular cardiomyopathy: the challenge of complex statistical modelling and its impact in clinical practice.
Monda E(1), Lioncino M(1), Limongelli G(1)(2).
NO ABSTRACT AVAILABLE

12. Eur Heart J. 2022 Dec 14;43(47):4961-4962. doi: 10.1093/eurheartj/ehac562.
Sudden cardiac death risk prediction in arrhythmogenic right ventricular cardiomyopathy: a practical approach to navigating the challenges of prediction models.
Cadrin-Tourigny J(1), Bosman LP(2), James CA(3).
NO ABSTRACT AVAILABLE

IN-HOSPITAL CARDIAC ARREST

1. Resuscitation. 2022 Dec 12:S0300-9572(22)00737-7. doi: 10.1016/j.resuscitation.2022.12.002. Online ahead of print.
Characteristics, Therapies, and Outcomes of In-Hospital vs Out-of-Hospital Cardiac Arrest in Patients Presenting to Cardiac Intensive Care Units: From the Critical Care Cardiology Trials Network (CCCTN).
Carnicelli AP(1), Keane R(2), Brown KM(3), Loriaux DB(3), Kendsersky P(1), Alviar CL(4), Arps K(3), Berg DD(5), Bohula EA(5), Burke JA(6), Dixson JA(3), Gerber DA(7), Goldfarb M(8), Granger CB(3), Guo J(5), Harrison RW(3), Kontos M(9), Lawler PR(10), Elliott Miller P(11), Nativi-Nicolau J(12), Kristin Newby L(3), Racharla L(6), Roswell RO(13), Shah KS(14), Sinha SS(15), Solomon MA(16), Teuteberg J(7), Wong G(17), van Diepen S(18), Katz JN(3), Morrow DA(5).
ABSTRACT
BACKGROUND: Cardiac arrest (CA) is a common reason for admission to the cardiac intensive care unit (CICU), though the relative burden of morbidity, mortality, and resource use between admissions with in-hospital (IH) and out-of-hospital (OH) CA is unknown. We compared characteristics, care patterns, and outcomes of admissions to contemporary CICUs after IHCA or OHCA. METHODS: The Critical Care Cardiology Trials Network is a multicenter network of tertiary CICUs in the US and Canada. Participating centers contributed data from consecutive admissions during 2-month annual snapshots from 2017 to 2021. We analyzed characteristics and outcomes of admissions by IHCA vs OHCA. RESULTS: We analyzed 2,075 admissions across 29 centers (50.3% IHCA, 49.7% OHCA). Admissions with IHCA were older (median 66 vs 62 years), more commonly had coronary disease (38.3% vs 29.7%), atrial fibrillation (26.7% vs 15.6%), and heart failure (36.3% vs 22.1%), and were less commonly comatose on CICU arrival (34.2% vs 71.7%), p<0.001 for all. IHCA admissions had lower lactate (median 4.3 vs 5.9) but greater utilization of invasive hemodynamics (34.3% vs 23.6%), mechanical circulatory support (28.4% vs 16.8%), and renal replacement therapy (15.5% vs 9.4%); p<0.001 for all. Comatose IHCA patients underwent targeted temperature management less frequently than OHCA patients (63.3% vs 84.9%, p<0.001). IHCA admissions had lower unadjusted CICU (30.8% vs 39.0%, p<0.001) and in-hospital mortality (36.1% vs 44.1%, p<0.001). CONCLUSION: Despite a greater burden of comorbidities, CICU admissions after IHCA have lower lactate, greater invasive therapy utilization, and lower crude mortality than admissions after OHCA.

Development of a machine-learning algorithm to predict in-hospital cardiac arrest for emergency department patients using a nationwide database.
Kim JH(#)(1), Choi A(#)(1), Kim MJ(2), Hyun H(3), Kim S(4), Chang HJ(5).
ABSTRACT
In this retrospective observational study, we aimed to develop a machine-learning model using data obtained at the prehospital stage to predict in-hospital cardiac arrest in the emergency department (ED) of patients transferred via emergency medical services. The dataset was constructed by attaching the prehospital information from the National Fire Agency and hospital factors to data from the National Emergency Department Information System. Machine-learning models were developed using patient variables, with and without hospital factors. We validated model performance and used the SHapley Additive exPlanation model interpretation. In-hospital cardiac arrest occurred in 5431 of the 1,350,693 patients (0.4%). The extreme gradient boosting model showed the best performance with area under receiver operating curve of 0.9267 when incorporating the hospital factor. Oxygen supply, age, oxygen saturation, systolic blood pressure, the number of ED beds, ED occupancy, and pulse rate were the most influential variables, in that order. ED occupancy and in-hospital cardiac arrest occurrence were positively correlated, and the impact of ED occupancy appeared greater in small hospitals. The machine-learning predictive model using the integrated information acquired in the prehospital stage effectively predicted in-hospital cardiac arrest in the ED and can contribute to the efficient operation of emergency medical systems.

Characteristics and Outcomes of Cardiac Arrest in Adult Patients Admitted to Pediatric Services: A Descriptive Analysis of the American Heart Association's Get With The Guidelines-Resuscitation Data.
O'Halloran AJ(1), Grossestreuer AV(2), Balaji L(2), Ross CE(2)(3), Holmberg MJ(2)(4), Donnino MW(2)(5), Kleinman ME(6); American Heart Association's Get With The Guidelines-Resuscitation Investigators.
ABSTRACT
OBJECTIVES: Differences between adult and pediatric in-hospital cardiac arrest (IHCA) are well-described. Although most adults are cared for on adult services, pediatric services often admit adults, particularly those with chronic conditions. The objective of this study is to describe IHCA in adults admitted to pediatric services. DESIGN: Retrospective cohort analysis from the American Heart Association's Get With The Guidelines-Resuscitation registry of a subpopulation of adults with IHCA while admitted to pediatric services. Multivariable logistic regression was used to evaluate adjusted survival outcomes and compare outcomes between age groups (18-21, 22-25, and ≥26 yr old). SETTING: Hospitals contributing to the Get With The Guidelines-Resuscitation registry. PATIENTS: Adult-aged patients (≥ 18 yr) with an index pulseless IHCA while admitted to a pediatric service from 2000 to 2018. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: A total of 491 adult IHCAs were recorded on pediatric services at 17 sites, during the 19 years of review, and these events represented 0.1% of all adult IHCAs. In total, 221 cases met inclusion criteria with 139 events excluded due to an initial rhythm of bradycardia with poor perfusion. Median patient age was 22 years (interquartile range, 19-28 yr). Ninety-eight percent of patients had at least one pre-existing condition. Return of spontaneous circulation occurred in 63% of events and 30% of the patients survived to discharge. All age groups had similar rates of survival to discharge (range 26-37%; p = 0.37), and survival did not change over the study period (range 26-37%; p = 0.23 for adjusted survival to discharge). CONCLUSIONS: In this cohort of adults with IHCA while admitted to a pediatric service, we failed to find an association between survival outcomes and age. Additional research is needed to better understand resuscitation in this population.

INJURIES AND CPR

LUCAS compression device-related severe injuries in a series of patients presenting with outside hospital cardiac arrest.
Waqar A(1), Rajput F(1), Rachwan RJ(1), Abi-Saab T(2), Gimelli G(1).

ABSTRACT
This case series presents patients who presented to the hospital with an outside hospital cardiac arrest and were initially resuscitated successfully. All patients suffered fatal traumatic injuries during the resuscitation process with the common variable being the use of mechanical cardiopulmonary resuscitation (CPR) device. The goal of this case series is to describe the limitations and potential fatal side effects of CPR. We also present a review of literature with our impressions of the appropriate indications for the use of mechanical CPR.LEARNING OBJECTIVES: 1) Recognize appropriate indications for the use of mechanical vs manual cardiopulmonary resuscitation (CPR). 2) Identify signs and symptoms of mechanical CPR-related complications.

CAUSE OF THE ARREST

Risk Factors of Sudden Cardiac Arrest during the Postoperative Period in Patient Undergoing Heart Valve Surgery.
Duchnowski P(1).

ABSTRACT
BACKGROUND: Sudden cardiac arrest (SCA) is the sudden cessation of normal cardiac activity with hemodynamic collapse. This usually leads to sudden cardiac death (SCD) when cardiopulmonary resuscitation is not undertaken. In patients undergoing heart valve surgery, postoperative SCA is a complication with a high risk of death, cerebral hypoxia and multiple organ dysfunction syndrome (MODS). Therefore, knowledge of the predictors of postoperative SCA is extremely important as it enables the identification of patients at risk of this complication and the application of the special surveillance and therapeutic management in this group of patients. The aim of the study was to evaluate the usefulness of selected biomarkers in predicting postoperative SCA in patients undergoing heart valve surgery. METHODS: This prospective study was conducted on a group of 616 consecutive patients with significant valvular heart disease that underwent elective valve surgery with or without coronary artery bypass surgery. The primary end-point at the intra-hospital follow-up was postoperative SCA. The secondary end-point was death from all causes in patients with postoperative SCA. Patients were observed until discharge from the hospital or until death. Logistic regression was used to assess the relationships between variables. RESULTS: The postoperative SCA occurred in 14 patients. At multivariate analysis, only NT-proBNP (odds ratio (OR) 1.022, 95% confidence interval (CI) 1.012-1.044; p = 0.03) remained independent predictors of the primary end-point. Age and NT-proBNP were associated with an increased risk of death in patients with postoperative SCA. CONCLUSIONS: The results of the presented study indicate that SCA in the early postoperative period in patients undergoing heart valve surgery is an unpredictable event with high mortality. The potential predictive ability of the preoperative NT-proBNP level for the occurrence of postoperative SCA and death in patients after SCA demonstrated in the study may indicate that the overloaded and damaged myocardium in patients undergoing heart valve surgery is particularly

sensitive to non-physiological conditions prevailing in the perioperative period, which may cause serious hemodynamic disturbances in the postoperative period and lead to death.

Cardiac arrest by rhino-cardiac reflex during nasotracheal intubation.
Yin F(1), Zhang TJ(2).
NO ABSTRACT AVAILABLE

Plaque histology and myocardial disease in sudden coronary death: the Fingesture study.
Holmström L(1), Juntunen S(1), Vähätalo J(1), Pakanen L(2)(3), Kaikkonen K(1), Haukilahti A(1), Kenttä T(1), Tikkanen J(1), Viitasalo V(1), Perkiömäki J(1), Huikuri H(1), Myerburg RJ(4), Junttila J(1).
ABSTRACT
AIMS: At least 50% of deaths due to coronary artery disease (CAD) are sudden cardiac deaths (SCDs), but the role of acute plaque complications on the incidence of sudden death in CAD is somewhat unclear. The present study aimed to investigate plaque histology and concomitant myocardial disease in sudden coronary death. METHODS AND RESULTS: The study population is derived from the Fingesture study, which has collected data from 5869 consecutive autopsy-verified SCD victims in Northern Finland (population ≈600 000) between 1998 and 2017. In this substudy, histological examination of culprit lesions was performed in 600 SCD victims whose death was due to CAD. Determination of the cause of death was based on the combination of medical records, police reports, and autopsy data. Plaque histology was classified as either (i) plaque rupture or erosion, (ii) intraplaque haemorrhage, or (iii) stable plaque. The mean age of the study subjects was 64.9 ± 11.2 years, and 82% were male. Twenty-four per cent had plaque rupture or plaque erosion, 24% had an intraplaque haemorrhage, and 52% had a stable plaque. Myocardial hypertrophy was present in 78% and myocardial fibrosis in 93% of victims. The presence of myocardial hypertrophy or fibrosis was not associated with specific plaque histology. CONCLUSION: Less than half of sudden deaths due to CAD had evidence of acute plaque complication, an observation which is contrary to historical perceptions. The prevalence of concomitant myocardial disease was high and independent of associated plaque morphology.

END-TIDAL CO$_2$

Increase in end-tidal carbon dioxide after defibrillation predicts sustained return of spontaneous circulation during out-of-hospital cardiac arrest.
Grabman B(1), Bulger NE(2), Harrington BM(3), Walker RG(4), Latimer AJ(2), Snyder BD(2), Sayre MR(5), Maynard C(6), Johnson NJ(2), Van Dyke M(2), Counts CR(5).
ABSTRACT
INTRODUCTION: Guidelines recommend monitoring end-tidal carbon dioxide (ETCO2) during out-of-hospital cardiac arrest (OHCA), though its prognostic value is poorly understood. This study investigated the relationship between ETCO2 and return of spontaneous circulation (ROSC) after defibrillation in intubated non-traumatic OHCA patients. METHODS: This retrospective, observational cohort analysis included adult OHCA patients who received a defibrillation shock during treatment by an urban EMS agency from 2015 to 2021. Peak ETCO2 values were determined for the 90-second periods before and after the first defibrillation in an intubated patient (shock of interest [SOI]). Values were analyzed for association between the change in ETCO2 from pre- to

post-shock and the presence of ROSC on the subsequent pulse check. RESULTS: Of 518 eligible patients, mean age was 61, 72% were male, 50% had a bystander-witnessed arrest, and 62% had at least one episode of ROSC. The most common arrest etiology was medical (92%). Among all patients, peak ETCO2 during resuscitation prior to SOI was 36.8 mmHg (18.6). ETCO2 increased in patients who achieved ROSC immediately after SOI (from 38.3 to 47.6 mmHg; +9.3 CI: 6.5, 12.1); patients with sustained ROSC experienced the greatest increase in ETCO2 after SOI (from 37.8 to 48.2 mmHg; +10.4 CI: 7.2, 13.6), while ETCO2 in patients who did not achieve ROSC after SOI rose (from 36.4 to 37.8 mmHg; +1.4 CI: -0.1, 2.8). CONCLUSIONS: ETCO2 rises after defibrillation in most patients during cardiac arrest. Patients with sustained ROSC experience larger rises, though the majority experience rises of less than 10 mmHg.

2. Resuscitation. 2022 Dec;181:3-9. doi: 10.1016/j.resuscitation.2022.09.019. Epub 2022 Sep 29.
The association between arterial-end-tidal carbon dioxide difference and outcomes after out-of-hospital cardiac arrest.

Abrahamowicz AA(1), Counts CR(2), Danielson KR(3), Bulger NE(4), Maynard C(5), Carlbom DJ(6), Swenson ER(6), Latimer AJ(7), Yang B(8), Sayre MR(2), Johnson NJ(9).

ABSTRACT
AIM: We sought to determine if the difference between PaCO2 and ETCO2 is associated with hospital mortality and neurologic outcome following out-of-hospital cardiac arrest (OHCA). METHODS: This was a retrospective cohort study of adult patients who achieved return of spontaneous circulation (ROSC) after OHCA over 3 years. The primary exposure was the PaCO2-ETCO2 difference on hospital arrival. The primary outcome was survival to hospital discharge. The secondary outcome was favorable neurologic status at discharge. We used receiver operating characteristic (ROC) curves to determine discrimination threshold and multivariate logistic regression to examine the association between the PaCO2-ETCO2 difference and outcome. RESULTS: Of 698 OHCA patients transported to the hospitals, 381 had sustained ROSC and qualifying ETCO2 and PaCO2 values. Of these, 160 (42%) survived to hospital discharge. Mean ETCO2 was 39 mmHg among survivors and 43 mmHg among non-survivors. Mean PaCO2-ETCO2 was 6.8 mmHg and 9.0 mmHg (p < 0.05) for survivors and non-survivors. After adjustment for Utstein characteristics, a higher PaCO2-ETCO2 difference on hospital arrival was not associated with hospital mortality (OR 0.99, 95% CI: 0.97-1.0) or neurological outcome. Area under the ROC curve or PaCO2-ETCO2 difference was 0.56 (95% CI 0.51-0.62) compared with 0.58 (95% CI 0.52-0.64) for ETCO2. CONCLUSION: Neither PaCO2-ETCO2 nor ETCO2 were strong predictors of survival or neurologic status at hospital discharge. While they may be useful to guide ventilation and resuscitation, these measures should not be used for prognostication after OHCA.

ORGAN DONATION

No articles identified.

FEEDBACK

No articles identified.

DRUGS

1. Crit Care. 2022 Dec 7;26(1):378. doi: 10.1186/s13054-022-04248-x.

Augmented-Medication CardioPulmonary Resuscitation Trials in out-of-hospital cardiac arrest: a pilot randomized controlled trial.

Kim JS(1), Ryoo SM(1), Kim YJ(1), Sohn CH(1), Ahn S(1), Seo DW(1), Hong SI(1), Kim SM(1), Chae B(1), Kim WY(2).

ABSTRACT

BACKGROUND: Previously conducted physician-centered trials on the usefulness of vasopressin have yielded negative results; thus, patient-oriented trials have been warranted. We hypothesize that Augmented-Medication CardioPulmonary Resuscitation could be helpful for selected patients with out-of-hospital cardiac arrest (OHCA). METHODS: This is a double-blind, single-center, randomized, placebo-controlled trial conducted in the emergency department in a tertiary, university-affiliated hospital in Seoul, Korea. A total of 148 adults with non-traumatic OHCA who had initial diastolic blood pressure (DBP) < 20 mm Hg via invasive arterial monitoring during the early cardiac compression period were randomly assigned to two groups. Patients received a dose of 40 IU of vasopressin or placebo with initial epinephrine. The primary endpoint was a sustained return of spontaneous circulation. Secondary endpoints were survival discharge, and neurologic outcomes at discharge. RESULTS: Of the 180 included patients, 32 were excluded, and 148 were enrolled in the trial. A sustained return of spontaneous circulation was achieved by 27 patients (36.5%) in the vasopressin group and 24 patients (32.4%) in the control group (risk difference, 4.1%; P = .60). Survival discharge and good neurologic outcomes did not differ between groups. The trial group had significantly higher median DBPs during resuscitation than the control group (16.0 vs. 14.5 mm Hg, P < 0.01). There was no difference in end-tidal carbon dioxide, acidosis, and lactate levels at baseline, 10 min, and end-time. CONCLUSION: Among patients with refractory vasodilatory shock in OHCA, administration of vasopressin, compared with placebo, did not significantly increase the likelihood of return of spontaneous circulation.

TRAUMA

No articles identified.

VENTILATION

Ten rules for optimizing ventilatory settings and targets in post-cardiac arrest patients.
Battaglini D(1), Pelosi P(1)(2), Robba C(3)(4).

ABSTRACT

Cardiac arrest (CA) is a major cause of morbidity and mortality frequently associated with neurological and systemic involvement. Supportive therapeutic strategies such as mechanical ventilation, hemodynamic settings, and temperature management have been implemented in the last decade in post-CA patients, aiming at protecting both the brain and the lungs and preventing systemic complications. A lung-protective ventilator strategy is currently the standard of care among critically ill patients since it demonstrated beneficial effects on mortality, ventilator-free days, and other clinical outcomes. The role of protective and personalized mechanical ventilation setting in patients without acute respiratory distress syndrome and after CA is becoming more evident. The individual effect of different parameters of lung-protective ventilation, including mechanical power as well as the optimal oxygen and carbon dioxide targets, on clinical outcomes is a matter of debate in post-CA patients. The management of hemodynamics and temperature in post-CA patients represents critical steps for obtaining clinical improvement. The aim of this review is to summarize and discuss current evidence on how to optimize mechanical ventilation in post-CA patients. We will

provide ten tips and key insights to apply a lung-protective ventilator strategy in post-CA patients, considering the interplay between the lungs and other systems and organs, including the brain.

2. Physiother Res Int. 2022 Dec 15:e1986. doi: 10.1002/pri.1986. Online ahead of print.
Correction to Immediate and long-term effects of manual chest compression and decompression maneuver on patients receiving invasive mechanical ventilation.
[No authors listed]
NO ABSTRACT AVAILABLE

CERERBRAL MONITORING

1. Crit Care. 2022 Dec 11;26(1):382. doi: 10.1186/s13054-022-04263-y.
Predicting neurological outcome in adult patients with cardiac arrest: systematic review and meta-analysis of prediction model performance.
Amacher SA(#)(1)(2), Blatter R(#)(2), Briel M(3)(4)(5), Appenzeller-Herzog C(6), Bohren C(2), Becker C(2)(7), Beck K(2), Gross S(2), Tisljar K(1), Sutter R(1)(5), Marsch S(1)(5), Hunziker S(8)(9).
ABSTRACT
This work aims to assess the performance of two post-arrest (out-of-hospital cardiac arrest, OHCA, and cardiac arrest hospital prognosis, CAHP) and one pre-arrest (good outcome following attempted resuscitation, GO-FAR) prediction model for the prognostication of neurological outcome after cardiac arrest in a systematic review and meta-analysis. A systematic search was conducted in Embase, Medline, and Web of Science Core Collection from November 2006 to December 2021, and by forward citation tracking of key score publications. The search identified 1'021 records, of which 25 studies with a total of 124'168 patients were included in the review. A random-effects meta-analysis of C-statistics and overall calibration (total observed vs. expected [O:E] ratio) was conducted. Discriminatory performance was good for the OHCA (summary C-statistic: 0.83 [95% CI 0.81-0.85], 16 cohorts) and CAHP score (summary C-statistic: 0.84 [95% CI 0.82-0.87], 14 cohorts) and acceptable for the GO-FAR score (summary C-statistic: 0.78 [95% CI 0.72-0.84], five cohorts). Overall calibration was good for the OHCA (total O:E ratio: 0.78 [95% CI 0.67-0.92], nine cohorts) and the CAHP score (total O:E ratio: 0.78 [95% CI 0.72-0.84], nine cohorts) with an overestimation of poor outcome. Overall calibration of the GO-FAR score was poor with an underestimation of good outcome (total O:E ratio: 1.62 [95% CI 1.28-2.04], five cohorts). Two post-arrest scores showed good prognostic accuracy for predicting neurological outcome after cardiac arrest and may support early discussions about goals-of-care and therapeutic planning on the intensive care unit. A pre-arrest score showed acceptable prognostic accuracy and may support code status discussions

ULTRASOUND AND CPR

No articles identified.

ORGANISATION AND TRAINING

1. Australas Emerg Care. 2022 Dec 14:S2588-994X(22)00093-8. doi: 10.1016/j.auec.2022.12.002. Online ahead of print.
Assessing student paramedics' measurements of fatigue and quality of cardiopulmonary resuscitation on a simulated cardiac arrest case.
Weber A(1), Delport S(2), Delport A(3).

ABSTRACT

OBJECTIVE: The International Liaison Committee on Resuscitation (ILCOR) and the Australian Resuscitation Council (ARC) recommend that high-quality cardiopulmonary resuscitation (CPR) is the key to performance outcomes, emphasising compression and rotation through this process. The proposed study has a two-stage approach to evaluating cardiopulmonary resuscitations effectiveness by out-of-hospital practitioners. The first stage aimed to evaluate the influence of providing real-time biofeedback using the Q-CPR system on the provision of CPR by student paramedics. Secondly, the study quantified the effects of physical fatigue on maintaining quality cardiopulmonary resuscitation performed by paramedic students. METHODS: Forty paramedic students completed cardiopulmonary resuscitation on an instrumented manikin with and without audio-visual biofeedback (Q-CPR within the Phillips MRx defibrillator) in a balanced cross-over fashion. To quantify the quality of cardiopulmonary resuscitation concerning the percentage of applied compressions that meet the current ARC guidelines in terms of rate, depth, and recoil time, a manikin feedback system (SimMan 3 G; Laerdal, Norwegian) was used. RESULTS: When using the Q-CPR prompt with bio-feedback, overall, the depth and fatigue levels increased significantly, highlighting a correlation between correct depth and increased fatigue. CONCLUSIONS: Audio prompts improved compression depth; however, fatigue levels increased. The depth during manual compression compared to the Q-CPR prompt was not statistically significant.

Community Cardiac Arrest as a Challenge for Emergency Medical Services in Poland.
Żuratyński P(1)(2), Ślęzak D(3), Krzyżanowski K(1), Robakowska M(4), Ulenberg G(5).
ABSTRACT

The problem of cardiac arrest, particularly out-of-hospital cardiac arrest (OHCA), is the subject of continuous research. The aim of this study was to analyze the use of an automated external defibrillator (AED) during the resuscitation of an adult in public places in Poland between 2015 and 2020. A retrospective analysis of the selected documentation obtained from AED distributors, the medical records obtained from the emergency call center, and the emergency medical teams was conducted. During the analysis period, there were 100 cases of recorded and documented use of AEDs in OHCAs in public places. In 70% of the cases, defibrillation was performed with an AED. This result could be higher, but the study's methodology and limited access to data only allowed for this result. In Poland, there are no legal acts on the registration of automatic external defibrillators and their implementation. Appropriate registries should be introduced nationwide as soon as possible. Due to the inadequacy of the medical records of the emergency medical teams to record the use of automated external defibrillators by a bystander to an incident, changes to these documents should be pursued. Based on such a small cohort, it is not possible to conclude that the return of spontaneous blood circulation is correlated with the use of AEDs and public access to defibrillation PADs.

The Effectiveness of Technology-Based Cardiopulmonary Resuscitation Training on the Skills and Knowledge of Adolescents: Systematic Review and Meta-analysis.
Lim XMA(1), Liao WA(1), Wang W(2), Seah B(2).
ABSTRACT

BACKGROUND: Cardiopulmonary resuscitation (CPR) training for adolescents is a prominent strategy to increase the number of community first responders who can recognize cardiac arrest and initiate CPR. More schools are adopting technology-based CPR training modalities to reduce class time and reliance on instructor availability and increase their capacity for wider training dissemination.

However, it remains unclear whether these technology-based modalities are comparable with standard training. OBJECTIVE: This study aimed to systematically review and perform meta-analyses to evaluate the effectiveness of technology-based CPR training on adolescents' CPR skills and knowledge. METHODS: Searches were conducted in PubMed, Embase, Cochrane Library, Ovid MEDLINE, CINAHL, PsycINFO, Education Resources Information Center, ProQuest Dissertations and Theses Global, and Scopus from inception to June 25, 2021. Eligible randomized controlled trials (RCTs) compared technology-based training with standard training for adolescents aged 12 to 18 years. Studies were appraised using the Cochrane risk-of-bias tool. Random-effects meta-analyses were performed using Review Manager (The Cochrane Collaboration). Subgroup analyses were conducted to explore sources of heterogeneity. Overall certainty of evidence was appraised using the Grading of Recommendations Assessment, Development, and Evaluation approach. RESULTS: Seventeen RCTs involving 5578 adolescents were included. Most of the studies had unclear risks of selection bias (9/17, 53%) and high risks of performance bias (16/17, 94%). Interventions that included instructor guidance increased the likelihood of adolescents checking the responsiveness of the person experiencing cardiac arrest (risk ratio 1.39, 95% CI 1.19-1.63) and calling the emergency medical services (risk ratio 1.11, 95% CI 1.00-1.24). Self-directed technology-based CPR training without instructor guidance was associated with poorer overall skill performance (Cohen d=-0.74, 95% CI -1.02 to -0.45). Training without hands-on practice increased mean compression rates (mean difference 9.38, 95% CI 5.75-13.01), whereas real-time feedback potentially yielded slower compression rates. Instructor-guided training with hands-on practice (Cohen d=0.45, 95% CI 0.13-0.78) and the use of computer programs or mobile apps (Cohen d=0.62, 95% CI 0.37-0.86) improved knowledge scores. However, certainty of evidence was very low. CONCLUSIONS: Instructor-guided technology-based CPR training that includes hands-on practice and real-time feedback is noninferior to standard training in CPR skills and knowledge among adolescents. Our findings supported the use of technology-based components such as videos, computer programs, or mobile apps for self-directed theoretical instruction. However, instructor guidance, hands-on practice, and real-time feedback are still necessary components of training to achieve better learning outcomes for adolescents. Such a blended learning approach may reduce class time and reliance on instructor availability. Because of the high heterogeneity of the studies reviewed, the findings from this study should be interpreted with caution. More high-quality RCTs with large sample sizes and follow-up data are needed. Finally, technology-based training can be considered a routine refresher training modality in schools for future research.

Discussing the research on public interest in cardiac arrest and cardiopulmonary resuscitation based on the web search traffic analysis.
Birkun A(1), Böttiger BW(2), Baldi E(3).
NO ABSTRACT AVAILABLE

Gender Differences in Anxiety, Attitudes, and Fear among Nursing Undergraduates Coping with CPR Training with PPE Kit for COVID.
Maestre-Miquel C(1), Martín-Rodríguez F(2)(3)(4), Durantez-Fernández C(5)(6), Martín-Conty JL(1)(6), Viñuela A(1)(6), Polonio-López B(1)(6), Romo-Barrientos C(7), Criado-Álvarez JJ(7)(8)(9), Torres-Falguera F(1)(6), Conty-Serrano R(10), Jorge-Soto C(11), Mohedano-Moriano A(1)(6).
ABSTRACT

BACKGROUND: The aim of this study was to examine the attitudes, fears, and anxiety level of nursing students faced with a critical clinical simulation (cardiopulmonary reanimation) with and without personal protective equipment (PPE). METHODS: A pilot before-after study as conducted from 21 to 25 June 2021, with 24 students registered in the nursing degree of the Faculty of Health Sciences of the Castilla-La Mancha University (UCLM) in the city of Talavera de la Reina (Toledo, Spain). From 520 possible participants, only 24 were selected according to the exclusion and inclusion criteria. The STAI Manual for the State-Trait Anxiety Inventory, a self-evaluation questionnaire, was used to study trait STAI (basal anxiety), trait STAI before CPR, state STAI after CPR, total STAI before CPR, and total STAI after CPR as the main variables. A t-test was used to study the STAI variables according to sex and the physiological values related to the anxiety level of participants. An ANOVA statistical test was used to perform a data analysis of the STAI variables. RESULTS: A total of 54.2% of participants (IC 95% 35.1-72.1) suffered from global anxiety before the cardiopulmonary reanimation maneuvers (CPR). The results of the STAI before CPR maneuvers showed significant differences according to gender in state anxiety ($p = 0.04$), with a higher level of anxiety in women (22.38 ± 7.69 vs. 15.82 ± 7.18). CONCLUSIONS: This study demonstrates different levels of anxiety in terms of gender suffered by nursing students in high-pressure environments, such as a CPR situation.

The use of a 'pillow partner' as a simple, cost-effective, and accessible tool to teach bystander cardiopulmonary resuscitation skills.
Shafiq U(1), Ali B(2), Masahuling A(3), Khanji MY(4).
NO ABSTRACT AVAILABLE

Effect of a hybrid team-based advanced cardiopulmonary life support simulation program for clinical nurses.
Jeong HW(1)(2), Ju D(1), Lee AK(1), Lee JA(1), Kang NR(1), Choi EJ(1), Ahn SH(1)(2), Moon SH(2)(3).
ABSTRACT
BACKGROUND: During in-hospital cardiac arrest events, clinical nurses are often the first responders; therefore, nurses require sufficient advanced cardiac life support (ACLS) competency. This study aimed to verify the effects of a hybrid team-based ACLS simulation (HTAS) program (developed in this study) on nurses' ACLS performance, specifically ACLS knowledge, cardiopulmonary resuscitation (CPR) self-efficacy, and CPR-related stress. METHODS: The developed HTAS comprised four lecture videos, one team-based skills training video, and a team-based ACLS simulation. A quasi-experimental pretest-posttest design with a comparison group (CG) was used to evaluate the effectiveness of the HTAS. Of the 226 general ward nurses with more than 6 months of clinical experience, 117 were allocated to the intervention group (IG), which attended the HTAS, and 109 to the CG, which attended only basic ACLS training. RESULTS: The IG's ACLS performance significantly improved ($t = 50.8$, $p < 0.001$) after the training. Relative to the respective pretest conditions, posttest ACLS knowledge ($t = 6.92$, $p < 0.001$) and CPR self-efficacy ($t = 6.97$, $p < 0.001$) of the IG also significantly increased. However, when the mean difference values were compared, there was no significant difference between the two groups with respect to ACLS knowledge ($t = 1.52$, $p = 0.130$), CPR self-efficacy ($t = -0.42$, $p = 0.673$), and CPR stress ($t = -0.88$, $p = 0.378$). CONCLUSION: The HTAS for ward nurses was effective at enhancing the nurses' ACLS performance. It is necessary to develop effective training methods for team-based ACLS and verify the sustained effects of such training.

8. Zhonghua Xin Xue Guan Bing Za Zhi. 2022 Dec 24;50(12):1229-1232. doi: 10.3760/
cma.j.cn112148-20221010-00782.
[Interpretation on the new sections and some update points of 2022 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death]. [Article in Chinese; Abstract available in Chinese from the publisher]
Wang ZL(1), Han YL(1).
NO ABSTRACT AVAILABLE

9. Can J Cardiol. 2022 Dec;38(12):1907-1910. doi: 10.1016/j.cjca.2022.10.016. Epub 2022 Nov 21.
Removing the "Man" in "Mannikin": The Importance of Sociodemographic Diversity in Resuscitation Training.
Grubic N(1), Smith BT(2), Randhawa VK(3), Blewer AL(4), Allan KS(5).
NO ABSTRACT AVAILABLE

POST-CARDIAC ARREST TREATMENTS

1. Catheter Cardiovasc Interv. 2022 Dec;100(7):1171-1172. doi: 10.1002/ccd.30499.
Coronary angiography after resuscitation without ST-Elevation: Indication remains elusive.
Kaleta FP(1), Gilchrist IC(2).
NO ABSTRACT AVAILABLE

2. Asian J Surg. 2022 Dec 9:S1015-9584(22)01715-8. doi: 10.1016/j.asjsur.2022.11.144. Online ahead of print.
Which approach is more effective in out-of-hospital cardiac arrest? A systematic review and meta-analysis.
Yang S(1), Zhu B(2), Liu X(2).
NO ABSTRACT AVAILABLE

TARGETED TEMPERATURE MANAGEMENT

1. Resuscitation. 2022 Dec;181:110-118. doi: 10.1016/j.resuscitation.2022.10.024. Epub 2022 Nov 3.
Alignment of targeted temperature management treatment with patients' mortality risk for out-of-hospital cardiac arrest.
Nguyen DD(1), Spertus JA(2), Uzendu AI(2), Kennedy KF(2), McNally BF(3), Chan PS(2).
ABSTRACT
OBJECTIVE: To examine whether TTM treatment was aligned with predicted mortality risk in patients with resuscitated OHCA during a period when it was a class I guideline-recommended therapy.
METHODS: Within the Cardiac Arrest Registry to Enhance Survival for OHCA, we identified adult patients with OHCA who survived to hospital admission and were presumed eligible for TTM. Multivariable models were constructed using pre-hospital variables to predict in-hospital death in patients with shockable and non-shockable rhythms. Within each rhythm category, we divided patients into deciles of predicted mortality risk and examined TTM treatment rates across deciles.
RESULTS: From 2013-2019, there were 25,882 successfully resuscitated patients with shockable rhythms and 43,414 patients with non-shockable rhythms presumed eligible for TTM. Of patients with shockable rhythms, predicted in-hospital mortality ranged from 16%-78% in deciles 1-10. TTM treatment increased from 44% in decile 1 to 59% in decile 10 (P for trend < 0.001), but over a third of patients in deciles 4-9 were not treated with TTM. Of patients with non-shockable rhythms, predicted mortality ranged from 48%-95% in deciles 1-10. Although TTM treatment rates increased

from 36% in decile 1 to 43% in decile 10 (P for trend 0.003), TTM treatment rates were agnostic to mortality risk (44% to 47%) from decile 2-9. CONCLUSION: TTM treatment patterns were not well-aligned with patients' mortality risk during a period when it was a guideline-recommended treatment for OHCA. Identifying strategies to better align guideline-recommended treatments with patients' mortality risk is critical for efforts to improve OHCA survival.

Hypothermia and its role in patients with ST-segment-elevation myocardial infarction and cardiac arrest.
Keller K(1)(2)(3), Sagoschen I(1), Schmitt VH(1)(4), Münzel T(1)(4), Gori T(1)(2)(4), Hobohm L(1)(2).
ABSTRACT
BACKGROUND: Patients suffering cardiac arrest resulting from ST-segment-elevation myocardial infarction (STEMI) are at very high risk of death. In addition to reperfusion strategies, therapeutic hypothermia is recommended for cardiac arrest patients who remain unconscious after resuscitation. However, data analysis of the impact of therapeutic hypothermia on survival showed inconsistent results. We aimed to investigate the benefits of therapeutic hypothermia in STEMI patients after cardiopulmonary resuscitation (CPR). METHODS: Patients with STEMI who received CPR were identified after nationwide German inpatient data (2005-2019) were screened. These patients were stratified for therapeutic hypothermia. The impact of hypothermia on mortality and adverse in-hospital outcomes was analyzed. RESULTS: Overall, 133,070 inpatients with STEMI and CPR (53.3% aged ≥70 years; 34% females) were recorded in Germany between 2005 and 2019, of which 12.3% (16,386 patients) underwent therapeutic hypothermia. Females (23.8 vs. 35.4%, p < 0.001) and patients aged ≥70 years (34.9 vs. 55.9%, p < 0.001) were less frequently treated with therapeutic hypothermia. The in-hospital case fatality rate was lower for STEMI with CPR and subsequent therapeutic hypothermia than for treatment without therapeutic hypothermia (53.5 vs. 66.7%, p < 0.001). Therapeutic hypothermia was independently associated with a reduced in-hospital case fatality rate {OR 0.83 [95% confidence interval (CI) 0.80-0.86], p < 0.001}. In addition, therapeutic hypothermia was associated with an increased risk for stroke (OR 1.37 [95% CI 1.25-1.49], p < 0.001), pneumonia (OR 1.75 [95% CI 1.68-1.82], p < 0.001), and acute kidney injury (OR 2.21 [95% CI 2.07-2.35], p < 0.001). CONCLUSION: Therapeutic hypothermia is associated with a survival benefit for STEMI patients after cardiac arrest.

Targeted Temperature Management in Cardiac Arrest: An Updated Narrative Review.
Belur AD(1), Sedhai YR(2), Truesdell AG(3), Khanna AK(4)(5)(6), Mishkin JD(7), Belford PM(8), Zhao DX(8), Vallabhajosyula S(9)(10)(11).
ABSTRACT
The established benefits of cooling along with development of sophisticated methods to safely and precisely induce, maintain, monitor, and reverse hypothermia have led to the development of targeted temperature management (TTM). Early trials in human subjects showed that hypothermia conferred better neurological outcomes when compared to normothermia among survivors of cardiac arrest, leading to guidelines recommending targeted hypothermia in this patient population. Multiple studies have sought to explore and compare the benefit of hypothermia in various subgroups of patients, such as survivors of out-of-hospital cardiac arrest versus in-hospital cardiac arrest, and survivors of an initial shockable versus non-shockable rhythm. Larger and more recent trials have shown no statistically significant difference in neurological outcomes between patients with targeted hypothermia and targeted normothermia; further, aggressive cooling is associated

with a higher incidence of multiple systemic complications. Based on this data, temporal trends have leaned towards using a lenient temperature target in more recent times. Current guidelines recommend selecting and maintaining a constant target temperature between 32 and 36 °C for those patients in whom TTM is used (strong recommendation, moderate-quality evidence), as soon as possible after return of spontaneous circulation is achieved and airway, breathing (including mechanical ventilation), and circulation are stabilized. The comparative benefit of lower (32-34 °C) versus higher (36 °C) temperatures remains unknown, and further research may help elucidate this. Any survivor of cardiac arrest who is comatose (defined as unarousable unresponsiveness to external stimuli) should be considered as a candidate for TTM regardless of the initial presenting rhythm, and the decision to opt for targeted hypothermia versus targeted normothermia should be made on a case-by-case basis.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

Double sequential external defibrillation versus standard defibrillation in refractory ventricular fibrillation: A systematic review and meta-analysis.
Li Y(1), He X(2), Li Z(3), Li D(1), Yuan X(1), Yang J(1).
ABSTRACT
INTRODUCTION: Double sequential external defibrillation (DSED) in cardiopulmonary resuscitation has shown different results in comparison with standard defibrillation in the treatment of refractory ventricular fibrillation (RVF). This review aims to compare the advantages of DSED with standard defibrillation in the treatment of refractory ventricular fibrillation. MATERIALS AND METHODS: PubMed, Embase, Web of Science, and Cochrane Library were searched from inception to May 1, 2022. Studies included adult patients who developed RVF. The study used random-effects and fixed-effects models for meta-analysis, which was reported by risk ratio (RR) with 95% confidence interval (CI), mean difference (MD), or standardized mean difference (SMD). The risk of bias in individual studies was assessed using the Robins-I tool for observational studies and the Cochrane Risk of Bias 2 (ROB-2) tool for clinical trials. Primary outcomes included the termination of RVF, prehospital return of spontaneous circulation (ROSC), survival to hospital admission, survival to hospital discharge, and good neurological recovery. Secondary outcomes included age, total defibrillation attempts, emergency medical system arrival time, and dose of epinephrine and amiodarone used. RESULTS: In this systematic review and meta-analysis, 10 studies containing 1347 patients with available data on treatment outcomes were included. The pooled estimate was (RR 1.03, 95% CI, 0.89 to 1.19; Z = 0.42, P = 0.678 > 0.05) for Termination of RVF, (RR 0.84, 95% CI, 0.63 to 1.11; Z = 1.23, P = 0.219 > 0.05) for ROSC, (RR 0.86, 95% CI, 0.69 to 1.06; Z = 1.4, P = 0.162 > 0.05) for survival to hospital admission, (RR 0.77, 95%CI, 0.52 to 1.15; Z = 1.26, P = 0.206 > 0.05) for survival to hospital discharge, (RR 0.65, 95%CI, 0.35 to 1.22; Z = 1.33, P = 0.184 > 0.05) for good neurologic recovery, (MD -1.01, 95%CI, -3.07 to 1.06; Z = 0.96, P = 0.34 > 0.05) for age, (MD 2.27, 95%CI, 1.80 to 2.73; Z = 9.50, P = 0.001 < 0.05) for total defibrillation attempts, (MD 1.10, 95%CI, -0.45 to 66; Z = 1.39, P = 0.16 > 0.05) for emergency medical system arrival time, (SMD 0.34, 95%CI, 0.17 to 0.50; Z = 4.04, P = 0.001 < 0.05) for epinephrine, and (SMD -0.30, 95%CI, -0.65 to -0.05; Z = 1.66, P = 0.1 > 0.05) for amiodarone. CONCLUSION: We discovered no differences between DSED and standard defibrillation in termination of RVF, prehospital return of spontaneous circulation, survival to hospital admission, survival to hospital discharge, good neurological outcome, emergency medical system arrival time, and amiodarone doses in patients with RVF. There were some differences in the number of defibrillations and epinephrine doses utilized during resuscitation.

2. Nat Rev Cardiol. 2023 Jan;20(1):5. doi: 10.1038/s41569-022-00808-4.
Alternative defibrillation strategies improve outcomes.
Lim GB(1).
ABSTRACT

Alternative strategies for defibrillation improve outcomes in patients with refractory ventricular fibrillation, according to findings from the DOSE VF trial.

3. Resuscitation. 2022 Dec;181:119-120. doi: 10.1016/j.resuscitation.2022.10.023. Epub 2022 Nov 10.
Demystifying non-shockable rhythms in Out-of-Hospital Cardiac Arrest.
Kosmopoulos M(1), Yannopoulos D(2).
NO ABSTRACT AVAILABLE

4. Am J Med Qual. 2022 Dec 16. doi: 10.1097/JMQ.0000000000000102. Online ahead of print.
Improving Time to Defibrillation Following Ventricular Tachycardia (VTach) and Ventricular Fibrillation (VFib) Cardiac Arrest: A Multicenter Retrospective and Prospective Quality Improvement Study.
Bodempudi S(1), Wus L(1), Kloo J(1), Zeniecki P(2), Coromilas J(3), West FM(1), Lev Y(1).
ABSTRACT

The goal of this study was to identify how often 2 independent centersdefibrillated patients within the American Heart Association recommended 2-minute time interval following ventricular fibrillation/ventricular tachycardia arrest. A retrospective chart review revealed significant delays in defibrillation. Simulation sessions and modules were implemented to train nursing staff in a single nursing unit at a Philadelphia teaching hospital. Recruited nurses completed a code blue simulation session to establish a baseline time to defibrillation. They were then given 2 weeks to complete an online educational module. Upon completion, they participated in a second set of simulation sessions to assess improvement. First round simulations resulted in 33% with delayed defibrillation and 27% no defibrillation. Following the module, 77% of the second round of simulations ended in timely defibrillation, a statistically significant improvement (P < 0.00001). Next steps involve prospective collection of the code blue data to analyze improvement in real code blue events.

PEDIATRICS AND CHILDREN

1. Crit Care Med. 2023 Jan 1;51(1):91-102. doi: 10.1097/CCM.0000000000005715. Epub 2022 Nov 9.
Diastolic Blood Pressure Threshold During Pediatric Cardiopulmonary Resuscitation and Survival Outcomes: A Multicenter Validation Study.
Berg RA(1), Morgan RW(1), Reeder RW(2), Ahmed T(3), Bell MJ(4), Bishop R(5), Bochkoris M(6), Burns C(7), Carcillo JA(6), Carpenter TC(5), Dean JM(2), Diddle JW(4), Federman M(8), Fernandez R(9), Fink EL(6), Franzon D(10), Frazier AH(11)(12), Friess SH(13), Graham K(1), Hall M(9), Hehir DA(1), Horvat CM(6), Huard LL(8), Maa T(9), Manga A(13), McQuillen PS(10), Meert KL(3), Mourani PM(5)(14), Nadkarni VM(1), Naim MY(1), Notterman D(15), Palmer CA(2), Pollack MM(4), Sapru A(8), Schneiter C(5), Sharron MP(4), Srivastava N(8), Tabbutt S(10), Tilford B(3), Viteri S(11)(12), Wessel D(4), Wolfe HA(1), Yates AR(9), Zuppa AF(1), Sutton RM(1).
ABSTRACT

OBJECTIVES: Arterial diastolic blood pressure (DBP) greater than 25 mm Hg in infants and greater than 30 mm Hg in children greater than 1 year old during cardiopulmonary resuscitation (CPR) was associated with survival to hospital discharge in one prospective study. We sought to validate these

potential hemodynamic targets in a larger multicenter cohort. DESIGN: Prospective observational study. SETTING: Eighteen PICUs in the ICU-RESUScitation prospective trial from October 2016 to March 2020. PATIENTS: Children less than or equal to 18 years old with CPR greater than 30 seconds and invasive blood pressure (BP) monitoring during CPR. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: Invasive BP waveform data and Utstein-style CPR data were collected, including prearrest patient characteristics, intra-arrest interventions, and outcomes. Primary outcome was survival to hospital discharge, and secondary outcomes were return of spontaneous circulation (ROSC) and survival to hospital discharge with favorable neurologic outcome. Multivariable Poisson regression models with robust error estimates evaluated the association of DBP greater than 25 mm Hg in infants and greater than 30 mm Hg in older children with these outcomes. Among 1,129 children with inhospital cardiac arrests, 413 had evaluable DBP data. Overall, 85.5% of the patients attained thresholds of mean DBP greater than or equal to 25 mm Hg in infants and greater than or equal to 30 mm Hg in older children. Initial return of circulation occurred in 91.5% and 25% by placement on extracorporeal membrane oxygenator. Survival to hospital discharge occurred in 58.6%, and survival with favorable neurologic outcome in 55.4% (i.e. 94.6% of survivors had favorable neurologic outcomes). Mean DBP greater than 25 mm Hg for infants and greater than 30 mm Hg for older children was significantly associated with survival to discharge (adjusted relative risk [aRR], 1.32; 1.01-1.74; p = 0.03) and ROSC (aRR, 1.49; 1.12-1.97; p = 0.002) but did not reach significance for survival to hospital discharge with favorable neurologic outcome (aRR, 1.30; 0.98-1.72; p = 0.051). CONCLUSIONS: These validation data demonstrate that achieving mean DBP during CPR greater than 25 mm Hg for infants and greater than 30 mm Hg for older children is associated with higher rates of survival to hospital discharge, providing potential targets for DBP during CPR.

EXTRACORPOREAL LIFE SUPPORT

Extracorporeal cardiopulmonary resuscitation location, coronary angiography and survival in out-of-hospital cardiac arrest.
Kim Y(1), Park JH(2), Lee SY(3), Ro YS(4), Hong KJ(5), Song KJ(6), Shin SD(7).
ABSTRACT
INTRODUCTION: The best location for safe and timely implementation of extracorporeal cardiopulmonary resuscitation (ECPR) is currently uncertain. We aimed to evaluate the association between the location of ECPR and survival outcomes in out-of-hospital cardiac arrest (OHCA) patients. We also evaluated whether the effects of ECPR location on survival differed between patients who underwent coronary angiography (CAG) and those who did not. METHODS: We used data collected between 2013 and 2020 from a nationwide OHCA database. Adult OHCA patients with presumed cardiac etiology who underwent ECPR were included in the study. The primary outcome was survival to discharge. The main exposure was the ECPR location (emergency department [ED] or cardiac catheterization laboratory [Cath lab]). We compared primary outcomes of ECPR between the ED and Cath lab using multivariable logistic regression. The interaction between ECPR location and CAG was also evaluated. RESULTS: Of 564 ECPR patients, 448 (79.4%) and 116 (20.6%) underwent ECPR in the ED and Cath lab, respectively. CAG was observed in 52.5% and 72.4% of the patients in the ED and Cath lab groups, respectively. There were no significant differences in survival to discharge between the ED and Cath lab groups (14.1% vs. 12.9%, p = 0.75, adjusted odds ratio [AOR] [95% confidence interval] 1.87 [0.85-4.11]). AOR of interaction analysis (95% CI) for survival to discharge of the ED group was 2.34 (1.02-5.40) in patients with CAG and 0.28 (0.04-1.84) in patients without CAG (p for interaction was 0.04). CONCLUSION: In adult OHCA patients who underwent

ECPR and CAG, ECPR in the ED shortened time to ECMO pump-on time and increased survival to discharge compared to ECPR in the Cath lab.

A Second Chance for Survival: Clinical Trial Evidence, Eligibility, and Barriers to Implementation of ECPR for Out-of-Hospital Cardiac Arrest.

Grunau B(1), Singh G(2), Bělohlávek J(3), Yannopoulos D(4), Tonna JE(5), Hutin A(6), Nagpal D(7), Cournoyer A(8), van Diepen S(9).

ABSTRACT
Randomized clinical trials now provide compelling evidence supporting extracorporeal membrane oxygenation-facilitated cardiopulmonary resuscitation (ECPR) for highly selected patients with refractory out-of-hospital cardiac arrest (specifically, initially shockable rhythms, witnessed arrests, and presumed cardiac etiology). ECPR should be considered in centres with experienced ECMO teams. High-performing systems-of-care and institutional commitment are required to implement this logistically and technically complex therapy.

Extracorporeal Cardiopulmonary Resuscitation for Cardiac Arrest: An Updated Systematic Review.

Holmberg MJ(1), Granfeldt A(2), Guerguerian AM(3), Sandroni C(4), Hsu CH(5), Gardner RM(6), Lind PC(2), Eggertsen MA(7), Johannsen CM(7), Andersen LW(8).

ABSTRACT
OBJECTIVES: To provide an updated systematic review on the use of extracorporeal cardiopulmonary resuscitation (ECPR) compared with manual or mechanical cardiopulmonary resuscitation during cardiac arrest. METHODS: This was an update of a systematic review published in 2018. OVID Medline, Embase, and the Cochrane Central Register of Controlled Trials were searched for randomized trials and observational studies between January 1, 2018, and June 21, 2022. The population included adults and children with out-of-hospital or in-hospital cardiac arrest. Two investigators reviewed studies for relevance, extracted data, and assessed bias. The certainty of evidence was evaluated using GRADE. RESULTS: The search identified 3 trials, 27 observational studies, and 6 cost-effectiveness studies. All trials included adults with out-of-hospital cardiac arrest and were terminated before enrolling the intended number of subjects. One trial found a benefit of ECPR in survival and favorable neurological status, whereas two trials found no statistically significant differences in outcomes. There were 23 observational studies in adults with out-of-hospital cardiac arrest or in combination with in-hospital cardiac arrest, and 4 observational studies in children with in-hospital cardiac arrest. Results of individual studies were inconsistent, although many studies favored ECPR. The risk of bias was intermediate for trials and critical for observational studies. The certainty of evidence was very low to low. Study heterogeneity precluded meta-analyses. The cost-effectiveness varied depending on the setting and the analysis assumptions. CONCLUSIONS: Recent randomized trials suggest potential benefit of ECPR, but the certainty of evidence remains low. It is unclear which patients might benefit from ECPR.

An Intensivist-Led Extracorporeal Membrane Oxygenation Program: Design, Implementation, and Outcomes of the First Five Years.

Kraai E(1)(2), Teixeira JP(1)(2), Patel IA(1), Wray TC(2)(3), Mitchell JA(2)(3), George N(2)(3), Kamm A(4), Henson J(4), Mirrhakimov A(5), Guliani S(2)(6), Tawil I(2)(3), Dettmer T(2)(3), Marinaro J(2)(3).

ABSTRACT
We describe the development, implementation, and outcomes of an intensivist-led adult extracorporeal life support (ECLS) program using intensivists both to perform venovenous (V-V),

venoarterial (V-A), and extracorporeal cardiopulmonary resuscitation (ECPR) cannulations, and to manage patients on ECLS throughout their ICU course. All adults supported with ECLS at the University of New Mexico Hospital (UNMH) from February 1, 2017 to December 31, 2021 were retrospectively analyzed. A total of 203 ECLS cannulations were performed in 198 patients, including 116 V-A cannulations (including 65 during ECPR) and 87 V-V cannulations (including 38 in patients with COVID-19). UNMH intensivists performed 195 cannulations, with 9 cannulation complications. Cardiothoracic surgeons performed 8 cannulations. Overall survival to hospital discharge or transfer was 46.5%. Survival was 32.3% in the ECPR group and 56% in the non-ECPR V-A group. In the V-V cohort, survival was 66.7% in the COVID-19-negative patients and 34.2% in the COVID-19-positive patients. This large series of intensivist-performed ECLS cannulations-including V-A, V-V, and ECPR modalities-demonstrates the successful implementation of a comprehensive intensivist-led ECLS program. With outcomes comparable to those in the literature, our program serves as a model for the initiation and development of ECLS programs in settings with limited access to local subspecialty cardiothoracic surgical services.

Outcome of extracorporeal membrane oxygenation use in severe accidental hypothermia with cardiac arrest and circulatory instability: a multicentre, prospective, observational study in Japan (ICE-CRASH study).

Takauji S(1), Hayakawa M(2), Yamada D(3), Tian T(4), Minowa K(5), Inoue A(6), Fujimoto Y(7), Isokawa S(8), Miura N(9), Endo T(10), Irie J(11), Otomo G(12), Sato H(13), Bando K(14), Suzuki T(15), Toyohara T(16), Tomita A(17), Iwahara M(18), Murata S(19), Shimazaki J(20), Matsuyoshi T(21), Yoshizawa J(22), Nitta K(23), Sato Y(24).

ABSTRACT

AIM: To elucidate the effectiveness of extracorporeal membrane oxygenation (ECMO) in accidental hypothermia (AH) patients with and without cardiac arrest (CA), including details of complications. METHODS: This study was a multicentre, prospective, observational study of AH in Japan. All adult (aged ≥ 18 years) AH patients with body temperature ≤ 32 °C who presented to the emergency department between December 2019 and March 2022 were included. Among the patients, those with CA or circulatory instability, defined as severe AH, were selected and divided into the ECMO and non-ECMO groups. We compared 28-day survival and favourable neurological outcomes at discharge between the ECMO and non-ECMO groups by adjusting for the patients' background characteristics using multivariable logistic regression analysis. RESULTS: Among the 499 patients in this study, 242 patients with severe AH were included in the analysis: 41 in the ECMO group and 201 in the non-ECMO group. Multivariable analysis showed that the ECMO group was significantly associated with better 28-day survival and favourable neurological outcomes at discharge in patients with CA compared to the non-ECMO group (odds ratio [OR] 0.17, 95% confidence interval [CI]: 0.05-0.58, and OR 0.22, 95%CI: 0.06-0.81). However, in patients without CA, ECMO not only did not improve 28-day survival and neurological outcomes, but also decreased the number of event-free days (ICU-, ventilator-, and catecholamine administration-free days) and increased the frequency of bleeding complications. CONCLUSIONS: ECMO improved survival and neurological outcomes in AH patients with CA, but not in AH patients without CA.

Effects of temperature control on hyperthermia-related cardiac dysfunction in a porcine model of cardiac arrest.

Wang D(1), Wang L(2), Sun Y(3), Kong F(4), Jiang Y(5), An M(6), Xia Y(7), Gong P(8), Yang Y(9).

ABSTRACT

The outcome of cardiac arrest is worse when there is fever after spontaneous circulation is restored (ROSC). The purpose of this study was to investigate the mechanism of post-ROSC cardiac dysfunction after hyperthermia treatment and the effects of temperature control. Twenty-four male Bama minipigs were randomized into 3 groups (8 per group): CPR + controlled normothermia (CN), CPR + hyperthermia (HT), and CPR + therapeutic mild hypothermia (TMH). Defibrillation was given to pigs with ventricular fibrillation after 8 min of untreated fibrillation. Subsequently, these animals received the post-ROSC treatments of hyperthermia (38 °C), controlled normothermia (37 °C) or hypothermia (33 °C) according to the groups. Hemodynamic parameters, left ventricular ejection fraction, blood samples and myocardial tissues were assessed. At 24 h after the post-ROSC treatments, the pigs treated with hyperthermia showed increments in heart rate and plasma cardiac troponin I, and decreases in mean arterial pressure, cardiac index, and left ventricular ejection fraction, compared to those with the controlled normothermia pigs. However, the deterioration of the above parameters can be attenuated by TMH. The pigs in the TMH group also had a reduced percentage of apoptotic cardiomyocytes, an increased anti-apoptotic Bcl-2/Bax ratio and a decreased caspase-3 activity in myocardium, as compared with both controlled normothermia and hyperthermia pigs. In conclusion, hyperthermia is associated with a worse myocardial dysfunction. TMH improves hyperthermia-induced myocardial dysfunction by attenuating apoptosis in a porcine model of cardiac arrest.

Oxyhaemoglobin Level Measured Using Near-Infrared Spectrometer Is Associated with Brain Mitochondrial Dysfunction After Cardiac Arrest in Rats.

Okuma Y(1)(2)(3), Shinozaki K(4), Yagi T(4), Hayashida K(4), Aoki T(4), Yin T(4), Kiguchi T(5), Iwami T(5), Becker LB(4).

ABSTRACT

Cerebral blood oxygenation (CBO), measured using near-infrared spectroscopy (NIRS), can play an important role in post-cardiac arrest (CA) care as this emerging technology allows for noninvasive real-time monitoring of the dynamic changes of tissue oxygenation. We recently reported that oxyhaemoglobin (oxy-Hb), measured using NIRS, may be used to evaluate the quality of chest compressions by monitoring the brain tissue oxygenation, which is a critical component for successful resuscitation. Mitochondria are the key to understanding the pathophysiology of post-CA oxygen metabolism. In this study, we focused on mitochondrial dysfunction, aiming to explore its association with CBO parameters such as oxy-Hb and deoxyhaemoglobin (deoxy-Hb) or tissue oxygenation index (TOI). Male Sprague-Dawley rats were used in the study. We applied NIRS between the nasion and the upper cervical spine. Following 10 min of CA, the rats underwent cardiopulmonary resuscitation (CPR) with a bolus injection of 20 µg/kg epinephrine. At 10 and 20 min after CPR, brain, and kidney tissues were collected. We isolated mitochondria from these tissues and evaluated the association between CBO and mitochondrial oxygen consumption ratios. There were no significant differences in the mitochondrial yields (10 vs. 20 min after resuscitation: brain,

1.33 ± 0.68 vs. 1.30 ± 0.75 mg/g; kidney, 19.5 ± 3.2 vs. 16.9 ± 5.3 mg/g, respectively). State 3 mitochondrial oxygen consumption rates, known as ADP-stimulated respiration, demonstrated a significant difference at 10 vs. 20 min after CPR (brain, 170 ± 26 vs. 115 ± 17 nmol/min/mg protein; kidney, 170 ± 20 vs. 130 ± 16 nmol/min/mg protein, respectively), whereas there was no significant difference in ADP non-dependent state 4 oxygen consumption rates (brain, 34.0 ± 6.7 vs. 31.8 ± 10 nmol/min/mg protein; kidney, 29.8 ± 4.8 vs. 21.0 ± 2.6 nmol/min/mg protein, respectively). Consequently, the respiratory control ratio (RCR = state 3/state 4) showed a significant difference over time, but this was only noted in the brain (brain, 5.0 ± 0.29 vs. 3.8 ± 0.64; kidney, 5.8 ± 0.53 vs. 6.2 ± 0.25 nmol/min/mg protein, respectively). The oxy-Hb levels had a dynamic change after resuscitation, and they had a significant association with the RCR of the brain mitochondria (r = 0.8311, p = 0.0102), whereas deoxy-Hb and TOI did not (r = -0.1252, p = 0.7677; r = 0.4186, p = 0.302, respectively). The RCRs of the kidney mitochondria did not have a significant association with CBO (oxy-Hb, r = -0.1087, p = 0.7977; deoxy-Hb, r = 0.1565, p = 0.7113; TOI, r = -0.1687, p = 0.6896, respectively). The brain mitochondrial respiratory dysfunction occurred over time, and it was seen at the time points between 10 and 20 min after CPR. The oxy-Hb level was associated with brain mitochondrial dysfunction during the early post-resuscitation period.

Effects of adrenaline and vasopressin on cerebral microcirculation at baseline and during global brain ischemia and reperfusion in rabbits.
Kondo D(1), Asano N(2), Ishiyama T(3), Shintani N(3), Matsukawa T(2).
ABSTRACT
BACKGROUND: During cardiopulmonary resuscitation, the brain becomes ischemic. Adrenaline and vasopressin have been recommended for use during cardiopulmonary resuscitation. We aimed to investigate the direct effects of adrenaline and vasopressin on the cerebral microvasculature at baseline and during ischemia and reperfusion in rabbits. METHODS: The closed cranial window method was used to visualize the cerebral microcirculation and changes in the pial arteriole diameter in rabbits. Adrenaline and vasopressin were administered topically on the brain tissue. First, the effects of adrenaline and vasopressin on pial arterioles were evaluated in 7 rabbits that were given 4 different concentrations of adrenaline, and another 7 rabbits that received 4 different concentrations of vasopressin. Second, the effects of adrenaline and vasopressin were determined during the global brain ischemia and reperfusion, which was induced by clamping the brachiocephalic, left common carotid, and left subclavian arteries for 15 min. An additional 21 rabbits were randomly assigned to receive artificial cerebrospinal fluid (aCSF) (n = 7), adrenaline 10-5 mol/L (n = 7), or vasopressin 10-7 mol/L (n = 7). Each drug was continuously infused from 5 min after the initiation of ischemia until 120 min after reperfusion. The pial arteriole diameters were recorded before and during ischemia, and after reperfusion. RESULTS: At baseline, adrenaline and vasopressin did not affect the cerebral pial arterioles. During ischemia, vasopressin, but not aCSF and adrenaline constricted the pial vessels. Late in the reperfusion phase, pial diameter became reduced in the vasopressin and aCSF groups whereas pial diameter was higher in the animals treated with adrenaline. CONCLUSIONS: Adrenaline and vasopressin did not affect pial arterioles at baseline. During reperfusion, adrenaline may counteract the cerebral vasoconstriction.

CASE REPORTS

Total arch and descending thoracic aortic replacement for massive hemoptysis requiring CPR caused by intrapulmonary penetration of chronic dissecting aortic aneurysm: a case report.

Mikami T(1)(2), Yamauchi T(3)(4), Sakakibara S(3), Ito Y(3), Suhara H(3), Hayashi Y(5), Kuratani T(3), Masai T(3), Sawa Y(6).

ABSTRACT

BACKGROUND: Intrapulmonary penetration of the thoracic aorta is a rare, life-threatening complication of a chronic dissecting aortic aneurysm. It causes massive hemoptysis requiring prompt intervention to prevent fatal airway bleeding. A surgical approach that enables diverse surgical maneuvers and intraoperative organ protection is crucial. CASE PRESENTATION: A 62-year-old man, who underwent graft replacement of the ascending aorta for an acute type A aortic dissection 20 months before, developed massive hemoptysis and cardiac arrest. The hemoptysis was secondary to an aortopulmonary fistula from a rapidly expanding dissecting aortic aneurysm. However, a successful return of spontaneous circulation was achieved with cardiopulmonary resuscitation, including establishment of veno-arterial extracorporeal membrane oxygenation. The patient successfully underwent a total arch and descending thoracic aortic replacement. This was achieved by a median sternotomy combined with a left thoracotomy using a straight incision with a rib-cross (SIRC) approach. The patient was uneventfully discharged and remained well for the following 2 years. CONCLUSIONS: When performing a surgical graft replacement for an aortopulmonary fistula with a thoracic aortic aneurysm, the surgical approach chosen is critical. A surgical procedure using a median sternotomy combined with a left thoracotomy and a SIRC approach can be an effective therapeutic option.

Cardiac arrest in a 14-year-old at an overnight camp.
Brill H(1), Handler A(2), Floh A(2), Dickinson V(2), Cheskes S(2).
NO ABSTRACT AVAILABLE

Delayed Presentation of Spontaneous Shockable Rhythm After Death: Another Subtype of Lazarus Phenomenon?
Kim HI(1)(2).
ABSTRACT
Lazarus phenomenon was defined as spontaneous circulatory restoration after death. It is important because survival discharge is possible. A 44-year-old woman developed traumatic cardiac arrest. She was declared dead after 30 minutes of resuscitation. Suddenly, pulseless ventricular tachycardia was shown after 6 minutes of death declaration. Resuscitation with epinephrine injection was resumed but was terminated after 7 minutes, and she was declared dead once more. A case where an electro-cardiography appears spontaneously should be classified as a subtype of the Lazarus phenomenon. If the transition from asystole to spontaneous shockable rhythm follows a mechanism similar to that of the Lazarus phenomenon, active resuscitation and monitoring for a period of time following death declaration should be considered.

Cardiac Arrest Following Torsades de Pointes Caused by Hypokalemia and Catecholamines in a Patient with Congenital Long QT Syndrome Type 1 After Surgical Aortic Valve Replacement: A Case Report.
Kitaura A(1), Nakao S(2), Yuasa H(1), Tsukimoto S(1), Nakajima Y(1).
ABSTRACT
BACKGROUND Prevention of lethal arrhythmias in congenital long QT syndrome type 1 (LQT1) requires avoidance of sympathoexcitation, drugs that prolong QT, and electrolyte abnormalities.

However, it is often difficult to avoid all these risks in the perioperative period of open heart surgery. Herein, we report hypokalemia-induced cardiac arrest in a postoperative cardiac patient with LQT1 on catecholamine. CASE REPORT A 79-year-old woman underwent surgical aortic valve replacement for severe aortic stenosis. Although the initial plan was not to use catecholamine, catecholamine was used in the Postoperative Intensive Care Unit with attention to QT interval and electrolytes due to heart failure caused by postoperative bleeding. Serum potassium levels were controlled above 4.5 mEq/L, and no arrhythmic events occurred. On postoperative day 4, the patient was started on insulin owing to hyperglycemia. Cardiac arrest occurred after the first insulin dose; the implantable cardioverter defibrillator was activated, and the patient's own heartbeat resumed. Subsequent examination revealed that a marked decrease in serum potassium level had occurred after insulin administration. The electrocardiogram showed obvious QT prolongation and ventricular fibrillation following R on T. Thereafter, under strict potassium management, there was no recurrence of cardiac arrest events. CONCLUSIONS A patient with LQT1 who underwent open heart surgery developed ventricular fibrillation after Torsades de Pointes, probably due to hypokalemia after insulin administration in addition to catecholamine. It is important to check serum potassium levels to avoid the onset of Torsades de Pointes in patients with long QT syndrome. In addition, the impact of insulin administration was reaffirmed.