This week's PubMed 3rd – 9th April 2022: articles of interest n = 50

CPR AND COVID-19

1. Drugs Real World Outcomes. 2022 Apr 6:1-11. doi: 10.1007/s40801-022-00300-y. Online ahead of print.

Serious Cardiovascular Adverse Events Associated with Hydroxychloroquine/Chloroquine Alone or with Azithromycin in Patients with COVID-19: A Pharmacovigilance Analysis of the FDA Adverse Event Reporting System (FAERS).

Zhao Y(#)(1), Zhang J(#)(2), Zheng K(3), Thai S(4), Simpson RJ Jr(5), Kinlaw AC(6)(7), Xu Y(8), Wei J(9), Cui X(1), Buse JB(5), Stürmer T(4), Wang T(10).

ABSTRACT

BACKGROUND: The use of hydroxychloroquine or chloroquine (HCQ/CQ) as monotherapy or combined with azithromycin for the treatment of coronavirus disease 2019 (COVID-19) may increase the risk of serious cardiovascular adverse events (SCAEs). OBJECTIVE: Our objective was to describe and evaluate the risk of SCAEs with HCQ/CQ as monotherapy or combined with azithromycin compared with that for therapeutic alternatives. METHODS: We performed a disproportionality analysis and descriptive case series using the US FDA Adverse Event Reporting System. RESULTS: Compared with remdesivir, HCQ/CQ was associated with increased reporting of SCAEs (reporting odds ratio [ROR] 2.1; 95% confidence interval [CI] 1.8-2.5), torsade de pointes (TdP)/QTc prolongation (ROR 35.4; 95% CI 19.4-64.5), and ventricular arrhythmia (ROR 2.5; 95% CI 1.6-3.9); similar results were found in comparison with other therapeutic alternatives. Compared with lopinavir/ritonavir, HCQ/CQ was associated with increased reporting of ventricular arrhythmia (ROR 10.5; 95% CI 3.3-33.4); RORs were larger when HCQ/CQ was used in combination with azithromycin. In 2020, 312 of the 575 reports of SCAEs listed concomitant use of HCQ/CQ and azithromycin, including QTc prolongation (61.4%), ventricular arrhythmia (12.0%), atrial fibrillation (8.2%), TdP (4.9%), and cardiac arrest (4.4%); 88 (15.3%) cases resulted in hospitalization and 79 (13.7%) resulted in death. In total, 122 fatal QTc prolongation-related cardiovascular reports were associated with 1.4 times higher odds of reported death than those induced by SCAEs; 87 patients received more than one QTc-prolonging agent. CONCLUSIONS: Patients treated with HCQ/CQ monotherapy or HCQ/CQ + azithromycin may be at increased risk of SCAEs, TdP/QTc prolongation, and ventricular arrhythmia. Cardiovascular risks need to be considered when evaluating the benefit/harm balance of treatment with HCQ/CQ, especially with the concurrent use of QTc-prolonging agents and cytochrome P450 3A4 inhibitors when treating COVID-19.

2. Minerva Anestesiol. 2022 Apr 5. doi: 10.23736/S0375-9393.22.15994-8. Online ahead of print.

Out-of-hospital and in-hospital cardiac arrest during the COVID-19 pandemic: changes in demographics, outcomes and management.

Fontanelli L(1), Sandroni C(2)(3), Skrifvars MB(4).

ABSTRACT

During the COVID-19 pandemic, prehospital and hospital services were put under great stress because of limited resources and increased workloads. One expected effect was the increased number of out-of-hospital (OHCA) and in-hospital (IHCA) cardiac arrests that occurred during 2020 compared to previous years. Both direct and indirect mechanisms were involved. In the former case, although the exact mechanisms by which Sars-Cov-2 causes cardiac arrest (CA) are still unknown, severe hypoxia, a dysregulated immune host response and sepsis are probably implicated and are often seen in COVID-19 patients with poor outcomes. In the latter case, the strain on hospitals, changes in treatment protocols, governments' actions to limit the spread of the disease and fear of

the contagion naturally affected treatment efficacy and disrupted the CA chain of survival; as expected in OHCA, only a small proportion of patients were positive to COVID-19, and yet reported outcomes were worse during the pandemic. CA patient characteristics were reported, along with modifications in patient management. In this review, we summarise the evidence to date regarding OHCA and IHCA epidemiology and management during the COVID-19 pandemic.

CPR/MECHANICAL CHEST COMPRESSION

1. Anaesthesist. 2022 Apr 7. doi: 10.1007/s00101-022-01112-z. Online ahead of print.
[Add-on-LUCAS2™ resuscitation at NEF Innsbruck].
[Article in German; Abstract available in German from the publisher]
Schwaiger D(1), Zanvettor A, Neumayr A, Baubin M.

ABSTRACT
STUDY GOAL: The study goals were to analyze the course and compare it with patients who were only resuscitated manually as well as to record the influencing factors in patients in whom the mechanical chest compression aid LUCAS2™ was used as an add-on treatment at the NEF Innsbruck. MATERIAL AND METHODOLOGY: Retrospective history data analysis of patients in the study period from 01.01.2014 to 31.12.2019 of the NEF Innsbruck from the German Resuscitation Register (GRR), in which LUCAS2™ was used as an add-on treatment according to an emergency doctor's order. RESULT: A total of 123 add-on LUCAS2™ applications (18.8%) were performed in 653 resuscitations. Of all patients 16.2% survived the first 30 days. By using add-on-LUCAS2TM application 7.3% (9/123) of all add-on LUCAS2TM resuscitations and 1.4% (n = 9) of all CPR survived. Cardiac arrest was observed in 8/9 add-on LUCAS2™ 30-day survivors and bystander CPR was performed and 8/9 showed ventricular fibrillation as the primary rhythm. Compared to manual CPR alone, add-on LUCAS2™ resuscitation was used highly significantly ($p < 0.001$) more frequently in younger, male patients, in public, in shockable initial rhythms and during transport, and significantly more frequently in observed cardiac arrest ($p < 0.05$). The 30-day mortality with additive lysis treatment was 100%. DISCUSSION: By using add-on LUCAS2™ CPR a percentage increase in survival rate can be achieved and thus appears advantageous (1.4% in our study). This means that high-quality CPR can be carried out on patients with favorable prognostic factors, even with technically complex rescue operations (turntable ladder, staircase, transport in an ambulance) and thus transport can be made possible; however, there is a higher admission rate under CPR and thus the treatment target decision is shifted to the shock room.

REGISTRIES, REVIEWS AND EDITORIALS

1. Nervenarzt. 2022 Apr 5:1-6. doi: 10.1007/s00115-022-01285-3. Online ahead of print.
[New aspects in neurointensive and emergency medicine: the most important studies in a review and overview]. [Article in German; Abstract available in German from the publisher]
Alonso A(1), Kollmar R(2)(3), Dimitriadis K(4)(5).

ABSTRACT
This review article summarizes the major clinical studies in neurological emergency and intensive care medicine from the end of 2020 to 2021 on the topics: recanalizing treatment in ischemic stroke, usefulness and effect of brain tissue oxygen monitoring in subarachnoid hemorrhage, efficacy of induced hypothermia in patients with cardiac arrest (CA), value of early cranial imaging after CA, relevance of rapid management and effects of different anticonvulsants in status epilepticus and

incidence of critical illness polyneuropathy myopathy in intensive care unit patients with COVID-19 infections.

2. Resusc Plus. 2022 Mar 31;10:100229. doi: 10.1016/j.resplu.2022.100229. eCollection 2022 Jun.
In-hospital mode of death after out-of-hospital cardiac arrest.
Wittwer MR(1)(2), Armstrong T(1), Conway J(1), Ruknuddeen MI(1)(2), Zeitz C(1)(3), Beltrame JF(1)(3), Arstall MA(1)(2).
ABSTRACT
INTRODUCTION: Factors associated with in-hospital mortality after out-of-hospital cardiac arrest (OHCA), such as mode of death and withdrawal of life-sustaining treatment (WLST), are not well established. This study aimed to compare clinical characteristics, timing of WLST and death, and precipitating aetiology between modes of death for OHCAs treated at hospital within a local health network. METHODS: Retrospective cohort study of adult non-traumatic OHCAs included in a hospital based OHCA registry between 2011 and 2016 and deceased at hospital discharge, excluding cases retrieved to external hospitals. Mode of death was defined as (1) cardiovascular instability, (2) non-neurological WLST, (3) neurological WLST, and (4) formal brain death. Relevant data were extracted from the registry and stratified according to mode of death and timing of death as early (within the emergency department) or late (after admission). RESULTS: Mode of death data was available for 69 early and 144 late deaths. Cardiovascular instability was the primary mode for 75% of early deaths, while 72% of late deaths were attributed to neurological injury (47% neurological WLST and 24% brain death, combined). Cardiovascular instability was associated with cardiac aetiology, brain death was associated with younger age and highest rates of organ donation, and neurological WLST was associated with highest rates of targeted temperature management, and longest time from arrest to death ($p < 0.05$). CONCLUSIONS: This is the first study to compare clinical characteristics of adult patients resuscitated from OHCA according to in-hospital mode of death. A consensus on the definition of mode of death with standardised classification is needed.

3. Resuscitation. 2022 Apr;173:136-143. doi: 10.1016/j.resuscitation.2022.01.020. Epub 2022 Jan 25.
The association between mode of transport and out-of-hospital cardiac arrest outcomes in Singapore.
Chua ISY(1), Fook-Chong SMC(2), Shahidah N(3), Ng YY(4), Chia MYC(5), Mao DR(6), Leong BSH(7), Cheah SO(8), Gan HN(9), Doctor NE(10), Tham LP(11), Ong MEH(12); Singapore PAROS investigators.
ABSTRACT
OBJECTIVE: We aimed to examine the survival outcomes of out-of-hospital cardiac arrest (OHCA) patients, stratified by the transportation modes to the Emergency Department (ED). METHODS: This was a retrospective analysis of Singapore's Pan-Asian Resuscitation Outcomes Study registry from Apr 2010-Dec 2017. The primary outcome was survival to discharge or 30 days post-arrest. Secondary outcomes were the return of spontaneous circulation (ROSC) rate and neurological outcomes. A subgroup analysis was performed for OHCA cases who collapsed enroute. RESULTS: A total of 15,376 cases were analysed. 15,129 (98.4%) were conveyed by Emergency Medical Services (EMS), 111 (0.72%) by private ambulance, 106 (0.69%) by own transport and 30 (0.2%) by public transport. 80% of patients brought by public transport arrested enroute, compared to 48.1% by own transport, 25.2% by private ambulance and 2.5% in the EMS group. 33/120 (27.5%) of paediatric OHCA cases were brought in by non-EMS transport to paediatric hospitals. The EMS group had the lowest survival rate at 4.5%, compared to 13.3% for public transport, 11.3% for own transport and 14.4% for private ambulance. ROSC rate was statistically significant but not for neurological outcomes. For the subgroup analysis, there was no statistical difference for primary and secondary

outcomes across the groups. CONCLUSION: In Singapore, most OHCA patients are conveyed by EMS to the hospital, but some OHCA patients still arrive via alternative transport without prehospital interventions like bystander CPR. More can be done to educate the public to recognise an impending cardiac arrest and to activate EMS early for such cases.

4. Can J Cardiol. 2022 Apr;38(4):491-501. doi: 10.1016/j.cjca.2021.12.005. Epub 2021 Dec 22.
Responding to Cardiac Arrest in the Community in the Digital Age.
Allan KS(1), O'Neil E(2), Currie MM(3), Lin S(4), Sapp JL(5), Dorian P(6).
ABSTRACT
Sudden cardiac arrest (SCA) is a common event, affecting almost 400,000 individuals annually in North America. Initiation of cardiopulmonary resuscitation (CPR) and early defibrillation using an automated external defibrillator (AED) are critical for survival, yet many bystanders are reluctant to intervene. Digital technologies, including mobile devices, social media, and crowdsourcing might help play a role to improve survival from SCA. In this article we review the current digital tools and strategies available to increase rates of bystander recognition of SCA, prompt immediate activation of emergency medical services (EMS), initiate high-quality CPR, and to locate, retrieve, and operate AEDs. Smartphones can help to educate and connect bystanders with EMS dispatchers, through text messaging or video calling, to encourage the initiation of CPR and retrieval of the closest AED. Wearable devices and household smart speakers could play a future role in continuous vital signs monitoring in individuals at risk of lethal arrhythmias and send an alert to either chosen contacts or EMS. Machine learning algorithms and mathematical modelling might aid EMS dispatchers with better recognition of SCA as well as policymakers with where to best place AEDs for optimal accessibility. There are challenges with the use of digital tech, including the need for government regulation and issues with data ownership, accessibility, and interoperability. Future research will include smart cities, e-linkages, new technologies, and using social media for mass education. Together or in combination, these emerging digital technologies might represent the next leap forward in SCA survival.

IN-HOSPITAL CARDIAC ARREST

1. Sci Rep. 2022 Apr 5;12(1):5685. doi: 10.1038/s41598-022-09510-4.
Clinical characteristics and survival in patients with heart failure experiencing in hospital cardiac arrest.
Aune E(1), McMurray J(2), Lundgren P(3)(4), Sattar N(2), Israelsson J(5)(6), Nordberg P(7), Herlitz J(4)(8), Rawshani A(3)(8).
ABSTRACT
In patients with heart failure (HF) who suffered in-hospital cardiac arrest (IHCA), little is known about the characteristics, survival and neurological outcome. We used the Swedish Registry of Cardiopulmonary Resuscitation to study this, including patients aged ≥ 18 years suffering IHCA (2008-2019), categorised as HF alone, HF with acute myocardial infarction (AMI), AMI alone, or other. Odds ratios (OR) for 30-day survival, trends in 30-day survival, and the implication of HF phenotype was studied. 6378 patients had HF alone, 2111 had HF with AMI, 4210 had AMI alone. Crude 5-year survival was 9.6% for HF alone, 12.9% for HF with AMI and 34.6% for AMI alone. The 5-year survival was 7.9% for patients with HF and left ventricular ejection fraction (LVEF) ≥ 50%, 15.4% for LVEF < 40% and 12.3% for LVEF 40-49%. Compared with AMI alone, adjusted OR (95% CI) for 30-day survival was 0.66 (0.60-0.74) for HF alone, and 0.49 (0.43-0.57) for HF with AMI. OR for 30-day survival in 2017-2019 compared with 2008-2010 were 1.55 (1.24-1.93) for AMI alone, 1.37 (1.00-1.87) for HF with AMI and 1.30 (1.07-1.58) for HF alone. Survivors with HF had good neurological outcome in 92% of cases.

2. Resuscitation. 2022 Apr 1:S0300-9572(22)00097-1. doi: 10.1016/j.resuscitation.2022.03.029. Online ahead of print.

Association Between Physician Turnover and Survival Outcome After In-Hospital Cardiopulmonary Resuscitation: A Nationwide Cohort Study in South Korea.

Kyu Oh T(1), Hwan Jo Y(2), Song IA(3).

ABSTRACT

AIM: We investigated the association between physician turnover and survival outcomes after in-hospital cardiopulmonary resuscitation (ICPR) in South Korea. METHODS: This population-based cohort study used the South Korean national registration database as the data source. All adult patients admitted to the hospital and who underwent ICPR between 1 January 2010 and 31 December 2019, were included. Patients who underwent ICPR in March were included in the turnover group, while those who underwent ICPR in the other months were included in the non-turnover group. Propensity score (PS) matching was performed. RESULTS: Overall, 298,676 adult patients who underwent ICPR in 2,553 South Korean hospitals were included in the analysis. Among them, 26,342 (8.8%) and 272,334 (91.2%) were included in the turnover and non-turnover groups, respectively. In total, 7,009 (26.6%) and 6,903 (26.2%) of the 26,342 patients each in the turnover and non-turnover groups, respectively, were discharged alive after ICPR. Using logistic regression analysis in the PS-matched cohort, the two groups did not show any significant association in the live discharge rate after ICPR (odds ratio: 1.02, 95% confidence interval: 0.98, 1.06; P=0.295). This non-significant association was also observed in patients who underwent ICPR in tertiary general hospitals that had cardiopulmonary resuscitation teams for ICPR (P=0.136). Moreover, the median survival time in the turnover and non-turnover groups was 4.0 days (95% confidence interval: 3.8 days, 4.2 days; log-rank test, P=0.796). CONCLUSION: Significant association between physician turnover and survival outcomes was not observed after ICPR in South Korea.

INJURIES AND CPR

No articles identified.

CAUSE OF THE ARREST

1. Resuscitation. 2022 Apr 1:S0300-9572(22)00098-3. doi: 10.1016/j.resuscitation.2022.03.030. Online ahead of print.

Healthy lifestyle factors, cardiovascular comorbidities, and the risk of sudden cardiac arrest: A case-control study in Korea.

Ho Park J(1), Cha KC(2), Sun Ro Y(1), Jun Song K(3), Do Shin S(1), Jin Jung W(2), Roh YI(2), Kim SC(4), Shin J(5), You Y(6), Hong JY(7), Ho Ryu H(8), Ok Park J(9), Min Park S(10), Jin Kim S(11), Jin Lee M(12), Young Kim W(13), Tak Lee G(14), Bum Oh S(15), Young Kim S(2), Oh Hwang S(16); Cardiac Arrest Pursuit Trial with Unique Registration, Epidemiologic Surveillance CAPTURES project investigators.

ABSTRACT

AIMS: We investigated the impact of healthy lifestyle factors and cardiovascular comorbidities for sudden cardiac arrest. METHODS: A case-control study, including patients with sudden cardiac arrest aged 20-79 years and community-based 1:2 matched controls, was conducted from September 2017 to December 2020. All participants completed a structured questionnaire. Using multivariable logistic regression, we assessed cardiovascular comorbidities (diabetes, hypertension, dyslipidaemia, myocardial infarction, congestive heart failure, arrhythmia, and stroke) and healthy lifestyle factors (low red meat consumption, low fish consumption, high fruit consumption, high vegetable consumption, current non-smoking, regular exercise, and adequate sleep duration) as sudden

cardiac arrest risk factors. RESULTS: Among 3,027 eligible cases, informed consent was obtained from 949 (31.3%) cases. A total of 1,731 controls were enrolled. Cardiovascular comorbidities, except dyslipidaemia, were associated with an increased risk of sudden cardiac arrest, whereas all healthy lifestyle factors were associated with a decreased risk. Relative to patients in the 0-2 healthy lifestyle factors group, the adjusted odds ratio (95% confidence interval) for sudden cardiac arrest was 0.25 (0.16-0.40) in patients with 3 healthy lifestyle factors, 0.08 (0.05-0.13) in patients with 4 healthy lifestyle factors, and 0.04 (0.03-0.06) in patients with over 5 healthy lifestyle factors. When the number of healthy lifestyle factors was analysed as a continuous variable, each additional factor was associated with a significant decrease in the likelihood of sudden cardiac arrest (adjusted odds ratio [95% confidence interval]: 0.41 [0.36-0.46]). CONCLUSION: The increased risk of sudden cardiac arrest by cardiovascular comorbidities could be significantly reduced with healthy lifestyle factors.

2. Forensic Sci Int Genet. 2022 May;58:102688. doi: 10.1016/j.fsigen.2022.102688. Epub 2022 Mar 16.

Rare variants in genes encoding structural myocyte contribute to a thickened ventricular septum in sudden death population without ventricular alterations.

Alcalde M(1), Nogué-Navarro L(2), Tiron C(3), Fernandez-Falgueras A(4), Iglesias A(1), Simon A(1), Buxó M(5), Pérez-Serra A(1), Puigmulé M(6), López L(1), Picó F(1), Del Olmo B(1), Corona M(1), Campuzano O(7), Moral S(4), Castella J(8), Coll M(9), Brugada R(10).

ABSTRACT

Unexpected cardiac deaths are a current challenge to healthcare systems. In adults, coronary artery disease and acquired cardiomyopathies are the most frequent causes of sudden cardiac death while in younger than 35 years old, the main cause is represented by non-ischemic diseases, usually inherited. Nowadays, around 10%-15% of unexpected deaths remain without a definite cause of decease after a complete autopsy, then classified as deaths potentially due to an inherited arrhythmia. Discrete abnormalities in some of the heart measures have been considered as potential predictors or risk factors for sudden cardiac death. However, role of non-benign genetic variants in these scattered heart alterations remains to be clarified, especially if variants are classified of ambiguous role. Clinicians usually only take into consideration pathogenic variants for decision-making. It is yet unclear what the role of VUS genetic variants in modifying the anatomical parameters of the heart. We hypothesize that some heart measures might be influenced by polygenic components as some variants may individually confer minor risk but may actually produce additive effects when combined with others. Our aim was to investigate whether carrying non-benign rare variants in genes related to inherited arrhythmias may contribute to scattered cardiac alterations in anatomical normal hearts. The study is composed by 761 samples collected from autopsies of SD suffered by adults from 18 to 50 years of age who occurred in Catalonia (Spain) in a 9-year period. Complete medico-legal autopsy was performed to determine the cause of death. Molecular autopsy was performed as part of our forensic protocol, including genes associated with inherited diseases.To evaluate the effect of genetic rare variants into hearts measures we performed a linear regression model and data were presented as regression. This study showed, for the first time, that rare variants, regardless of significance (pathogenic, probably pathogenic or uncertain significance), may contribute to interventricular septum width in the structurally normal heart. While the cohort is based on sudden death cases, further studies and case-control studies will be necessary to conclude that the genetic determinants of septal thickness contributes to sudden cardiac death. We conclude that non-benign rare variants contribute to modify scattered septum width in structural normal hearts, being a potential risk factor of arrhythmia in genetic harbors. These evidence support the current recommendation in forensic protocols of including histologic analysis of septum when inherited arrhythmogenic disease is suspicious cause of decease.

3. J Am Heart Assoc. 2022 Mar 15;11(6):e023446. doi: 10.1161/JAHA.121.023446. Epub 2022 Mar 4.
Racial Disparities in Ion Channelopathies and Inherited Cardiovascular Diseases Associated With Sudden Cardiac Death.
Chahine M(1)(2), Fontaine JM(3)(4), Boutjdir M(5)(6)(7).
ABSTRACT
Cardiovascular disease (CVD) continues to be the most common cause of death worldwide, and cardiac arrhythmias account for approximately one half of these deaths. The morbidity and mortality from CVD have been reduced significantly over the past few decades; however, disparities in racial or ethnic populations still exist. This review is based on available literature to date and focuses on known cardiac channelopathies and other inherited disorders associated with sudden cardiac death in African American/Black subjects and the role of epigenetics in phenotypic manifestations of CVD, and illustrates existing disparities in treatment and outcomes. The review also highlights the knowledge gaps that limit understanding of the manifestation of phenotypic abnormalities across racial or ethnic groups and discusses disparities associated with device underuse in the management of patients at risk for sudden cardiac death. We discuss factors related to reports in the United States, that the overall mortality attributed to CVD and the number of out-of-hospital cardiac arrests are higher among African American/Black subjects when compared with other racial or ethnic groups. African American/Black subjects are disproportionally affected by CVD, including cardiac arrhythmias and sudden cardiac death, thus highlighting a major concern in this population that remains underrepresented in clinical trials with limited genetic testing and device underuse. The proposed solutions include (1) early identification of genetic variants, which is crucial in tailoring a preventive management strategy; (2) inclusion of diverse racial or ethnic groups in clinical trials; (3) compliance with guideline-directed medical treatment and referral to cardiovascular subspecialists; and (4) training and mentoring of underrepresented junior faculty in cardiovascular health disparities research.

4. Ir J Med Sci. 2022 Apr;191(2):937-944. doi: 10.1007/s11845-021-02646-8. Epub 2021 May 10.
Evaluation of histopathological findings of cardiac deaths in forensic autopsies.
Daş T(1), Buğra A(2), Buğra AK(3).
ABSTRACT
BACKGROUND: The vast majority of sudden and unexpected natural deaths are related to cardiovascular diseases, especially coronary artery diseases. AIMS: In this study, we aimed to reveal the epidemiological differences between men and women and to investigate the most common pathologies that cause cardiac deaths. METHODS: Five thousand seven hundred sixty-eight autopsy cases that were done in 2016 were reviewed for the autopsy information and histopathological findings. Of the 5768 autopsies performed, 866 were due to cardiac causes. Eight hundred thirty-two cases were reviewed due to lack of autopsy information in 34 cases.RESULTS: One hundred sixteen (13.9%) were female, and 716 (86.1%) were male. Coronary artery disease was detected in 760 of 832 cases. There were findings of acute or previous myocardial infarction in 595 (71.5%), perivascular and interstitial fibrosis in 159 (19.1%), myocardial rupture and tamponade in 31 (%3.7), valvular disease in 6 (0.7%), cardiomyopathy in 4 (0.5%), and congenital heart disease in 3 (0.4%). In the study, it was observed that the mean age of death due to cardiac pathology other than coronary artery disease was significantly lower than deaths due to coronary artery disease ($p < 0.05$). The presence of coronary artery disease in men was found to be significantly higher than in women ($p < 0.001$). CONCLUSION: In our study, it was found that deaths due to coronary artery disease are seen at an older age than cardiac deaths other than coronary artery disease. In addition, in line with

current knowledge, it has been confirmed that the mortality rate of coronary artery disease is higher in men than in women.

5. Resuscitation. 2022 Apr;173:31-38. doi: 10.1016/j.resuscitation.2022.02.005. Epub 2022 Feb 11.
Long-term prognosis and causes of death among survivors after out-of-hospital cardiac arrest: A population-based longitudinal study.
Cho Y(1), Oh J(2), Shin JH(3), Kim BS(4), Park JK(5), Lee JH(6), Kim JH(7), Park M(7).
ABSTRACT
BACKGROUND: We aimed to identify the long-term prognosis and causes of death of out-of-hospital cardiac arrest (OHCA) survivors. METHODS: Using claims data from the National Health Insurance Service (NHIS) database, we included 4937 OHCA patients (aged ≥ 18 years) who were hospitalized between January 2005 and December 2015 and had survived for 30 days or more. The endpoints were long-term mortality and causes of death. Subgroup analyses were performed based on whether cardiac procedures were performed, and risk factors associated with cardiac and noncardiac deaths were identified. RESULTS: We followed 4937 OHCA patients for a median of 3.3 years and up to 14 years of follow-up. The all-cause 1-, 3-, 5-, and 10-year cumulative mortality were 35.2%, 46.5%, 52.3%, and 62.7%, respectively. Regarding the 1130 OHCA survivors who had undergone cardiac procedures, the all-cause 1-, 3-, 5-, and 10-year cumulative mortality were 10.7%, 16.9%, 21.4%, and 30.6%, respectively. More patients (56.2%) died from noncardiovascular causes than from cardiovascular causes (43.8%) among the 2738 total patients who had died. The proportion of patients with cardiac death was significantly higher in the patient group with a cardiac procedure than in the group without a cardiac procedure (49.6% vs. 31.7%; P value < 0.001). A higher Charlson comorbidity index (CCI) was associated with an increased risk of cardiac mortality in the cardiac procedure group. CONCLUSIONS: The long-term mortality among OHCA survivors remains high, particularly within the first year. Individual characteristics are crucial for the follow-up of OHCA survivors and may help improve their long-term prognosis.

6. Resuscitation. 2022 Apr;173:39-46. doi: 10.1016/j.resuscitation.2022.02.006. Epub 2022 Feb 10.
The association between alcohol intake shortly before arrest and survival outcomes of out-of-hospital cardiac arrest.
Choi DH(1), Ro YS(2), Kim KH(3), Park JH(4), Jeong J(5), Hong KJ(6), Song KJ(7), Shin SD(8).
ABSTRACT
INTRODUCTION: Alcohol intake is one of the triggers of out-of-hospital cardiac arrest (OHCA) and is associated with survival outcomes due to its relationship with cardiovascular conditions such as variant angina and arrhythmias. The aim of this study was to evaluate the association between alcohol intake shortly before cardiac arrest and survival outcomes after OHCA. METHODS: This observational study was conducted using a nationwide OHCA registry database in Korea. All adult OHCA patients with presumed cardiac etiology from 2016 to 2019 were analyzed. The primary outcome was survival to hospital discharge. Secondary outcomes included coronary angiography (CAG), percutaneous coronary intervention (PCI), and implantable cardioverter-defibrillator (ICD) implantation. Groups with and without alcohol intake shortly before cardiac arrest were compared using propensity score matching and conditional logistic regression analysis. RESULTS: Among the study population of 83,087, 1,777 (2.1%) patients consumed alcohol shortly before OHCA. In the propensity score-matched population, the group with alcohol intake showed significantly higher odds of survival to hospital discharge compared to the group without alcohol intake (OR (95% CI): 1.33 (1.15-1.53)). The odds of receiving CAG without PCI and ICD implantation were significantly higher in the group with alcohol intake compared to the group without alcohol intake (OR (95% CI): 1.60 (1.34-1.92) and 1.74 (1.28-2.37), respectively), while the odds of receiving CAG with PCI were

significantly lower (OR (95% CI): 0.75 (0.59-0.95)). CONCLUSION: In OHCA patients with presumed cardiac etiology, alcohol intake shortly before arrest was associated with higher odds of survival outcomes.

7. Can J Cardiol. 2022 Apr;38(4):418-426. doi: 10.1016/j.cjca.2022.01.001. Epub 2022 Jan 10.
Sudden Cardiac Death in Diabetes and Obesity: Mechanisms and Therapeutic Strategies.
Remme CA(1).

ABSTRACT
Ventricular arrhythmias and sudden cardiac death (SCD) occur most frequently in the setting of coronary artery disease, cardiomyopathy and heart failure but are also increasingly observed in persons suffering from diabetes mellitus and obesity. The incidence of these metabolic disorders is rising in Western countries, but adequate prevention and treatment of arrhythmias and SCD in affected patients is limited because of our incomplete knowledge of the underlying disease mechanisms. Here, an overview is presented of the prevalence of electrophysiological disturbances, ventricular arrhythmias, and SCD in the clinical setting of diabetes and obesity. Experimental studies are reviewed, which have identified disease pathways and associated modulatory factors, in addition to pro-arrhythmic mechanisms. Key processes are discussed, including mitochondrial dysfunction, oxidative stress, cardiac structural derangements, abnormal cardiac conduction, ion channel dysfunction, prolonged repolarization, and dysregulation of intracellular sodium and calcium homeostasis. In addition, the recently identified pro-arrhythmic effects of dysregulated branched chain amino acid metabolism, a common feature in patients with metabolic disorders, are addressed. Finally, current management options are discussed in addition to the potential development of novel preventive and therapeutic strategies based on recent insight gained from translational studies.

END-TIDAL CO_2

1. Emerg Med Australas. 2022 Apr 7. doi: 10.1111/1742-6723.13972. Online ahead of print.
Out-of-hospital cardiac arrest outcomes, end-tidal carbon dioxide and extracorporeal cardiopulmonary resuscitation eligibility: New South Wales pilot data.
Dennis M(1); RESET Study Group and Sydney ECMO Research Interest Group(1).

ABSTRACT
OBJECTIVE: To describe on-scene times for out-of-hospital cardiac arrests (OHCA) transferred to hospital, the number of these that were extracorporeal cardiopulmonary resuscitation (ECPR) eligible and potential association between end-tidal carbon dioxide (ETCO2) and survival so as to inform planned interventional studies. METHODS: Prospective cohort study of all OHCA, of suspected medical cause, where resuscitation was commenced and who were transported to participating hospitals from October 2020 to May 2021. RESULTS: One hundred and forty-nine OHCA were included. Forty-four (30%) patients survived to hospital discharge. Eighteen (8%) met ECPR inclusion criteria. Median on-scene time was 33 min (interquartile range [IQR] 24-44). Initial hospital ETCO2 for non-survivors was 35 mmHg (IQR 19-50), survivors 36 mmHg (IQR 33-45); P = 0.215. No patient with an ETCO2 less than 20 mmHg on hospital arrival to survived to hospital discharge. CONCLUSIONS: Average on-scene time did not differ on survivorship. A small number of transferred patients with OHCA were ECPR eligible. ETCO2 less than 20 mmHg portends adverse prognosis. Our data will be used for future interventional studies.

ORGAN DONATION

1. Am J Emerg Med. 2022 Apr 1;56:117-123. doi: 10.1016/j.ajem.2022.03.054. Online ahead of print.
Early identified risk factors and their predictive performance of brain death in out-of-hospital cardiac arrest survivors.
Lee BK(1), Min JH(2), Park JS(3), Kang C(1), Lee BK(4).
ABSTRACT
BACKGROUND: Early prediction of brain death (BD) after the return of spontaneous circulation (ROSC) in patients with cardiac arrest would be useful for the proper distribution of good quality transplantable organs and medical resources. We aimed to early identify independent risk factors of BD and their predictive performance in out-of-hospital cardiac arrest (OHCA) survivors. METHODS: This retrospective observational study included adult OHCA survivors from May 2018 to February 2021. Independent risk factors for progression to BD were identified by performing multivariate logistic regression analysis, including clinical, laboratory, biological parameters and prognostic factors, obtained within 6 h after ROSC. Neuron-specific enolase (NSE) level were categorized into quartile. The primary outcome was BD occurrence. RESULTS: Overall, 108 patients were included in this analysis, 31 (29%) of whom had BD. In multivariate logistic regression analysis, initial serum NSE levels in the fourth quartile compared to the first quartile (odds ratio [OR], 88.5; 95% confidence interval [CI]: 7.0-1113.6) and absence of pupil light reflex (PLR) (OR, 40.3; 95% CI: 3.8-430.3) were independently associated with BD. According to the receiver operating characteristic curve analysis, initial serum NSE levels and PLR showed good-to-excellent and fair-to-good prognostic performance, respectively (area under the curve [AUC], 0.90; 95% CI: 0.83-0.95 vs. 0.81; 95% CI: 0.72-0.88). Additionally, the combination of both the risk factors (AUC, 0.96; 95% CI: 0.90-0.99) showed significantly higher predictive performance for BD than when using them individually ($P = 0.04$ and $P < 0.01$, respectively). CONCLUSION: High levels of initial serum NSE and PLR obtained within 6 h after ROSC may help early predict progression to BD in OHCA survivors. A large prospective multicenter study should be conducted to confirm these results.

FEEDBACK

No articles identified.

DRUGS

1. Resuscitation. 2022 Apr;173:59-60. doi: 10.1016/j.resuscitation.2022.02.010. Epub 2022 Feb 19.
Prophylactic amiodarone administration on ROSC after a successful first defibrillation.
Freire-Tellado M(1), Navarro-Patón R(2), Mateos-Lorenzo J(3), Pérez-López G(4), Pavón-Prieto MDP(5).
NO ABSTRACT AVAILABLE

TRAUMA

No articles identified.

VENTILATION

1. Curr Anesthesiol Rep. 2022 Mar 25:1-10. doi: 10.1007/s40140-022-00527-z. Online ahead of print.
Airway Management During Cardiopulmonary Resuscitation.
Mohamed BA(1).

ABSTRACT
PURPOSE OF THE REVIEW: This review summarizes the updated literature on airway management during cardiopulmonary resuscitation (CPR). It provides guidance for clinicians to carefully incorporate the most recent recommendations related to airway management, oxygenation, and ventilation both during CPR and after return of spontaneous circulation. RECENT FINDINGS: The American Heart Association and the International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care provide updated recommendations related to airway management during CPR, which focus on advanced airway strategies in out-of-the hospital cardiac arrest and in-hospital cardiac arrest. There is no evidence that any single advanced airway technique is superior to the other in terms of survival and neurological outcomes. There is controversy as to whether early advanced airway management could lead to favorable outcome. SUMMARY: Advanced airway strategies and alternatives to airway management (including passive oxygenation) can be utilized in different settings while minimizing interruption in chest compressions.

CERERBRAL MONITORING

1. Resuscitation. 2022 Apr 5:S0300-9572(22)00100-9. doi: 10.1016/j.resuscitation.2022.03.032. Online ahead of print.
A new variant position of head-up CPR may be associated with improvement in the measurements of cranial near-infrared spectroscopy suggestive of an increase in cerebral blood flow in non-traumatic out-of-hospital cardiac arrest patients: A prospective interventional pilot study.
Won Kim D(1), Kwan Choi J(2), Hyun Won S(3), Ju Yun Y(4), Hwan Jo Y(5), Min Park S(5), Keon Lee D(6), Jang DH(7).

ABSTRACT
AIM OF THE STUDY: This study aimed to investigate the effect of the head-up position implemented during cardiopulmonary resuscitation (CPR) on cerebral blood flow (CBF) using near-infrared spectroscopy in out-of-hospital cardiac arrest patients. METHODS: Baseline characteristics (age, sex, cerebral performance category before cardiac arrest, witnessed cardiac arrest, bystander CPR, first monitored rhythm, no-flow time, prehospital low-flow time, CPR duration in the emergency department (ED), and reason for stopping CPR in the ED) were recorded. The changes of CBF were derived from the optical oscillation waveform measured by near-infrared spectroscopy in adult patients with out-of-hospital cardiac arrest by alternating head-up and supine positions at 4-minute intervals while performing CPR. The CBF velocity according to the head position was also evaluated using the time derivative of the oscillation waveform. RESULTS: During the study period, 28 patients were enrolled. The median increase in CBF in the prefrontal area in the head-up position was 14.6% (Interquartile range, 8.8-65.0), more than that in the supine position. An increase in CBF was observed in the head-up position compared with the supine position in 83.3% of the patients included in the analysis. CONCLUSION: CBF increased when the head-up position was used during CPR in non-traumatic out-of-hospital cardiac arrest patients. abberivation OHCA: out-of-hospital cardiac arrest, ROSC: return of spontaneous circulation, CBF: cerebral blood flow, CPR: cardio-pulmonary resuscitation, EMT: emergency medical technician, ACD: active chest compression-decompression, ITD: impedance threshold device, HUP: head-up position, ICP: intracranial pressure, CePP: cerebral perfusion pressure, NIRS: Near-infrared spectroscopy, ED: emergency department, ALS: advanced life support, HbO2: oxy-haemoglobin, HbR: deoxy-haemoglobin, RMS: root-mean-

square, IQR: interquartile rage, TCD: transcranial doppler, CVR: cerebrovascular resistance, MAP: mean arterial pressure.

2. Ann Saudi Med. 2022 Mar-Apr;42(2):127-138. doi: 10.5144/0256-4947.2022.127. Epub 2022 Apr 7.

Neurological outcomes in adult drowning patients in China.

Zhou P(1), Xu H(1), Li B(1), Yang C(1), Zhou Z(2), Shi J(3), Li Z(4).

ABSTRACT

BACKGROUND: Drowning is the third leading cause of unintentional death worldwide. The epidemiological characteristics of adult drownings are rarely reported. OBJECTIVE: Investigate factors associated with neurological prognosis in adult drowning inpatients. DESIGN: Multicenter medical record review. SETTING: Tertiary health care institutions. PATIENTS AND METHODS: We collected demographic and clinical data on patients who drowned but survived between September 2006 and January 2020. Neurological prognosis was compared in patients with and without cardiac arrest. MAIN OUTCOME MEASURES: Neurological outcomes. SAMPLE SIZE AND CHARACTERISTICS: 142 patients with mean age of 50.6 (19.8) years, male/female ratio of 1.54:1. RESULT: Forty-five patients (31.7%) received CPR, 90 patients (63.4%) experienced unconsciousness, and 59 patients (41.5%) received endotracheal intubation and mechanical ventilation. Multivariate logistic regression analysis showed that the initial blood lactic acid level (OR: 7.67, 95%CI: 1.23-47.82, P=.029) was associated with a poor neurological prognosis in patients without cardiac arrest. The incidence of ICU admission (OR: 16.604, 95%CI: 1.15-239.49, P=.039) was associated with a poor neurologic prognosis in patients with cardiac arrest. CONCLUSIONS: For the drowning patients with cardiac arrest, ICU admission was associated with neurological function prognosis in these patients. Among the patients without cardiac arrest, the initial lactate value was associated with neurological function prognosis of these patients. LIMITATIONS: Retrospective. CONFLICT OF INTEREST: None.

3. Resuscitation. 2022 Apr 1:S0300-9572(22)00096-X. doi: 10.1016/j.resuscitation.2022.03.028. Online ahead of print.

Routine Reporting of Grey-White Matter differentiation in Early Brain Computed Tomography in comatose patients after cardiac arrest: a substudy of the COACT trial.

Adriaansens KO(1), Jewbali LSD(2), Lemkes JS(3), Spoormans EM(3), Meuwissen M(4), Blans MJ(5), van der Harst P(6), Eikemans BJW(7), Bleeker GB(8), Beishuizen A(9), Henriques JP(10), van der Lugt A(11), van Royen N(12), den Uil CA(13).

ABSTRACT

AIM: A multimodal approach is advised for neurological prognostication in comatose patients after out-of-hospital cardiac arrest (OHCA). Grey-white matter differentiation (grey-white ratio, GWR) obtained from a brain CT scan performed <24 hours after return of circulation can be part of this approach. The aims of this study were to investigate the frequency and method of reporting the GWR in brain CT scan reports and their association with outcome. METHODS: This is a post-hoc descriptive analysis of the COACT trial. The primary endpoint was the reporting of GWR by the radiologist. Secondary endpoints were APACHE IV score, Cerebral Performance Categories at discharge and 90-day follow-up, Glasgow Coma Scale at discharge, GWR-stratified 1-year survival, and RAND-36 stratified by normal versus abnormal GWR. Associations were analysed using multivariable analysis. RESULTS: A total of 427 OHCA patients were included in this study, 234 (55%) of whom underwent a brain CT scan within 24 hours after ROSC. Median time between arrest and initial CT scan was 12 hours. In 195 patients (83%), the GWR was described in the reports, but always expressed qualitatively. The GWR was deemed abnormal in 57 (29%) CT scans. No differences were found in secondary endpoints between the two groups. CONCLUSION: GWR was frequently

described in CT scan reports. Early abnormal GWR, as assessed qualitatively by a radiologist within 24 hours after ROSC, was a poor predictor of neurological prognosis.

4. Front Med (Lausanne). 2022 Mar 15;9:847089. doi: 10.3389/fmed.2022.847089. eCollection 2022.
Gray-White Matter Ratio at the Level of the Basal Ganglia as a Predictor of Neurologic Outcomes in Cardiac Arrest Survivors: A Literature Review.
Zhou F(1)(2), Wang H(1)(2), Jian M(1)(2), Wang Z(1)(2), He Y(1)(2), Duan H(1)(2), Gan L(1)(2), Cao Y(1)(2).
ABSTRACT
Loss of gray-white matter discrimination is the primary early imaging finding within of cranial computed tomography in cardiac arrest survivors, and this has been also regarded as a novel predictor for evaluating neurologic outcome. As displayed clearly on computed tomography and based on sensitivity to hypoxia, the gray-white matter ratio at basal ganglia (GWR-BG) region was frequently detected to assess the neurologic outcome by several studies. The specificity of GWR-BG is 72.4 to 100%, while the sensitivity is significantly different. Herein we review the mechanisms mediating cerebral edema following cardiac arrest, demonstrate the determination procedures with respect to GWR-BG, summarize the related researches regarding GWR-BG in predicting neurologic outcomes within cardiac arrest survivors, and discuss factors associated with predicting the accuracy of this methodology. Finally, we describe the effective measurements to increase the sensitivity of GWR-BG in predicting neurologic outcome.

5. Resuscitation. 2022 Apr;173:185-186. doi: 10.1016/j.resuscitation.2022.02.014.
Role of delayed head CT in predicting neurological outcome in out-of-hospital cardiac arrest survivors.
Abdelmonem A(1), Martinez S(2), AlRemeithi R(3), Patel J(3).
NO ABSTRACT AVAILABLE

6. Am J Emerg Med. 2022 Apr;54:257-262. doi: 10.1016/j.ajem.2022.02.003. Epub 2022 Feb 5.
Association of hypoxic ischemic brain injury on early CT after out of hospital cardiac arrest with neurologic outcome.
Schick A(1), Prekker ME(2), Kempainen RR(3), Mulder M(4), Moore J(5), Evans D(3), Hall J(5), Rodin H(6), Larson J(3), Caraganis A(7).
ABSTRACT
AIM: This study aimed to describe the prevalence of hypoxic-ischemic brain injury (HIBI) on head CT (HCT) obtained within two hours of return of spontaneous circulation (ROSC) care in the Emergency Department following out-of-hospital cardiac arrest (OHCA) and evaluate the association between early HIBI and neurologic outcome. METHODS: Retrospective single center observational study of post-OHCA patients between 2009 and 2017. Two cohorts were analyzed: those who underwent non-contrast HCT within two hours of ROSC and all others who survived to ICU admission. HIBI was defined as the presence of cerebral edema and/or abnormal gray-white matter differentiation in the HCT interpretation by a neuroradiologist. The primary outcomes were the prevalence of HIBI on early HCT and the magnitude of the association between HIBI and survival with good neurologic outcome using multivariable logistic regression. RESULTS: Following OHCA, 333 of 520 patients (64%) underwent HCT within two hours of ROSC and HIBI was present in 96 of 333 patients (29%). Of the early HCT cohort, those with HIBI had a significantly lower hospital survival (2%) and favorable neurologic outcome (1%). In those without HIBI on imaging, 88 of 237 patients (37%) had a favorable outcome. After adjustment for confounding variables, HIBI on early HCT was independently associated with a decreased likelihood of good neurologic outcome (aOR 0.015, 95% CI 0.002-0.12).

CONCLUSION: HIBI was present on 29% of HCTs obtained within 2 h of ROSC in the patients selected for early imaging by emergency physicians and was strongly and inversely associated with survival with a good neurologic outcome.

7. Resuscitation. 2022 Apr;173:103-111. doi: 10.1016/j.resuscitation.2022.01.033. Epub 2022 Feb 8.
Severe cerebral edema in substance-related cardiac arrest patients.
Kulpanowski AM(1), Copen WA(2), Hancock BL(1), Rosenthal ES(3), Schoenfeld DA(4), Dodelson JA(1), Edlow BL(3), Kimberly WT(3), Amorim E(5), Westover MB(3), Ning MM(3), Schaefer PW(2), Malhotra R(6), Giacino JT(7), Greer DM(8), Wu O(9).
ABSTRACT
BACKGROUND: Studies of neurologic outcomes have found conflicting results regarding differences between patients with substance-related cardiac arrests (SRCA) and non-SRCA. We investigate the effects of SRCA on severe cerebral edema development, a neuroimaging intermediate endpoint for neurologic injury. METHODS: 327 out-of-hospital comatose cardiac arrest patients were retrospectively analyzed. Demographics and baseline clinical characteristics were examined. SRCA categorization was based on admission toxicology screens. Severe cerebral edema classification was based on radiology reports. Poor clinical outcomes were defined as discharge Cerebral Performance Category scores > 3. RESULTS: SRCA patients (N = 86) were younger (P < 0.001), and more likely to have non-shockable rhythms (P < 0.001), be unwitnessed (P < 0.001), lower Glasgow Coma Scale scores (P < 0.001), absent brainstem reflexes (P < 0.05) and develop severe cerebral edema (P < 0.001) than non-SRCA patients (N = 241). Multivariable analyses found younger age (P < 0.001), female sex (P = 0.008), non-shockable rhythm (P = 0.01) and SRCA (P = 0.05) to be predictors of severe cerebral edema development. Older age (P < 0.001), non-shockable rhythm (P = 0.02), severe cerebral edema (P < 0.001), and absent pupillary light reflexes (P = 0.004) were predictors of poor outcomes. SRCA patients had higher proportion of brain deaths (P < 0.001) compared to non-SRCA patients. CONCLUSIONS: SRCA results in higher rates of severe cerebral edema development and brain death. The absence of statistically significant differences in discharge outcomes or survival between SRCA and non-SRCA patients may be related to the higher rate of withdrawal of life-sustaining treatment (WLST) in the non-SRCA group. Future neuroprognostic studies may opt to include neuroimaging markers as intermediate measures of neurologic injury which are not influenced by WLST decisions.

ULTRASOUND AND CPR

1. Prehosp Disaster Med. 2022 Apr 5:1. doi: 10.1017/S1049023X22000577. Online ahead of print.
POCUS in Out-of-Hospital Cardiac Arrest.
Canakci ME(1), Ozakin E(1), Acar N(1).
NO ABSTRACT AVAILABLE

ORGANISATION AND TRAINING

1. BMJ Open. 2022 Apr 5;12(4):e056798. doi: 10.1136/bmjopen-2021-056798.
Impact of family presence during cardiopulmonary resuscitation on team performance and perceived task load: a prospective randomised simulator-based trial.
Willmes M(1), Sellmann T(2)(3), Semmer N(4), Tschan F(5), Wetzchewald D(1), Schwager H(1), Russo SG(3)(6)(7), Marsch S(8).
ABSTRACT

OBJECTIVES: Guidelines recommend family presence to be offered during cardiopulmonary resuscitation (CPR). Data on the effects of family presence on the quality of CPR and rescuers' workload and stress levels are sparse and conflicting. This randomised trial investigated the effects of family presence on quality of CPR, and rescuers' perceived stress. DESIGN: Prospective randomised single-blind trial. SETTING: Voluntary workshops of educational courses. PARTICIPANTS: 1085 physicians (565 men) randomised to 325 teams entered the trial. 318 teams completed the trial without protocol violation. INTERVENTIONS: Teams were randomised to a family presence group (n=160) or a control group (n=158) and to three versions of leadership: (a) designated at random, (b) designated by the team or (c) left open. Thereafter, teams were confronted with a simulated cardiac arrest which was video-recorded. Trained actors played a family member according a scripted role. MAIN OUTCOME MEASURES: The primary endpoint was hands-on time. Secondary outcomes included interaction time, rescuers' perceived task load and adherence to CPR algorithms. RESULTS: Teams interacted with the family member during 24 (17-36) % of the time spent for resuscitation. Family presence had no effect on hands-on time (88% (84%-91%) vs 89% (85%-91%); p=0.18). Family presence increased frustration (60 (30-75) vs 45 (30-70); p<0.001) and perceived temporal (75 (55-85) vs 70 (50-80); p=0.001) and mental demands (75 (60-85) vs 70 (55-80); p=0.009), but had no relevant effect on CPR performance markers. Leadership condition had no effects. CONCLUSIONS: Interacting with a family member occupied about a quarter of the time spent for CPR. While this additional task was associated with an increase in frustration and perceived temporal and mental demands, family presence had no relevant negative effect on the quality of CPR.

2. Resuscitation. 2022 Mar 30:S0300-9572(22)00094-6. doi: 10.1016/j.resuscitation.2022.03.026. Online ahead of print.

Global variation in the incidence and outcome of emergency medical services witnessed out-of-hospital cardiac arrest: A systematic review and meta-analysis.

Gowens P(1), Smith K(2), Clegg G(1), Williams B(3), Nehme Z(4).

ABSTRACT

AIM OF THE REVIEW: To examine global variation in the incidence and outcomes of emergency medical services (EMS) witnessed out-of-hospital cardiac arrest (OHCA). DATA SOURCES: We systematically reviewed four electronic databases for studies between 1990 and 5th April 2021 reporting EMS-witnessed OHCA populations. Studies were included if they reported sufficient data to calculate the primary outcome of survival to hospital discharge or 30-day survival. Random-effects models were used to pool incidence and survival outcomes, and meta-regression was used to examine sources of heterogeneity. Study quality was appraised using the Joanna Briggs Institute critical appraisal tools. RESULTS: The search returned 1178 non-duplicate titles of which 66 articles comprising 133,981 EMS-witnessed patients treated by EMS across 33 countries were included. All but one study was observational and only 12 studies (18%) were deemed to be at low risk of bias. The pooled incidence of EMS-treated cases was 4.1 per 100,000 person-years (95% CI: 3.5, 4.7), varying almost 4-fold across continents. The pooled proportion of survivors to hospital discharge or 30-days was 20% overall (95% CI: 18%, 22%; I2 = 98%), 43% (95% CI: 37%, 49%; I2 = 94%) for initial shockable rhythms and 6% (95% CI: 5%, 8%; I2 = 79%) for initial non-shockable rhythms. In the meta-regression analysis, only region and aetiology were significantly associated with survival. When compared to studies from North America, pooled survival was significantly higher in studies from Europe (14% vs. 26%; p = 0.04) and Australasia (14% vs. 31%, p < 0.001). CONCLUSION: We identified significant global variation in the incidence and survival outcome of EMS-witnessed OHCA. Further research is needed to understand the factors contributing to these variations.

3. J Am Heart Assoc. 2022 Apr 5;11(7):e023763. doi: 10.1161/JAHA.121.023763. Epub 2022 Mar 24.
Practitioners' Confidence and Desires for Education in Cardiovascular and Sudden Cardiac Death Genetics.
Lopez Santibanez Jacome L(1), Dellefave-Castillo LM(1), Wicklund CA(1), Scherr CL(2), Duquette D(1), Webster G(3), Smith ME(1), Kalke K(2), Gordon AS(1), De Berg K(4), McNally EM(1), Rasmussen-Torvik LJ(5).

ABSTRACT
Background Educating cardiologists and health care professionals about cardiovascular genetics and genetic testing is essential to improving diagnosis and management of patients with inherited cardiomyopathies and arrhythmias and those at higher risk for sudden cardiac death. The aim of this study was to understand cardiology and electrophysiology practitioners' current practices, confidence, and knowledge surrounding genetic testing in cardiology and desired topics for an educational program. Methods and Results A one-time survey was administered through purposive email solicitation to 131 cardiology practitioners in the United States. Of these, 107 self-identified as nongenetic practitioners. Over three quarters of nongenetic practitioners reported that they refer patients to genetic providers to discuss cardiovascular genetic tests (n=82; 76.6%). More than half of nongenetic practitioners reported that they were not confident about the types of cardiovascular genetic testing available (n=60; 56%) and/or in ordering appropriate cardiovascular genetic tests (n=66; 62%). In addition, 45% (n=22) of nongenetic practitioners did not feel confident making cardiology treatment recommendations based on genetic test results. Among all providers, the most desired topics for an educational program were risk assessment (94%) and management of inherited cardiac conditions based on guidelines (91%). Conclusions This study emphasizes the importance of access to genetics services in the cardiology field and the need for addressing the identified deficit in confidence and knowledge about cardiogenetics and genetic testing among nongenetic providers. Additional research is needed, including more practitioners from underserved areas.

4. Jt Comm J Qual Patient Saf. 2022 Apr;48(4):196-204. doi: 10.1016/j.jcjq.2022.01.004. Epub 2022 Jan 13.
Longitudinal Evaluation of a Pediatric Rapid Response System with Realist Evaluation Framework.
Acorda DE, Bracken J, Abela K, Ramsey-Coleman J, Stutts A, Kritz E, Bavare A.

ABSTRACT
BACKGROUND: Rapid response (RR) systems' impact on clinical outcomes is influenced by institutional social factors. This study applied the realist evaluation (context-mechanism-outcomes) framework to review significant RRs defined as REACT (Rapid Escalation After Critical Transfer) events for appraising a pediatric RR system. METHODS: REACT events included all RRs with cardiopulmonary arrest (CPA) and/or ventilation and/or hemodynamic support instituted within 24 hours after RR. A continuous quality improvement process was employed to identify, debrief, and review REACT events to recognize and act on RR mechanistic and contextual deficiencies. The aim was to decrease REACT events with mechanistic/contextual gaps categorized into crisis resource management (CRM) themes by 25% over three years while ensuring process sustainability. RESULTS: From 2015 to 2019, 5,581 RR events occurred, of which 67.2% transferred to ICU, and 1,392 (24.9%) were identified as REACTs. In the first two years, 100% identification and review within three months of 90% REACTs was accomplished. One hundred percent of the 17 providers ascertained that the process was safe and transparent, and 80.0% of respondents expressed their commitment from perceived benefit to patient care. Over five years, the proportion of REACTs with CRM gaps decreased from 62.3% to 26.5%, those with multiple deficiencies reduced from 72.5% to 23.2%, and CPAs outside ICUs decreased from 15 to 3 per year. Improvement actions included modifications to RR system (activation, process, and management), hospital (resources and policies), dedicated RR

training, and sharing of positive feedback. CONCLUSION: The realist evaluation framework facilitated holistic assessment of an RR system. Review of REACTs was feasible, sustainable, and yielded useful information to guide systemwide improvement.

5. East Mediterr Health J. 2022 Mar 29;28(3):213-220. doi: 10.26719/emhj.22.010.
Time for a do-not-resuscitate policy? Outcomes of inpatient cardiopulmonary resuscitation in very old patients in Bahrain.
Al Saeed M(1), Al Awainati M(2), Al Mousawi B(1), Al Barni M(1), Abbas F(1), Sarwani A(1).
ABSTRACT
BACKGROUND: Globally, do-not-resuscitate orders have been used for many years. Due to the lack of a do-not-resuscitate policy, full resuscitative measures including cardiopulmonary resuscitation (CPR) are applied for all patients admitted to our institution regardless of prognosis. AIMS: To observe the outcomes of very old patients who underwent CPR, including mortality rate and length of stay. This will allow discussion of the need to implement a do-not-resuscitate policy in Bahrain, and its associated challenges. METHODS: This was a retrospective observational study conducted in a 1200-bed tertiary hospital in Bahrain. We included patients aged ≥ 80 years admitted under general medicine who underwent CPR between January and July 2018. Medical records were reviewed for patients' characteristics and outcomes. RESULTS: Ninety patients were included in the study with an average age of 87.91 (6.27) years. The inhospital mortality rate was 96.67%, and 57.78% of patients died immediately after the first CPR attempt and 38.89% died during subsequent attempts. The survival rate at 1-year follow-up was only 1.11%. CONCLUSION: Survival of very old patients after cardiopulmonary arrest is low, and survival at discharge is even lower. The increase in the very old population will lead to a higher demand for critical care resources given the absence of a do-not-resuscitate policy. Our results demonstrate that implementing such a policy at our institution is crucial to reduce the number of futile CPR attempts, minimizing patients' suffering, and optimizing resource allocation.

6. Resuscitation. 2022 Apr;173:61-68. doi: 10.1016/j.resuscitation.2022.01.028. Epub 2022 Feb 7.
Emotional work stress reactions of emergency medical technicians involved in transporting out-of-hospital cardiac arrest patients with "do not attempt resuscitation" orders.
Tanabe R(1), Hongo T(1), Mandai Y(2), Inaba M(1), Yorifuji T(3), Nakao A(1), Elmer J(4), Naito H(5).
ABSTRACT
BACKGROUND: Emergency medical technicians (EMTs) may be subjected to emotional stress during patient treatment/transport. In Japan, dispatched EMTs must attempt resuscitation in all cases of out-of-hospital cardiac arrest (OHCA), including patients with "do not attempt resuscitation" (DNAR) orders and patients whose families do not support resuscitation. We described the characteristics, prevalence, and outcomes of OHCA/DNAR patients, and aimed to identify factors associated with EMT stress when treating them. METHODS: We included OHCA patients transported by EMTs in the city of Okayama from 2015 to 2019. We identified patients with DNAR orders based on emergency medical service (EMS) records, then EMTs completed questionnaires regarding the management of those patients and EMTs' emotions. RESULTS: Among 3079 eligible OHCA patients, 122 patients (4%) had DNAR orders (DNAR group), and 2957 (96%) patients had no DNAR orders (no DNAR group). Based on responses from 243 EMT participants involved in OHCA/DNAR transports, we divided EMTs into high stress (73/243, 30%) and low stress (170/243, 70%) groups. EMTs experienced emotional stress from treating patients with family physician orders to transport (AOR: 4.74, 95% CI: 2.35-9.56) and those for whom prehospital defibrillation was performed (AOR: 20.7, 95% CI: 3.10-137.9). CONCLUSIONS: Approximately 30% of EMTs providing resuscitation to OHCA/DNAR patients experienced high levels of stress. Establishment of a prehospital emergency system incorporating

physician medical direction and updated guidelines for treating patients with DNAR orders may reduce the psychosocial stress of EMTs.

POST-CARDIAC ARREST TREATMENTS

1. Wien Klin Wochenschr. 2022 Apr 5. doi: 10.1007/s00508-022-02026-x. Online ahead of print.
Postresuscitation care and prognostication after cardiac arrest-Does sex matter?
Hasslacher J(1), Ulmer H(2), Lehner G(1), Klein S(1), Mayerhoefer T(1), Bellmann R(1), Joannidis M(3).

ABSTRACT
BACKGROUND: There are conflicting results concerning sex-specific differences in the post-cardiac arrest period. We investigated the sex distribution of patients after successful cardiopulmonary resuscitation (CPR), differences in treatment, complications, outcome and sex-specific performance of biomarkers for prognostication of neurological outcome. METHODS: Prospective observational study including cardiac-arrest (CA) patients treated with mild therapeutic hypothermia (MTH) at 33 °C for 24 h or normothermia. We investigated common complications including pneumonia and acute kidney injury (AKI) and neuron-specific enolase, secretoneurin and tau protein as biomarkers of neurological outcome, which was assessed with the cerebral performance categories score at hospital discharge. RESULTS: Out of 134 patients 26% were female. Women were significantly older (73 years, interquartile range (IQR) 56-79 years vs. 62 years, IQR 53-70 years; p = 0.038), whereas men showed a significantly higher rate of pneumonia (29% vs. 6%; p = 0.004) and a trend towards higher rates of AKI (62% vs. 45%; p = 0.091). Frequency of MTH treatment was not significantly different (48% vs. 31%; p = 0.081). Female sex was not associated with neurological outcome in multivariable analysis (p = 0.524). There was no significant interaction of sex with prognostication of neurological outcome at 24, 48 and 72 h after CPR. At the respective time intervals pinteraction for neuron-specific enolase was 0.524, 0.221 and 0.519, for secretoneurin 0.893, 0.573 and 0.545 and for tau protein 0.270, 0.635, and 0.110. CONCLUSION: The proportion of female patients was low. Women presented with higher age but had fewer complications during the post-CA period. Female sex was not associated with better neurological outcome. The performance of biomarkers is not affected by sex.

2. Resuscitation. 2022 Mar 30:S0300-9572(22)00095-8. doi: 10.1016/j.resuscitation.2022.03.027. Online ahead of print.
Coronary angiography and percutaneous coronary intervention in cardiac arrest patients without return of spontaneous circulation.
Rob D(1), Kavalkova P(2), Smalcova J(2), Kral A(2), Kovarnik T(2), Zemanek D(2), Franěk O(3), Smid O(2), Havranek S(2), Linhart A(2), Belohlavek J(2).

ABSTRACT
OBJECTIVES: This study aimed to examine coronary angiography (CAG) findings, percutaneous coronary intervention (PCI) results and outcomes in out-of-hospital cardiac arrest patients (OHCA) without return of spontaneous circulation (ROSC) on admission to hospital. METHODS: We analyzed the OHCA register and compared CAG, PCI, and outcome data in patients with and without ROSC on admission to hospital. RESULTS: Between January 2012 and December 2020, 697 OHCA patients were analyzed. Of these, 163 (23%) did not have ROSC at admission. Patients without ROSC were younger (59 vs. 61 years, p=0.001) and had a longer resuscitation time (62 vs. 18 minutes, p<0.001) than patients with ROSC. Significant coronary artery disease was highly prevalent in both groups (65% vs. 68%, p=0.48). Patients without ROSC had higher rates of acute coronary occlusions (42% vs. 33%, p=0.046), specifically affecting the left main stem (16% vs. 1%, p<0.001). PCI was performed in 81 patients (50%) without ROSC and in 295 (55%) with ROSC (p=0.21). The success rate was 86% in patients without ROSC and 90% in patients with ROSC (p=0.33). Thirty-day survival was 24% in patients without ROSC and 70% in patients with ROSC. CONCLUSIONS: OHCA patients without ROSC

on admission to hospital had higher acute coronary occlusion rates than patients with prehospital ROSC. PCI is feasible with a high success rate in patients without ROSC. Despite prolonged resuscitation times, meaningful survival in patients admitted without ROSC is achievable.

TARGETED TEMPERATURE MANAGEMENT

1. Resuscitation. 2022 Apr;173:147-153. doi: 10.1016/j.resuscitation.2022.01.026. Epub 2022 Feb 2.
Effects of targeted temperature management at 33 °C vs. 36 °C on comatose patients after cardiac arrest stratified by the severity of encephalopathy.
Nutma S(1), Tjepkema-Cloostermans MC(2), Ruijter BJ(3), Tromp SC(4), van den Bergh WM(5), Foudraine NA(6), Kornips FHM(7), Drost G(8), Scholten E(9), Strang A(10), Beishuizen A(11), van Putten MJAM(12), Hofmeijer J(13).

ABSTRACT
OBJECTIVES: To assess neurological outcome after targeted temperature management (TTM) at 33 °C vs. 36 °C, stratified by the severity of encephalopathy based on EEG-patterns at 12 and 24 h. DESIGN: Post hoc analysis of prospective cohort study. SETTING: Five Dutch Intensive Care units. PATIENTS: 479 adult comatose post-cardiac arrest patients. INTERVENTIONS: TTM at 33 °C (n = 270) or 36 °C (n = 209) and continuous EEG monitoring. MEASUREMENTS AND MAIN RESULTS: Outcome according to the cerebral performance category (CPC) score at 6 months post-cardiac arrest was similar after 33 °C and 36 °C. However, when stratified by the severity of encephalopathy based on EEG-patterns at 12 and 24 h after cardiac arrest, the proportion of good outcome (CPC 1-2) in patients with moderate encephalopathy was significantly larger after TTM at 33 °C (66% vs. 45%; Odds Ratios 2.38, 95% CI = 1.32-4.30; p = 0.004). In contrast, with mild encephalopathy, there was no statistically significant difference in the proportion of patients with good outcome between 33 °C and 36 °C (88% vs. 81%; OR 1.68, 95% CI = 0.65-4.38; p = 0.282). Ordinal regression analysis showed a shift towards higher CPC scores when treated with TTM 33 °C as compared with 36 °C in moderate encephalopathy (cOR 2.39; 95% CI = 1.40-4.08; p = 0.001), but not in mild encephalopathy (cOR 0.81 95% CI = 0.41-1.59; p = 0.537). Adjustment for initial cardiac rhythm and cause of arrest did not change this relationship. CONCLUSIONS: Effects of TTM probably depend on the severity of encephalopathy in comatose patients after cardiac arrest. These results support inclusion of predefined subgroup analyses based on EEG measures of the severity of encephalopathy in future clinical trials.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

1. J Am Heart Assoc. 2022 Mar 15;11(6):e022848. doi: 10.1161/JAHA.121.022848. Epub 2022 Mar 9.
Association Between Temporal Changes in Early Repolarization Pattern With Long-Term Cardiovascular Outcome: A Population-Based Cohort Study.
Liu LJ(1)(2), Tang N(3), Bi WT(1)(2), Zhang M(4), Deng XQ(1)(2), Cheng YJ(1)(2).

ABSTRACT
Background The prognostic value of early repolarization pattern (ERP) remains controversial. We aim to test the hypothesis that temporal changes in ERP are associated with increased risks for sudden cardiac death (SCD) and cardiovascular death. Methods and Results A total of 14 679 middle-aged participants from the prospective, population-based cohort were included in this analysis, with ERP status recorded at baseline and during 3 follow-up visits in the ARIC (Atherosclerosis Risk in Communities) study. We related baseline ERP, time-varying ERP, and temporal changes in ERP to cardiovascular outcomes. Cox models were used to estimate the hazard ratios (HRs) adjusted for

possible confounding factors. With a median follow-up of 22.5 years, there were 5033 deaths, 1239 cardiovascular deaths, and 571 SCDs. Time-varying ERP was associated with increased risks of SCD (HR, 1.59 [95% CI, 1.25-2.02]), cardiovascular death (HR, 1.70 [95% CI, 1.44-2.00]), and death from any cause (HR, 1.16 [95% CI, 1.05-1.27]). Baseline ERP was also associated with 3 outcomes. Compared with those with consistently normal ECG findings, subjects with new-onset ERP or consistent ERP experienced increased risks of developing SCD and cardiovascular death. The time-varying ERP in women, White subjects, and anterior leads and J-wave amplitudes ≥0.2 mV appeared to indicate poorer cardiovascular outcomes. Conclusions Our findings suggest that baseline ERP, time-varying ERP, new-onset ERP, and consistent ERP were independent predictors of SCD and cardiovascular death in the middle-aged biracial population. Repeated measurements of the ERP might improve its use as a risk indicator for SCD.

PEDIATRICS AND CHILDREN

1. Artif Organs. 2022 Apr 4. doi: 10.1111/aor.14246. Online ahead of print.
Risk Factors of paediatric Venoarterial Extracorporeal Membrane Oxygenation-Related gastrointestinal bleeding after Open Heart Surgeries.
Yang Y(1), Yu X(1), Guo Z(1), Zhang W(1), Shen J(1), Wang W(1).
ABSTRACT
OBJECTIVE: To analyze the risk factors for gastrointestinal (GI) bleeding in congenital heart disease (CHD) patients supported with venoarterial extracorporeal membrane oxygenation (V-A ECMO) after open heart surgery. METHODS: A retrospective analysis was performed on children with (GI group: 26 cases) and without (control group: 122 cases) GI bleeding during ECMO at Shanghai Children's Medical Center from 2017 to 2020. Clinical data were analyzed and compared between groups to search for risk factors for GI bleeding. RESULTS: A total of 148 cases were included in the study. The overall incidence of GI bleeding was 17.6% (26/148). The in-hospital mortality rate in the GI group was 61.5% (16/26) vs. 45.9% (56/122) in the control group. Twenty-six patients suffered cardiac arrest before ECMO support. The GI bleeding incidence among extracorporeal cardiopulmonary resuscitation (ECPR) patients was 50.0% (13/26) vs. 28.7 (35/122) among non-ECPR patients, P=0.035. The activated clotting time (ACT) was 201.40 s (180.47 to 247.27) in the GI group vs. 177.63 s (167.79 to 203.13) (P = 0.050) in the control group. The lowest antithrombin level (Min AT) was 27.00±13.07% vs. 37.62±15.18 (P=0.001). The pH and lactate levels before ECMO (Pre PH and Pre Lac) were lower in the GI group than in the control group. (7.31±0.23 vs. 7.35±0.17, P=0.035 and 12.2±6.11 vs. 7.78±6.67, P=0.003). Liver function during ECMO support was statistically worse in the GI group than in the control group. Multivariate analysis showed that Pre Lac (OR = 1.106 [1.018-1.202], P=0.0016) was an independent risk factor for GI bleeding. ROC analysis of Pre Lac and GI bleeding showed an area under the curve (AUC) of 0.700 (95% CI: 0.600-0.800, P=0.002) and a cutoff value of 9.30 mmol/L (sensitivity, 73.1%; specificity, 62.7%). CONCLUSIONS: As the first study in this field, the probability of GI bleeding and related mortality were found to be high in children supported with V-A ECMO after open heart surgery. A higher lactate level before ECMO was an independent risk factor for GI bleeding.

2. Pediatrics. 2022 Apr 1;149(4):e2021054432. doi: 10.1542/peds.2021-054432.
Family Screening After Sudden Death in a Population-Based Study of Children.
Kannankeril PJ(1), Shoemaker MB(2), Fountain D(1), Roden DM(2), Yandell M(3), Tristani-Firouzi M(4), Etheridge SP(4), Webster G(5), George AL(6), McNally EM(7), MacLeod H(8), Burns KM(9).
ABSTRACT

In a US population-based registry of sudden death in the young, this study performed familial evaluation of surviving relatives.

EXTRACORPOREAL LIFE SUPPORT

1. Crit Care. 2022 Apr 7;26(1):96. doi: 10.1186/s13054-022-03969-3.
Amniotic fluid embolism rescued by venoarterial extracorporeal membrane oxygenation.
Aissi James S(1), Klein T(2), Lebreton G(3)(4), Nizard J(5), Chommeloux J(1)(3), Bréchot N(1)(3), Pineton de Chambrun M(1)(3), Hékimian G(1)(3), Luyt CE(1)(3), Levy B(2), Kimmoun A(2), Combes A(1)(3)(6), Schmidt M(7)(8)(9)(10).
ABSTRACT
BACKGROUND: Amniotic fluid embolism (AFE) is a rare but often catastrophic complication of pregnancy that leads to cardiopulmonary dysfunction and severe disseminated intravascular coagulopathy (DIC). Although few case reports have reported successful use of venoarterial extracorporeal membrane oxygenation (VA-ECMO) with AFE, concerns can be raised about the increased bleeding risks with that device. METHODS: This study included patients with AFE rescued by VA-ECMO hospitalized in two high ECMO volume centers between August 2008 and February 2021. Clinical characteristics, critical care management, in-intensive care unit (ICU) complications, and hospital outcomes were collected. ICU survivors were assessed for health-related quality of life (HRQL) in May 2021. RESULTS: During that 13-year study period, VA-ECMO was initiated in 54 parturient women in two high ECMO volume centers. Among that population, 10 patients with AFE [median (range) age 33 (24-40), SAPS II at 69 (56-81)] who fulfilled our diagnosis criteria were treated with VA-ECMO. Pregnancy evolved for 36 (30-41) weeks. Seven patients had a cardiac arrest before ECMO and two were cannulated under cardiopulmonary resuscitation. Pre-ECMO hemodynamic was severely impaired with an inotrope score at 370 (55-1530) µg/kg/min, a severe left ventricular ejection fraction measured at 14 (0-40)%, and lactate at 12 (2-30) mmol/L. 70% of these patients were alive at hospital discharge despite an extreme pre-ECMO severity and massive blood product transfusion. However, HRQL was lower than age-matched controls and still profoundly impaired in the role-physical, bodily pain, and general health components after a median of 44 months follow-up. CONCLUSION: In this rare per-delivery complication, our results support the use of VA-ECMO despite intense DIC and ongoing bleeding. Future studies should focus on customized, patient-centered, rehabilitation programs that could lead to improved HRQL in this population.

2. J Cardiovasc Transl Res. 2022 Apr;15(2):279-290. doi: 10.1007/s12265-021-10195-9. Epub 2022 Feb 22.
Predictors of Survival and Favorable Neurologic Outcome in Patients Treated with eCPR: a Systematic Review and Meta-analysis.
Bertic M(1)(2), Worme M(3)(4), Foroutan F(3), Rao V(3)(5), Ross H, Billia F(3)(4), Alba AC(3)(4).
ABSTRACT
Extracorporeal cardiopulmonary resuscitation (eCPR) can improve survival in selected patients with cardiac arrest (CA). In this meta-analysis, we evaluated factors associated with short-term survival and favorable neurologic outcome (FNO) post-eCPR. In June 2019, we systematically searched electronic databases for studies reporting on survival and predictors associated with short-term survival or FNO post-eCPR using multivariable analysis. We meta-analyzed outcomes and predictors using the inverse variance method with a random-effects model. We identified 92 studies with 13 factors amenable to meta-analysis. Pooled short-term survival and FNO were 25% and 16% respectively. Lower lactate, return of spontaneous circulation, shockable rhythm, shorter CPR duration, baseline pH, shorter low-flow time, and history of hypertension were significantly associated with short-term survival. In addition, shockable rhythm, lower lactate, and use of

targeted temperature management were associated with FNO. The identified factors associated with short-term survival and FNO post-eCPR could guide prognosis prediction at the time of CA.

EXPERIMENTAL RESEARCH

1. J Cardiovasc Transl Res. 2022 Apr;15(2):291-301. doi: 10.1007/s12265-022-10210-7. Epub 2022 Mar 14.

Extracorporeal Cardiopulmonary Resuscitation Guided by End-Tidal Carbon Dioxide-a Porcine Model.

Ölander CH(1), Vikholm P(1), Lindblom R(1), Schiller P(1), Hellgren L(2).

ABSTRACT

Extracorporeal membrane cardiopulmonary resuscitation (ECPR) during cardiopulmonary resuscitation (CPR) for selected cases and end-tidal carbon dioxide (ETCO2) could be used to guide initiation of ECPR. Ventricular fibrillation was induced in 12 pigs and CPR was performed until ETCO2 fell below 10 mmHg; then, ECPR was performed. Animals were divided into group short (GShort) and group long (GLong), according to time of CPR. Carotid blood flow was higher ($p = 0.02$) and mean arterial blood pressure lower in GLong during CPR ($p < 0.05$). B-Lactate was lower and pH higher in GShort ($p < 0.01$). In microdialysis lactate-pyruvate ratio, glycerol and glutamate increased in both groups during CPR, but considerably in GLong ($p < 0.01$). No difference could be seen in histopathology of the brain or kidney post-ECPR. No apparent histological differences of tissue damage in brains or levels of S100B in plasma were detected between groups. This might suggest that ETCO2 could be used as a marker for brain injury following ECPR.

2. Pediatr Emerg Care. 2022 Apr 1;38(4):e1166-e1172. doi: 10.1097/PEC.0000000000002127.

Tibial Intraosseous Administration of Epinephrine Is Effective in Restoring Return of Spontaneous Circulation in a Pediatric Normovolemic But Not Hypovolemic Cardiac Arrest Model.

Yauger YJ(1), Johnson MD(1), Mark J(1), Le T(1), Woodruff T(1), Silvey S(1), Revis J(1), Blouin D(1), O'Sullivan J(1), Brady K(2), Hensler JG(1), Johnson D(1).

ABSTRACT

OBJECTIVE: We compared the efficacy of tibial intraosseous (TIO) administration of epinephrine in a pediatric normovolemic versus hypovolemic cardiac arrest model to determine the incidence of return of spontaneous circulation (ROSC) and plasma epinephrine concentrations over time. METHODS: This experimental study evaluated the pharmacokinetics of epinephrine and/or incidence of ROSC after TIO administration in either a normovolemic or hypovolemic pediatric swine model. RESULTS: All subjects in the TIO normovolemia cardiac arrest group experienced ROSC after TIO administration of epinephrine. In contrast, subjects experiencing hypovolemia and cardiac arrest were significantly less likely to experience ROSC when epinephrine was administered TIO versus intravenous (TIO hypovolemia: 14% [1/7] vs IV hypovolemia: 71% [5/7]; $P = 0.031$). The TIO hypovolemia group exhibited significantly lower plasma epinephrine concentrations versus IV hypovolemia at 60, 90, 120, and 150 seconds ($P < 0.05$). Although the maximum concentration of plasma epinephrine was similar, the TIO hypovolemia group exhibited significantly slower time to maximum concentration times versus TIO normovolemia subjects ($P = 0.004$). CONCLUSIONS: Tibial intraosseous administration of epinephrine reliably facilitated ROSC among normovolemic cardiac arrest pediatric patients, which is consistent with published reports. However, TIO administration of epinephrine was ineffective in restoring ROSC among subjects experiencing hypovolemia and cardiac arrest. Tibial intraosseous-administered epinephrine during hypovolemia and cardiac arrest may have resulted in a potential sequestration of epinephrine in the tibia. Central or peripheral

intravascular access attempts should not be abandoned after successful TIO placement in the resuscitation of patients experiencing concurrent hypovolemia and cardiac arrest.

3. Mol Neurobiol. 2022 Mar;59(3):1872-1881. doi: 10.1007/s12035-021-02645-x. Epub 2022 Jan 14.
Rapid Treatment with Intramuscular Magnesium Sulfate During Cardiopulmonary Resuscitation Does Not Provide Neuroprotection Following Cardiac Arrest.
Zhang R(1)(2)(3), Bryson TD(1)(4), Fogo GM(1)(5), Liao J(1), Raghunayakula S(1), Mathieu J(1), Wider JM(1)(6), Ren X(1), Maheras KJ(1), Emaus KJ(1)(5), Gruley E(1), Chen Y(2), Neumar RW(7)(8), Sanderson TH(9)(10)(11)(12)(13).

ABSTRACT
Brain injury is the most common cause of death for patients resuscitated from cardiac arrest. Magnesium is an attractive neuroprotective compound which protects neurons from ischemic injury by reducing neuronal calcium overload via NMDA receptor modulation and preventing calcium-induced mitochondrial permeability transition. Intramuscular (IM) delivery of $MgSO_4$ during CPR has the potential to target these mechanisms within an early therapeutic window. We hypothesize that IM $MgSO_4$ administrated during CPR could achieve therapeutic serum magnesium levels within 15 min after ROSC and improve neurologic outcomes in a rat model of asphyxial cardiac arrest. Male Long Evans rats were subjected to 8-min asphyxial cardiac arrest and block randomized to receive placebo, 107 mg/kg, 215 mg/kg, or 430 mg/kg $MgSO_4$ IM at the onset of CPR. Serum magnesium concentrations increased rapidly with IM delivery during CPR, achieving twofold to fourfold increase by 15 min after ROSC in all magnesium dose groups. Rats subjected to cardiac arrest or sham surgery were block randomized to treatment groups for assessment of neurological outcomes. We found that IM $MgSO_4$ during CPR had no effect on ROSC rate ($p > 0.05$). IM $MgSO_4$ treatment had no statistically significant effect on 10-day survival with good neurologic function or hippocampal CA1 pyramidal neuron survival compared to placebo treatment. In conclusion, a single dose IM $MgSO_4$ during CPR achieves up to fourfold baseline serum magnesium levels within 15 min after ROSC; however, this treatment strategy did not improve survival, recovery of neurologic function, or neuron survival. Future studies with repeated dosing or in combination with hypothermic targeted temperature management may be indicated.

CASE REPORTS

1. Front Cardiovasc Med. 2022 Mar 21;9:788644. doi: 10.3389/fcvm.2022.788644. eCollection 2022.
Case Report: Early Resection of Pheochromocytoma in a Patient With Cardiogenic Shock Due to Pheochromocytoma-Induced Cardiomyopathy With Extracorporeal Life Support.
Lyu T(1), Niu J(1), Liu Z(1), Li T(1).

ABSTRACT
BACKGROUND: Pheochromocytoma-induced cardiomyopathy is a rare but potentially life-threatening complication of pheochromocytoma. It mimics the patterns of stress-induced cardiomyopathy. In severe cases, patients can develop refractory cardiogenic shock, which might require mechanical circulatory support. CASE PRESENTATION: We presented a case of 54-year-old female who developed refractory cardiogenic shock, following an elective orthopaedic surgery complicated by cardiac arrest, requiring veno-arterial extracorporeal membrane oxygenation (VA-ECMO) support. After urgent coronary catheterisation revealed normal coronary arteries, further evaluation of the aetiology of cardiogenic shock revealed pheochromocytoma. With a diagnosis of pheochromocytoma-induced cardiomyopathy, the patient had accelerated preoperative alpha adrenergic blockade preparation for a total of 6 days and subsequently had the tumour removed under VA-ECMO support. Postoperatively, the patient recovered well and was off ECMO support and

extubated a few days later.The optimal management of pheochromocytoma-induced cardiomyopathy, especially for severe cases, is still unclear. Indeed, some cases will require mechanical circulatory support to allow left ventricular function recovery. But our case also showed that it was possible to introduce alpha blockade safely whilst the patient is on VA-ECMO and has the pheochromocytoma removed with VA-ECMO support after accelerated preoperative preparation.

2. Ann Med Surg (Lond). 2022 Mar 7;75:103454. doi: 10.1016/j.amsu.2022.103454. eCollection 2022 Mar.

Cardiac arrest secondary to subclavian artery injury in blunt chest trauma: A lifesaving emergency surgery in COVID crises.

Chaudhry IUH(1), M Al Fraih O(1), A Al Abdulhai M(1), Al Maimon H(1), A Alqahtani Y(1), Tariq Khan M(1), M Al Ghamdi A(1).

ABSTRACT

A 25-year-old male vehicle driver had a road traffic accident and sustained a blunt chest injury. His chest x-ray in the emergency department showed left hemithorax opacification. A chest drain Fr32 was inserted, and 1300ml of Blood drained out. While having a computed tomographic scan of the thorax scan, he had a cardiac arrest and after Cardiopulmonary Resuscitation (CPR) he was transferred to our tertiary care hospital on a mechanical ventilator and massive ionotropic support (adrenaline and noradrenaline) with a blood pressure of 50/24 mmHg. We performed a lifesaving emergency thoracotomy in a supine position with all COVID precautions, as COVID status was not available before hospitalization. After the repair of the Subclavian artery patient recovered completely and was discharged for follow-up in outpatient.

3. J Card Surg. 2022 May;37(5):1439-1443. doi: 10.1111/jocs.16313. Epub 2022 Feb 13.

A case of fulminant myocarditis due to COVID-19 in an adolescent patient successfully treated with venous arterial ECMO as a bridge to recovery.

Buitrago DH(1), Munoz J(2), Finkelstein ER(1)(3), Mulinari L(1).

ABSTRACT

Emerging data suggest an association between severe acute respiratory syndrome coronavirus 2 and the development of acute myocarditis, with children and older adults being most at risk. We describe the clinical course of a previously healthy 12-year-old female who rapidly deteriorated into cardiogenic shock and arrest due to coronavirus disease 2019 induced fulminant myocarditis, necessitating venous-arterial extracorporeal membrane oxygenation as a bridge to full recovery. This case highlights the importance of early clinical recognition of myocardial involvement, and the benefits of taking a multidisciplinary approach in treating these patients.

4. Front Cardiovasc Med. 2022 Mar 17;9:842440. doi: 10.3389/fcvm.2022.842440. eCollection 2022.

Case Report: Takotsubo Syndrome Induced by Severe Anaphylactic Reaction During Anesthesia Induction and Subsequent High-Dose Epinephrine Resuscitation.

Wei J(1)(2), Zhang L(1), Ruan X(1), He K(1), Yu C(1), Shen L(1)(3).

ABSTRACT

Takotsubo syndrome (TTS) is a type of non-ischemic cardiomyopathy characterized by an acute reversible left ventricular dysfunction with typical apical ballooning, usually with subsequent complete recovery. Early diagnosis and prompt treatment are of great essence. Herein, we described a case of TTS of a patient who was scheduled initially for laparoscopic endometrial cancer staging. The 69-year-old woman presented with cardiogenic shock induced by the severe anaphylactic reaction to the antibiotics during anesthesia induction. Cardiopulmonary resuscitation (CPR) was implemented while several boluses of 1 mg epinephrine were injected. After the return of

spontaneous circulation, a large number of orange peel-like rash appeared on the head, face, neck, and trunk of the patient. Transesophageal echocardiography (TEE) revealed diffused decreased left ventricular systolic function. Therefore, veno-arterial extracorporeal membrane oxygenation (VA-ECMO) and intra-aortic balloon pump (IABP) were applied in the intensive care unit. Biomarkers like cardiac troponin I (cTnI) subsequently decreased with improved cardiac insufficiency. Finally, the patient was discharged in good condition. This case demonstrated that TTS could be secondary to severe anaphylactic shock and exogenous catecholamines. With the consideration of the reversible condition and predictable recovery of TTS, early vigilance and advanced life support devices should be necessary.

5. BMC Pregnancy Childbirth. 2022 Mar 26;22(1):252. doi: 10.1186/s12884-022-04572-8.
Can cell salvage be used for resuscitation in a patient with amniotic fluid embolism and hepatic laceration? A case report.
Li P(1)(2), Luo L(1)(2), Luo D(1)(2), Wang R(3).
ABSTRACT
BACKGROUND: Amniotic fluid embolism (AFE) is a rare disease that can lead to profound coagulopathy and hemorrhage, especially when combined with the laceration and bleeding of other organs. Intraoperative cell salvage (ICS) has been widely used for treating obstetric hemorrhage, but it remains unclear whether ICS can be used in the treatment of AFE. CASE PRESENTATION: We report the case of a 27-year-old woman at 39 weeks' gestation who suddenly developed severe abdominal pain, convulsions, loss of consciousness, and decreased vital signs during labor. Despite an emergency cesarean section being performed, the parturient experienced sudden cardiac arrest. Fortunately, the heart rate spontaneously recovered after effective cardiopulmonary resuscitation (CPR). Further abdominal exploration revealed right hepatic laceration with active bleeding. ICS was performed and the salvaged blood was promptly transfused back to the patient. Subsequently, the patient was diagnosed with AFE based on hypotension, hypoxia, coagulopathy, and cardiac arrest. The patient was transfused with 2899 mL salvaged blood during surgery with no adverse effects. At 60- and 90-day follow-ups, no complaints of discomfort or abnormal laboratory test results were observed in the mother or the baby. CONCLUSION: ICS was used to rescue patient with AFE, and ICS did not worsen the condition of patients with AFE. For pregnant women who received CPR, clinicians should explore the presence of hepatic laceration which can be fatal to patients.