This week's PubMed 13th – 19th November 2022: articles of interest n = 35

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

No articles identified.

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

1. Resuscitation. 2022 Nov 14:S0300-9572(22)00710-9. doi: 10.1016/j.resuscitation.2022.11.004. Online ahead of print.
Specific theorical and practical education on mechanical chest compression during Advanced Life Support training courses - results from a local experience.
D'Agostino F(1), Eugenio Agrò F(1), Fusco P(2), Ferri C(3), Ristagno G(4); training group collaborators.
ABSTRACT
Specific training modules focusing on mechanical chest compression and device use might be considered in a structured manner during the standard advanced life support (ALS) courses. The aim of this study was to evaluate the impact of a specific brief 15 min training on the use of a specific mechanical CPR device during Advanced Cardiac Life Support courses on its correct use and on attendees' satisfaction.

2. Thorac Cardiovasc Surg Rep. 2022 Nov 9;11(1):e64-e66. doi: 10.1055/s-0042-1757873. eCollection 2022 Jan.
Subacute Aortic Rupture Due to Mechanical Chest Compression with Indwelling Impella.
Penov K(1), Radakovic D(1), Madrahimov N(1), Aleksic I(1).
ABSTRACT
Mechanical cardiopulmonary resuscitation (CPR) devices like Lund University Cardiopulmonary Assist System (LUCAS) cause more skeletal and visceral injuries than standard CPR. A 62-year-old woman with ST-elevation myocardial infarction was resuscitated with LUCAS and Impella CP for refractory cardiogenic shock during percutaneous coronary intervention. She suffered delayed ascending aortic rupture necessitating supracommissural ascending aortic replacement plus triple bypass grafting. Prolonged mechanical CPR with concomitant Impella may lead to aortic rupture. The combined use of LUCAS and Impella may have disastrous consequences.

3. Arch Acad Emerg Med. 2022 Sep 1;10(1):e72. doi: 10.22037/aaem.v10i1.1589. eCollection 2022.
Factors Associated with Return of Spontaneous Circulation following Pre-Hospital Cardiac Arrest in Daegu Metropolitan City, South Korea; a Cross-Sectional Study.
Jung HO(1), Han SW(2).
ABSTRACT
INTRODUCTION: The probability of Return of Spontaneous Circulation (ROSC) in cardiac arrest cases in pre-hospital setting is still low. This study aimed to identify the factors that may improve the rate of ROSC in patients with pre-hospital cardiac arrest. METHODS: This retrospective cross-sectional study is a secondary data analysis of cardiac arrest patients, who were managed by paramedics in the pre-hospital setting, from January 1, 2019, to December 31, 2019, in Daegu, South Korea. The association of ROSC with place of arrest occurrence, cardiac arrest being witnessed, performing cardiopulmonary resuscitation (CPR), using compression device and defibrillator, administration of epinephrine, and intubation was analyzed and independent predictive factors of ROSC were reported. RESULTS: 2750 out-of-hospital cardiac arrest cases, which were managed by paramedics in

the pre-hospital setting were studied. 2034 (86.9%) cases of arrest had occurred at home, 2028 (73.7%) were not witnessed, and CPR was not performed for 1721 (64.1%) cases. ROSC before arriving to emergency department (ED) was more probable if the cardiac arrest was witnessed ($p < 0.001$), if CPR was performed ($p = 0.044$), if a mechanical compression device was used ($p < 0.001$), if a first-aid defibrillator was used ($p < 0.001$), and if intravenous access was secured ($p < 0.001$). Multivariate regression analysis revealed that using mechanical compression device (OR: 0.18; 95% CI = 0.08 - 0.40; $p = 0.001$), using first-aid defibrillator (OR: 3.13; 95% CI = 1.40 - 6.99; $p = 0.005$), administration of epinephrine (OR: 6.57; 95% CI = 2.16 - 19.53; $p = 0.001$), and intubation (OR: 1.82; 95% CI = 1.04-3.19; $p = 0.001$) were independent predictive factors of ROSC before arrival to ED. CONCLUSION: It seems that chest compression by hand instead of using chest compression device, using defibrillator, epinephrine administration, and intubation my increase the probability of ROSC in pre-hospital arrest cases.

REGISTRIES, REVIEWS AND EDITORIALS

1. Cardiol Clin. 2023 Feb;41(1):35-49. doi: 10.1016/j.ccl.2022.08.003. Epub 2022 Oct 21.
The International Criteria for Electrocardiogram Interpretation in Athletes: Common Pitfalls and Future Directions.
Petek BJ(1), Drezner JA(2), Churchill TW(3).
ABSTRACT

Preparticipation cardiovascular screening (PPCS) in young athletes is performed to detect conditions associated with sudden cardiac death. Many medical societies and sports governing bodies support the addition of a 12-lead electrocardiogram (ECG) to the history and physical to improve PPCS sensitivity. The current standard for ECG interpretation in athletes, the International Criteria, was developed to distinguish physiologic from pathologic ECG findings in athletes. Although application of the International Criteria has reduced the PPCS false-positive rate, interpretative challenges and potential areas of improvement remain. This review provides an overview of common pitfalls and future directions for ECG interpretation in athletes.

IN-HOSPITAL CARDIAC ARREST

No articles identified.

INJURIES AND CPR

No articles identified.

CAUSE OF THE ARREST

1. Am Heart J. 2022 Nov 13:S0002-8703(22)00290-3. doi: 10.1016/j.ahj.2022.11.009. Online ahead of print.
Incidence of sudden cardiac arrest and sudden cardiac death after unstable angina pectoris and myocardial infarction.
Koivunen M(1), Tynkkynen J(2), Oksala N(3), Eskola M(4), Hernesniemi J(5).
ABSTRACT

BACKGROUND: Sudden cardiac arrests (SCA) and sudden cardiac deaths (SCD) are believed to account for a large proportion of deaths due to cardiovascular causes. The purpose of this study is to provide comprehensive information on the epidemiology of SCAs and SCDs after acute coronary syndrome. METHODS: The incidence of SCA (including SCDs) was studied retrospectively among 10,316 consecutive patients undergoing invasive evaluation for acute coronary syndrome (ACS) between 2007 and 2018 at Tays Heart Hospital (sole provider of specialized cardiac care for a catchment area of over 0.5 million residents). Baseline and follow-up information was collected by combining information from the hospital's electronic health records, death certificate data, and a full-disclosure review of written patient records and accounts of the circumstances leading to death. RESULTS: During twelve years of follow-up, the cumulative incidence of SCAs (including SCDs) was 9.8% (0.8% annually) and that of SCDs 5.4% (0.5% annually). Cumulative incidence of SCAs in patients with ST-elevation myocardial infarction, non-ST-elevation myocardial infarction and unstable angina pectoris were: 11.9%,10.2% and 5.7% at twelve years. SCAs accounted for 30.5% (n = 528/1,732) of all deaths due to cardiovascular causes. The vast majority of SCAs (95.6%) occurred in patients without implantable cardioverter defibrillator (ICD) devices or among patients with no recurrent hospitalizations for coronary artery disease (89.1%). CONCLUSIONS: SCAs accounted for less than a third of all deaths due to cardiovascular causes among patients with previous ACS. Incidence of SCA is highest among STEMI and NSTEMI patients. After the hospital discharge, most of SCAs happen to NSTEMI patients.

Near Hanging: evaluation and management.
Dorfman J(1).

ABSTRACT
Prior to the COVID-19 pandemic, the incidence of self-harm was already on the rise. Hanging/suffocation accounted for 50% of the increase in suicide attempts and remains the second leading cause of death from self-harm in the United States. Studies on the management of near hanging patients are lacking and most published literature is retrospective. Following airway and circulation assessment, clinical examination and imaging, namely CT angiography, remain the standard to identify the injuries associated with near hanging - cervical spine fracture, blunt cerebrovascular injury, laryngeal injury, injury to the trachea and oropharynx. These injuries, however, are uncommon, and each occur in less than 5% of patients in most series. In a large series of critically ill near hanging patients, over 50% survived to hospital discharge, however cardiac arrest predicted a poor outcome. The management of asphyxia related arrest remains controversial. Targeted Temperature Management (TTM) has only been studied in a single large multicenter trial which was retrospective. Given the significant selection bias of TTM treatment for the most ill patients, no firm recommendations can be made. Finally, for survivors, the underlaying mental health issues must be addressed to avoid recurrent suicide attempts. Thirty percent of patients in a large near hanging series were admitted for their second suicide attempt.

END-TIDAL CO$_2$

No articles identified.

ORGAN DONATION

No articles identified.

FEEDBACK

No articles identified.

DRUGS

1. BMJ. 2022 Nov 18;379:o2705. doi: 10.1136/bmj.o2705.
Epinephrine before defibrillation in patients with shockable in-hospital cardiac arrest: propensity matched analysis.
[No authors listed]
Erratum for BMJ. 2021 Nov 10;375:e066534.

TRAUMA

No articles identified.

VENTILATION

No articles identified.

CERERBRAL MONITORING
No articles identified.

ULTRASOUND AND CPR
No articles identified.

ORGANISATION AND TRAINING

1. Heart Lung. 2022 Nov 16;58:54-61. doi: 10.1016/j.hrtlng.2022.11.004. Online ahead of print.
Return to work and everyday life following out-of-hospital cardiac arrest. Results from the national survey, DenHeart.
Nielsen MH(1), Rasmussen TB(2), Wagner MK(3), Bekker D(1), Bruvik SM(4), Ekholm O(5), Berg SK(6), Christensen AV(3), Mols RE(7), Thorup CB(8), Thrysoee L(1), Borregaard B(9).
ABSTRACT
BACKGROUND: With increasing survival rates following out-of-hospital cardiac arrest (OHCA), knowledge on return to everyday life, including return to work, should be getting increasing attention. OBJECTIVES: To i) describe patterns of labor market affiliation up to 12 months after discharge among a workforce population and to, ii) investigate the association between clinical and sociodemographic characteristics, self-reported health at discharge and a composite endpoint of prolonged sick leave and leaving the workforce after 3 and 12 months. METHODS: Data from the

national survey, DenHeart, were used, including measures of self-reported health: HeartQoL and the Hospital Anxiety and Depression Scale (HADS), combined with register-based follow-up. RESULTS: During the study period, n = 572 OHCA patients were discharged from five Heart centres, n = 184 were part of the workforce. At discharge, 60% were on paid sick leave, and 20% at 12 months. Age (per one year older) increased the odds of experiencing the composite endpoint at 3 and 12 months (3 months: OR 1.06 95%CI 1.03-1.10, 12 months: OR 1.06 95%CI 1.03-1.09) among the total population (n = 184). Self-reported health at discharge was not associated with the endpoint. CONCLUSION: One-fifth of the OHCA survivors at a working-age prior to the OHCA was still on paid sick leave after 12 months. Increasing age was the only characteristic associated with a composite endpoint of prolonged sick leave or leaving the workforce at 3 and 12 months after discharge. With increasing survival rates, healthcare professionals need to support the population in resuming daily life, including returning to the workforce, when relevant.

Mass Casualty CPR: flawed, futile or a first responder mandate?
Granholm F(1), Tin D(2), Ciottone GR(3).
NO ABSTRACT AVAILABLE

Video-assisted bystander cardiopulmonary resuscitation improves the quality of chest compressions during simulated cardiac arrests: A systemic review and meta-analysis.
Pan DF(1)(2), Li ZJ(2), Ji XZ(2), Yang LT(3), Liang PF(4).
ABSTRACT
BACKGROUND: It remains unclear whether video aids can improve the quality of bystander cardiopulmonary resuscitation (CPR). AIM: To summarize simulation-based studies aiming at improving bystander CPR associated with the quality of chest compression and time-related quality parameters. METHODS: The systematic review was conducted according to the PRISMA guidelines. All relevant studies were searched through PubMed, EMBASE, Medline and Cochrane Library databases. The risk of bias was evaluated using the Cochrane collaboration tool. RESULTS: A total of 259 studies were eligible for inclusion, and 6 randomised controlled trial studies were ultimately included. The results of meta-analysis indicated that video-assisted CPR (V-CPR) was significantly associated with the improved mean chest compression rate [OR = 0.66 (0.49-0.82), P < 0.001], and the proportion of chest compression with correct hand positioning [OR = 1.63 (0.71-2.55), P < 0.001]. However, the difference in mean chest compression depth was not statistically significant [OR = 0.18 (-0.07-0.42), P = 0.15], and V-CPR was not associated with the time to first chest compression compared to telecommunicator CPR [OR = -0.12 (-0.88-0.63), P = 0.75]. CONCLUSION: Video real-time guidance by the dispatcher can improve the quality of bystander CPR to a certain extent. However, the quality is still not ideal, and there is a lack of guidance caused by poor video signal or inadequate interaction.

Incidence, characteristics, and outcome of out-of-hospital cardiac arrest in Italy: A systematic review and meta-analysis.
Scquizzato T(1), Gamberini L(2), D'Arrigo S(3), Galazzi A(4), Babini G(5), Losiggio R(1), Imbriaco G(6)(7), Fumagalli F(8), Cucino A(9), Landoni G(1), Scapigliati A(3), Ristagno G(5)(10), Semeraro F(2); Collaborators.
ABSTRACT

INTRODUCTION: Data on out-of-hospital cardiac arrest (OHCA) is limited in Italy, and there has never been a comprehensive systematic appraisal of the available evidence. Therefore, this review aims to explore the incidence, characteristics, and outcome of OHCA in Italy. METHODS: We systematically searched PubMed, Embase, Google Scholar, ResearchGate, and conference proceedings up to September 23, 2022. Studies investigating OHCA in Italy and reporting at least one outcome related to cardiac arrest were considered eligible. The primary outcome was survival at the longest follow-up available. Risk of bias was assessed using the Joanna Briggs Institute critical appraisal tool. A random-effects model proportion meta-analysis was performed to calculate the pooled outcomes with 95% confidence interval (CI). RESULTS: We included 42 studies (43,042 patients) from 13 of the 20 Italian regions published between 1995 and 2022. Only five studies were deemed to be at low risk of bias. The overall average incidences of OHCA attended by emergency medical services and with resuscitation attempted were 86 (range: 10-190) and 55 (range: 6-108) per 100,000 populations per year, respectively. Survival at the longest follow-up available was 9.0% (95% CI, 6.7-12%; 30 studies and 15,195 patients) in the overall population, 25% (95% CI, 21-30%; 16 studies and 2,863 patients) among patients with shockable rhythms, 28% (95% CI, 20-37%; 8 studies and 1,292 patients) among the Utstein comparator group. Favourable neurological outcome was 5.0% (95% CI, 3.6-6.6%; 16 studies and 9,675 patients). Return of spontaneous circulation was achieved in 19% (95% CI, 16-23%; 40 studies and 30,875 patients) of cases. Bystanders initiated cardiopulmonary resuscitation in 26% (95% CI, 21-32%; 33 studies and 23,491 patients) of cases but only in 3.2% (95% CI, 1.9-4.9%; 9 studies and 8,508 patients) with an automated external defibrillator. The mean response time was 10.2 (95% CI, 8.9-11.4; 25 studies and 23,997 patients) minutes. CONCLUSIONS: Survival after OHCA in Italy occurred in one of every ten patients. Bystanders initiated cardiopulmonary resuscitation in only one-third of cases, rarely with a defibrillator. Different areas of the country collected data, but an essential part of the population was not included. There was high heterogeneity and large variation in outcomes results and reporting, limiting the confidence in the estimates of incidence and outcome. Creating and maintaining a nationwide registry is a priority.

Smartwatch based automatic detection of out-of-hospital cardiac arrest: Study rationale and protocol of the HEART-SAFE project.
Schober P(1)(2), van den Beuken WMF(1), Nideröst B(3), Kooy TA(4), Thijssen S(5), Bulte CSE(1)(2), Huisman BAA(1)(6), Tuinman PR(7), Nap A(8), Tan HL(9), Loer SA(1), Franschman G(10), Lettinga RG(11)(12), Demirtas D(13), Eberl S(14), van Schuppen H(2)(14), Schwarte LA(1)(2).
ABSTRACT
Out-of-hospital cardiac arrest (OHCA) is a leading cause of mortality. Immediate detection and treatment are of paramount importance for survival and good quality of life. The first link in the 'chain of survival' after OHCA - the early recognition and alerting of emergency medical services - is at the same time the weakest link as it entirely depends on witnesses. About one half of OHCA cases are unwitnessed, and victims of unwitnessed OHCA have virtually no chance of survival with good neurologic outcome. Also in case of a witnessed cardiac arrest, alerting of emergency medical services is often delayed for several minutes. Therefore, a technological solution to automatically detect cardiac arrests and to instantly trigger an emergency response has the potential to save thousands of lives per year and to greatly improve neurologic recovery and quality of life in survivors. The HEART-SAFE consortium, consisting of two academic centres and three companies in the Netherlands, collaborates to develop and implement a technical solution to reliably detect OHCA based on sensor signals derived from commercially available smartwatches using artificial intelligence. In this manuscript, we describe the rationale, the envisioned solution, as well as a protocol outline of the work packages involved in the development of the technology.

Performance of the Medical Priority Dispatch System in Correctly Classifying Out-of-Hospital Cardiac Arrests as Appropriate for Resuscitation.

Yap J(1), Helmer J(2), Gessaroli M(3), Hutton J(4), Khan L(1), Scheuermeyer F(5), Wall N(6), Bolster J(6), van Deipen S(7), Puyat J(8), Asamoah-Boaheng M(9), Straight R(6), Christenson J(5), Grunau B(10).

ABSTRACT

BACKGROUND: Emergency dispatch centres receive emergency calls and assign resources. Out-of-hospital cardiac arrests (OHCA) can be classified as appropriate (requiring emergent response) or inappropriate (requiring non-emergent response) for resuscitation. We sought to determine system accuracy in emergency medical services (EMS) OHCA response allocation. METHODS: We analyzed EMS-assessed non-traumatic OHCA records from the British Columbia (BC) Cardiac Arrest registry (January 1, 2019-June 1, 2021), excluding EMS-witnessed cases. In BC the "Medical Priority Dispatch System" is used. We classified EMS dispatch as "emergent" or "non-emergent" and compared to the gold standard of whether EMS personnel decided treatment was appropriate upon scene arrival. We calculated sensitivity, specificity, and positive and negative predictive values (PPV, NPV), with 95% CI's. RESULTS: Of 15,371 non-traumatic OHCAs, the median age was 65 (inter quartile range 51-78), and 4834 (31%) were women; 7152 (47%) were EMS-treated, of whom 651 (9.1%) survived). Among EMS-treated cases 6923/7152 had an emergent response (sensitivity=97%, 95% CI 96-97) and among EMS-untreated cases 3951/8219 had a non-emergent response (specificity=48%, 95% CI, 47 to 49). Among cases with emergent dispatch, 6923/11191 were EMS-treated (PPV=62%, 95% CI 61-62), and among those with non-emergent dispatch, 3951/4180 were EMS-untreated (NPV=95%, 95% CI 94-95); 229/4180 (5.5%) with a non-emergent dispatch were treated by EMS. CONCLUSION: The dispatch system in BC has a high sensitivity and moderate specificity in sending the appropriate responses for OHCAs deemed appropriate for treatment by paramedics. Future research may address strategies to increase system specificity, and decrease the incidence of non-emergent dispatch to EMS-treated cases.

Do Video Calls Improve Dispatcher-Assisted First Aid for Infants with Foreign Body Airway Obstruction? A Randomized Controlled Trial/Simulation Study.

Igarashi Y(1), Suzuki K(2), Norii T(3), Motomura T(1)(4), Yoshino Y(1)(5), Kitagoya Y(6), Ogawa S(2), Yokobori S(1), Yokota H(2).

ABSTRACT

BACKGROUND: Because choking quickly leads to cardiopulmonary arrest, it is crucial that bystanders remove foreign bodies effectively. Although oral instructions in video calls by dispatchers have improved the quality of cardiopulmonary resuscitation, it is unclear whether video calls improve the quality of first aid for choking infants. Therefore, this simulation study aimed to determine whether video calls with dispatchers improve the quality of first aid for infants with foreign body airway obstruction (FBAO). METHODS: Seventy first-year college students randomly assigned in pairs to communicate by video or audio calls participated in simulated emergency calls for infants with FBAO. Both groups began with oral instruction in voice calls until the transition was made to video calls in the video group. The primary outcome was quality of first aid performance, which was categorized as excellent, acceptable, or poor on the basis of existing guidelines. RESULTS: There were 17 simulations in the video-call groups and 16 in the voice-call groups. After initial oral instruction, the proportion of rescuers that received an evaluation of excellent or acceptable did not

differ significantly between the groups (video, 41% vs. voice, 50%; P=0.61); however, evaluations for seven rescuers improved after transitioning to video calls. Ultimately, the proportion receiving a poor evaluation was significantly lower in the video-call group than in the voice-call group (50% vs. 82%, P=0.049). CONCLUSION: Oral instruction communicated by video calls improved the quality of first aid for infants with FBAO.

8. Cardiol Young. 2022 Nov 14:1-14. doi: 10.1017/S1047951122003572. Online ahead of print.
Automated external defibrillators and basic life support practices in secondary schools: A nationwide study.
Abela M(1)(2), Grech V(3), Sammut MA(4).
ABSTRACT
AIM: Cardiac arrest prevention in schools has recently gained momentum. The survival benefit in schools who have access to defibrillators is clear, with far better survival outcomes in children or adults who sustain a cardiac arrest on school grounds. The main objectives of this study were to assess sudden cardiac arrest prevention in Maltese schools, specifically the availability of defibrillators and staff competence in delivering resuscitation. METHODOLOGY AND RESULTS: An online based questionnaire was distributed to all secondary schools across the Maltese archipelago. Data was collected, tabulated, and analysed using SPSS V.23. Most schools (n=40, 74.1%) completed the questionnaire. Two schools documented a cardiac arrest in the past 10 years. 87.5% agreed that cardiac arrest prevention is an important health topic. Most have a defibrillator on the premises (n=37, 92.5%). Only 1 defibrillator is usually available (n=27, 75.0%). Despite the majority claiming its ease of accessibility (n=35, 97.2%), most where not available on every floor (n=37, 97.2%). Only a third were close to a sporting facility (n=11, 30.6%).Schools do not organise regular resuscitation courses (n=21, 58.3%), with 8 schools having five or more certified staff members (23.5%). The number of defibrillators did not influence the frequency of resuscitation courses at school (p=0.607) and there was no association with the number of certified individuals (p=0.860). CONCLUSION: Defibrillators are not readily available at secondary schools and are often installed in low risk areas. Most schools have only one staff member certified in resuscitation. These factors should be addressed with urgency.

9. J Interprof Care. 2022 Nov 13:1-6. doi: 10.1080/13561820.2022.2140130. Online ahead of print.
A simulation-enhanced, spaced learning, interprofessional "code blue" curriculum improves ACLS algorithm adherence and trainee resuscitation skill confidence.
Toft LEB(1), Bottinor W(2), Cobourn A(1), Blount C(3), Tripathi A(4), Mehta I(5), Koch J(6).
ABSTRACT
In-hospital cardiac arrest resuscitation training often happens in silos, with minimal interprofessional training. The aim of this study was to implement and evaluate a simulation enhanced, interprofessional cardiac arrest curriculum in a university hospital. The curriculum ran monthly for 12 months, training interprofessional teams of internal medicine residents, nurses, respiratory therapists, and pharmacy residents. Teams participated in a 90-min high-fidelity simulation including "code blue" (30 min) followed by a 30-min debriefing and a repeat identical simulated "code blue" scenario. Teams were tested in an unannounced mock Code Blue the following month. Advanced Cardiac Life Support (ACLS) algorithm adherence was assessed using a standardized checklist. In-hospital cardiac arrest (IHCA) incidence and survival was tracked for 2 years prior, during, and 1 year after curriculum implementation. Team ACLS-algorithm adherence at baseline varied from 47% to 90% (mean of 71 ± 11%) and improved immediately following training (mean 88 ± 4%, range 80-93%, p = .011). This improvement persisted but decreased in magnitude over 1 month (mean 81 ± 7%, p

= .013). Medical resident self-reported comfort levels with resuscitation skills varied widely at baseline, but improved for all skills post-curriculum. This simulation-enhanced, spaced practice, interprofessional curriculum resulted in a sustained improvement in team ACLS algorithm adherence.

POST-CARDIAC ARREST TREATMENTS

Factors Associated with Early Withdrawal of Life-Sustaining Treatments After Out-of-Hospital Cardiac Arrest: A Subanalysis of a Randomized Trial of Prehospital Therapeutic Hypothermia.
Wahlster S(#)(1)(2)(3), Danielson K(#)(4), Craft L(5), Matin N(6), Town JA(7), Srinivasan V(8), Schubert G(6), Carlbom D(7), Kim F(9), Johnson NJ(#)(7)(8), Tirschwell D(#)(6).
ABSTRACT
BACKGROUND: The objective of this study is to describe incidence and factors associated with early withdrawal of life-sustaining therapies based on presumed poor neurologic prognosis (WLST-N) and practices around multimodal prognostication after out-of-hospital cardiac arrest (OHCA). METHODS: We performed a subanalysis of a randomized controlled trial assessing prehospital therapeutic hypothermia in adult patients admitted to nine hospitals in King County with nontraumatic OHCA between 2007 and 2012. Patients who underwent tracheal intubation and were unconscious following return of spontaneous circulation were included. Our outcomes were (1) incidence of early WLST-N (WLST-N within < 72 h from return of spontaneous circulation), (2) factors associated with early WLST-N compared with patients who remained comatose at 72 h without WLST-N, (3) institutional variation in early WLST-N, (4) use of multimodal prognostication, and (5) use of sedative medications in patients with early WLST-N. Analysis included descriptive statistics and multivariable logistic regression. RESULTS: We included 1,040 patients (mean age was 65 years, 37% were female, 41% were White, and 44% presented with arrest due to ventricular fibrillation) admitted to nine hospitals. Early WLST-N accounted for 24% (n = 154) of patient deaths and occurred in half (51%) of patients with WLST-N. Factors associated with early WLST-N in multivariate regressions were older age (odds ratio [OR] 1.02, 95% confidence interval [CI]: 1.01-1.03), preexisting do-not-attempt-resuscitation orders (OR 4.67, 95% CI: 1.55-14.01), bilateral absent pupillary reflexes (OR 2.4, 95% CI: 1.42-4.10), and lack of neurological consultation (OR 2.60, 95% CI: 1.52-4.46). The proportion of patients with early WLST-N among all OHCA admissions ranged from 19-60% between institutions. A head computed tomography scan was obtained in 54% (n = 84) of patients with early WLST-N; 22% (n = 34) and 5% (n = 8) underwent ≥ 1 and ≥ 2 additional prognostic tests, respectively. Prognostic tests were more frequently performed when neurological consultation occurred. Most patients received sedating medications (90%) within 24 h before early WLST-N; the median time from last sedation to early WLST-N was 4.2 h (interquartile range 0.4-15). CONCLUSIONS: Nearly one quarter of deaths after OHCA were due to early WLST-N. The presence of concerning neurological examination findings appeared to impact early WLST-N decisions, even though these are not fully reliable in this time frame. Lack of neurological consultation was associated with early WLST-N and resulted in underuse of guideline-concordant multimodal prognostication. Sedating medications were often coadministered prior to early WLST-N and may have further confounded the neurological examination. Standardizing prognostication, restricting early WLST-N, and a multidisciplinary approach including neurological consultation might improve outcomes after OHCA.

Recurrent Out-of-Hospital Sudden Cardiac Arrest: Prevalence and Clinical Factors.
Held EP(1), Reinier K(1), Chugh H(1), Uy-Evanado A(1), Jui J(2), Chugh SS(1).
ABSTRACT

BACKGROUND: Despite improvements in management following survival from sudden cardiac arrest (SCA) and wide availability of implantable cardioverter defibrillators for secondary prevention, a subgroup of individuals will suffer multiple distinct episodes of SCA. The objective of this study was to characterize and evaluate the burden of recurrent out-of-hospital SCA among survivors of SCA in a single large US community. METHODS: SCA cases were prospectively ascertained in the Oregon Sudden Unexpected Death Study. Individuals that experienced recurrent SCA were identified both prospectively and retrospectively. RESULTS: We ascertained 6649 individuals with SCA (2002-2020) and 924 (14%) survived to hospital discharge. Of these, 88 survivors (10%) experienced recurrent SCA. Of the nonsurvivors (n=5725), 35 had suffered a recurrent SCA. Of the total 123 SCA cases with recurrent SCA, >60% occurred at least 1 year after the initial SCA (median 23 months, range: 6 days to 31 years). SCA occurred despite a secondary prevention implantable cardioverter defibrillator in 22% (n=26). Prevalence of coronary disease (36% versus 25%), hypertension (69% versus 43%), diabetes (44% versus 21%), and chronic kidney disease (35% versus 14%) was significantly higher in recurrent SCA versus single SCA survivors (n=80, P=0.01). Among individuals with no secondary prevention implantable cardioverter defibrillators before recurrent SCA, the majority had apparently reversible etiologies identified at initial SCA, with one-quarter undergoing coronary revascularization and over half diagnosed with noncoronary cardiac etiologies. CONCLUSIONS: At least 10% of SCA survivors had recurrent SCA, and a large subgroup suffered their repeat SCA despite treatment for an apparently reversible etiology. A renewed focus on careful assessment of cardiac substrate as well as management of coronary disease, hypertension, diabetes, and chronic kidney disease in SCA survivors could reduce recurrent SCA.

Relationship between serum lactate dehydrogenase and mortality after cardiac arrest: A retrospective cohort study.
Lin L(1), Gao R, Chen L, Wu Z, Wei X, Xie Y.
ABSTRACT
Serum lactate dehydrogenase (LDH) has been identified as an independent risk factor for predicting all-cause mortality in patients with multiple diseases. However, the prognostic value of LDH levels in post-cardiac arrest patients remains uncertain. This study aimed to assess the association between LDH and mortality in intensive care unit (ICU) patients after cardiac arrest. This retrospective observational study is based on data from the Dryad Digital Repository, which included 374 consecutive adult patients after cardiac arrest. Patients were divided into 2 groups based on median LDH values. A multivariate Cox proportional hazards model was established to assess the independent relationship between LDH and ICU mortality. Cumulative mortality was compared using Kaplan-Meier curves. The cohort included 374 patients, of which 51.9% (194/374) died in the ICU. The overall death rate from cardiac arrest was significantly higher for patients with LDH ≥ 335 IU/L (59.6%) than for those with LDH < 335 IU/L (44.1%). In multiple Cox regression models, hazard ratios (HR) and corresponding 95% confidence intervals (CI) for logLDH and the 2 LDH groups were 1.72 (1.07, 2.78) and 1.42 (1.04, 1.93), respectively. Participants with LDH ≥ 335IU/L had a higher incidence of ICU mortality than LDH < 335 IU/L, as shown by the Kaplan-Meier curves (P = .0085). Subgroup analysis revealed that the association between LDH and ICU mortality was vitally stable, with all P interactions from different subgroups >.05. Serum LDH levels are positively associated with ICU mortality in patients after cardiac arrest, especially for patients with LDH ≥ 335 IU/L.

The role of F-18 FDG PET/CT in the prognosis of patients with hypoxic/anoxic brain injury after cardio-circulatory arrest.
Rossato E(1), Avesani R(2), Bonadiman S(2), Olivari L(3), Silva R(4), Zanatta P(5), Lupi A(6), Salgarello M(3).

ABSTRACT
BACKGROUND: Advances in resuscitation techniques have resulted in more patients surviving cardio-circulatory arrest (CA) and consequently developing hypoxic/anoxic brain damage. The aim of this study is to evaluate the role of PET/CT (Positron Emission Tomography/Computerized Tomography scan) with F-18 FDG (F-18 fluorodeoxyglucose) during the early rehabilitative hospitalization phase in determining the V/C (Vermis/Cerebellar) ratio as a prognostic index to predict patient outcome, as defined by clinical evaluation scales. METHODS: This is a single-center retrospective study of 37 consecutive adult patients admitted to the neurorehabilitation center between January 2011 and June 2019. Functional status was measured by the following clinical scales: FIM (Functional Indipendence Measure), LCFS (Levels of Cognitive Functioning Scale), GOS (Glasgow Outcome Scale) and CRS-R (Coma Recovery Scale-Revised). PET/CT with F-18 FDG as a functional imaging technique was used to calculate the V/C ratio as a ratio between the metabolism of the vermis and of the Cerebellar Hemisphere. RESULTS: A statistically significant correlation was observed between the V/C ratio and the delta values (difference between discharge and admission value) for each clinical evaluation scale (Delta FIM: P=0.0014; Delta LCFS P=0.0003). A statistically significant difference was observed between the V/C ratio of patients with LCFS ≥4 that showed an improved outcome (defined as an improvement of at least two points in LCFS), and that of patients with LCFS <4 that did not improve (P=0.0011). A V/C ratio cut-off of 1.5 corresponded with a positive predictive power of 80% and a negative predictive power of 82%; a value <1.5 predicted a better outcome. CONCLUSIONS: Clinical evaluation scales when associated with F-18 FDG PET/CT measurement of metabolism, provide a more reliable prognosis. This allows for more focused rehabilitation treatment and better management of family members' expectation.

TARGETED TEMPERATURE MANAGEMENT

Speed of cooling after cardiac arrest in relation to the intervention effect: a sub-study from the TTM2-trial.
Simpson RFG(1)(2), Dankiewicz J(3), Karamasis GV(1)(2), Pelosi P(4)(5), Haenggi M(6), Young PJ(7)(8)(9)(10), Jakobsen JC(11)(12), Bannard-Smith J(13)(14), Wendel-Garcia PD(15), Taccone FS(16), Nordberg P(17)(18), Wise MP(19), Grejs AM(20), Lilja G(21), Olsen RB(22), Cariou A(23), Lascarrou JB(24), Saxena M(25)(26), Hovdenes J(27), Thomas M(28), Friberg H(29), Davies JR(1)(2), Nielsen N(30), Keeble TR(31)(32).
ABSTRACT
BACKGROUND: Targeted temperature management (TTM) is recommended following cardiac arrest; however, time to target temperature varies in clinical practice. We hypothesised the effects of a target temperature of 33 °C when compared to normothermia would differ based on average time to hypothermia and those patients achieving hypothermia fastest would have more favorable outcomes. METHODS: In this post-hoc analysis of the TTM-2 trial, patients after out of hospital cardiac arrest were randomized to targeted hypothermia (33 °C), followed by controlled re-warming, or normothermia with early treatment of fever (body temperature, ≥ 37.8 °C). The average temperature at 4 h (240 min) after return of spontaneous circulation (ROSC) was calculated for participating sites. Primary outcome was death from any cause at 6 months. Secondary outcome was poor functional outcome at 6 months (score of 4-6 on modified Rankin scale). RESULTS: A total of 1592 participants were evaluated for the primary outcome. We found no evidence of heterogeneity of intervention effect based on the average time to target temperature on mortality (p = 0.17). Of patients allocated to hypothermia at the fastest sites, 71 of 145 (49%) had died compared to 68 of 148 (46%) of the normothermia group (relative risk with hypothermia, 1.07; 95%

confidence interval 0.84-1.36). Poor functional outcome was reported in 74/144 (51%) patients in the hypothermia group, and 75/147 (51%) patients in the normothermia group (relative risk with hypothermia 1.01 (95% CI 0.80-1.26). CONCLUSIONS: Using a hospital's average time to hypothermia did not significantly alter the effect of TTM of 33 °C compared to normothermia and early treatment of fever.

2. Ther Hypothermia Temp Manag. 2022 Nov 15. doi: 10.1089/ther.2022.0041. Online ahead of print.

A Commentary on the Effect of Targeted Temperature Management in Patients Resuscitated from Cardiac Arrest.

Holzer M(1), Poole JE(2), Lascarrou JB(3), Fujise K(4), Nichol G(5).

ABSTRACT

The members of the International Liaison Committee on Resuscitation (ILCOR) Advanced Life Support Task Force have written a comprehensive summary of trials of the effectiveness of induced hypothermia (IH) or targeted temperature management (TTM) in comatose patients after cardiac arrest (CA). However, in-depth analysis of these studies is incomplete, especially since there was no significant difference in primary outcome between hypothermia versus normothermia in the recently reported TTM2 trial. We critically appraise trials of IH/TTM versus normothermia to characterize reasons for the lack of treatment effect, based on a previously published framework for what to consider when the primary outcome fails. We found a strong biologic rationale and external clinical evidence that IH treatment is beneficial. Recent TTM trials mainly included unselected patients with a high rate of bystander cardiopulmonary resuscitation. The treatment was not applied as intended, which led to a large delay in achievement of target temperature. While receiving intensive care, sedative drugs were likely used that might have led to increased neurologic damage as were antiplatelet drugs that could be associated with increased acute stent thrombosis in hypothermic patients. It is reasonable to still use or evaluate IH treatment in patients who are comatose after CA as there are multiple plausible reasons why IH compared to normothermia did not significantly improve neurologic outcome in the TTM trials.

3. Am Heart J. 2022 Nov 10:S0002-8703(22)00288-5. doi: 10.1016/j.ahj.2022.11.005. Online ahead of print.

Effect of Cooling Methods and Target Temperature on Outcomes in Comatose Patients Resuscitated from Cardiac Arrest: Systematic Review and Network Meta-Analysis of Randomized Trials.

Matsumoto S(1), Kuno T(2), Mikami T(3), Takagi H(4), Ikeda T(1), Briasoulis A(5), Bortnick AE(6), Sims D(6), Katz JN(7), Jentzer J(8), Bangalore S(9), Alviar CL(9).

ABSTRACT

Targeted temperature management (TTM) has been recommended after cardiac arrest (CA), however the specific temperature targets and cooling methods (intravascular cooling (IVC) versus surface cooling (SC)) remain uncertain. PUBMED and EMBASE were searched until October 8, 2022 for randomized clinical trials (RCTs) investigating the efficacy of TTM after CA. The randomized treatment arms were categorized into the following 6 groups: 31-33°C IVC, 31-33°C SC, 34-36°C IVC, 34-36°C SC, strict normothermia or fever prevention (Strict NT or FP), and standard of care without TTM (No-TTM). The primary outcome was neurological recovery. P-score was used to rank the treatments, where a larger value indicates better performance. We identified 15 RCTs, involving 5,218 patients with CA. Compared to No-TTM as the reference, the other therapeutic options significantly improved neurological outcomes (versus No-TTM; 31-33°C IVC: RR=0.67, 95% CI 0.54-

0.83; 31-33°C SC RR=0.73, 95% CI 0.61-0.87; 34-36°C IVC: RR=0.66, 95% CI 0.51-0.86; 34-36°C SC: RR=0.73, 0.59-0.90; Strict NT or FP: RR=0.75, 95% CI 0.62-0.90). Overall, 31-33°C IVC had the highest probability to be the best therapeutic option to improve outcomes (the ranking P-score of 0.836). As a subgroup analysis, the ranking P-score showed that IVC might be a better cooling method compared to SC (IVC versus SC P-score: 0.960 versus 0.670). In conclusion, hypothermia (31-36°C IVC and SC) and active normothermia (Strict-NT and Strict-FP) were associated with better neurological outcomes compared to No-TTM, with IVC having a greater probability of being the better cooling method than SC.

Serum total cholesterol level as a potential predictive biomarker for neurological outcomes in cardiac arrest survivors who underwent target temperature management.
Ahn C(1), Kang C(1), Ahn HJ(1)(2), You Y(1), Park JS(1)(2), Min JH(2)(3), Jeong W(1), Cho Y(1), Ryu S(1), In YN(2)(3).
ABSTRACT
Cholesterol is an essential substance to maintain cell membranes. Low levels of total cholesterol (TC) are associated with poor prognosis in critically ill patients. Cardiac arrest-induced whole-body ischemia and reperfusion injury cause a sepsis-like syndrome. The Cholesterol level in post-cardiac arrest patients may indicate the degree of endotoxemia or inflammation caused by ischemic and reperfusion injury. We aimed to investigate the association of TC levels with neurologic outcome of out-of-hospital cardiac arrest (OHCA) survivors who underwent target temperature management (TTM). This was a retrospective single-center observational study from May 2018 to April 2021 on a cohort of 106 patients. TC levels were determined in samples obtained immediately and at 24, 48, and 72 hours after the return of spontaneous circulation (ROSC). The primary outcome was poor neurologic outcome at 3 months after ROSC. Poor neurologic outcome was defined by cerebral performance categories 3 to 5. Sixty patients had a poor neurologic outcome. TC levels were significantly lower in the poor neurologic outcome group at each time point. The TC levels for predicting poor neurologic outcome had a sensitivity of 80.8%, with 67.6% specificity at 48 hours (TC48) after ROSC. The areas under the curve value of TC48 was 0.771 (0.670-0.853), with a cutoff value of 114 mg/dL. TC level at 48 hours after ROSC was a helpful marker for the 3-month poor neurologic outcome. This might be an easily accessible predictive marker of neurologic outcome in OHCA survivors treated with TTM.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

Is the AED as intuitive as we think? Potential relevance of "The Sound of Silence" during AED use.
Abelairas-Gómez C(1)(2)(3), Carballo-Fazanes A(1)(2), Chang TP(4)(5), Fijačko N(6)(3), Rodríguez-Núñez A(1)(2)(7).
NO ABSTRACT AVAILABLE

Benign EEG for prognostication of favorable outcome after cardiac arrest: a reappraisal.
Fenter H(1), Ben-Hamouda N(2), Novy J(1), Rossetti AO(3).
ABSTRACT
AIM: The current EEG role for prognostication after cardiac arrest (CA) essentially aims at reliably identifying patients with poor prognosis ("highly malignant" patterns, defined by Westhall et al. in

2014). Conversely, "benign EEGs", defined by the absence of elements of "highly malignant" and "malignant" categories, has limited sensitivity in detecting good prognosis. We postulate that a less stringent "benign EEG" definition would improve sensitivity to detect patients with favorable outcomes. METHODS: Retrospectively assessing our registry of unconscious adults after CA (1.2018 - 8.2021), we scored EEGs within 72h after CA using a modified "benign EEG" classification (allowing discontinuity, low-voltage, or reversed anterio-posterior amplitude development), versus Westhall's "benign EEG" classification (not allowing the former items). We compared predictive performances towards good outcome (Cerebral Performance Category 1-2 at 3 months), using 2x2 tables (and binomial 95% confidence intervals) and proportions comparisons. RESULTS: Among 381 patients (mean age 61.9±15.4 years, 104 (27.2%) females, 240 (62.9%) having cardiac origin), the modified "benign EEG" definition identified a higher number of patients with good outcome (230, 54.3%). Sensitivity of the modified EEG definition was 0.97 (95% CI: 0.92-0.97) vs 0.71 (95% CI: 0.62-0.78) (p<0.001). Positive predictive values (PPV) were 0.53 (95% CI: 0.46-0.59) versus 0.59 (95% CI: 0.51-0.67; p=0.17). Similar statistics were observed at definite recording times, and for survivors. DISCUSSION: The modified "benign EEG" classification demonstrated a markedly higher sensitivity towards favorable outcome, with minor impact on PPV. Adaptation of "benign EEG" criteria may improve efficient identification of patients who may reach a good outcome.

PEDIATRICS AND CHILDREN

[Risk factors for early acute kidney injury after cardiac arrest in children in the pediatric intensive care unit and a prognostic analysis].
[Article in Chinese; Abstract available in Chinese from the publisher]
Zhang XP(1), He J(1), Huang JT(1), Cao JS(1), Zhu DS(1), Xiao ZH(1).
ABSTRACT
OBJECTIVES: To investigate the risk factors for acute kidney injury (AKI) in children with cardiac arrest (CA) and the influencing factors for prognosis. METHODS: A retrospective analysis was performed on the medical records of the children who developed CA in the pediatric intensive care unit (PICU) of Hunan Children's Hospital from June 2016 to June 2021. According to the presence or absence of AKI within 48 hours after return of spontaneous circulation (ROSC) for CA, the children were divided into two groups: AKI (n=50) and non-AKI (n=113). According to their prognosis on day 7 after ROSC, the AKI group was further divided into a survival group (n=21) and a death group (n=29). The multivariate logistic regression analysis was used to investigate the risk factors for early AKI in the children with CA and the influencing factors for prognosis. RESULTS: The incidence rate of AKI after CA was 30.7% (50/163). The AKI group had a 7-day mortality rate of 58.0% (29/50) and a 28-day mortality rate of 78.0% (39/50), and the non-AKI group had a 7-day mortality rate of 31.9% (36/113) and a 28-day mortality rate of 58.4% (66/113). The multivariate logistic regression analysis showed that long duration of cardiopulmonary resuscitation (OR=1.164, 95%CI: 1.088-1.246, P<0.001), low baseline albumin (OR=0.879, 95%CI: 0.806-0.958, P=0.003), and adrenaline administration before CA (OR=2.791, 95%CI: 1.119-6.961, P=0.028) were closely associated with the development of AKI after CA, and that low baseline pediatric critical illness score (OR=0.761, 95%CI: 0.612-0.945, P=0.014), adrenaline administration before CA (OR=7.018, 95%CI: 1.196-41.188, P=0.031), and mechanical ventilation before CA (OR=7.875, 95%CI: 1.358-45.672, P=0.021) were closely associated with the death of the children with AKI after CA. CONCLUSIONS: Albumin should be closely monitored for children with ROSC after CA, especially for those with long duration of cardiopulmonary resuscitation, low baseline pediatric critical illness score, adrenaline administration

before CA, and mechanical ventilation before CA, and such children should be identified and intervened as early as possible to reduce the incidence of AKI and the mortality rate.

National Surveillance of Pediatric Out-of-Hospital Cardiac Arrest in Korea: The 10-Year Trend From 2009 to 2018.
Kim M(1), Yu J(2)(3), Chang H(1)(2), Heo S(1)(2), Lee SU(1), Hwang SY(1), Yoon H(1), Cha WC(1)(2)(4), Shin TG(1), Kim T(5).
ABSTRACT
BACKGROUND: This study reports trends in pediatric out-of-hospital cardiac arrest (OHCA) and factors affecting clinical outcomes by age group. METHODS: We identified 4,561 OHCA patients younger than 18 years between January 2009 and December 2018 in the Korean OHCA Registry. The patients were divided into four groups: group 1 (1 year or younger), group 2 (1 to 5 years), group 3 (6 to 12 years), and group 4 (13 to 17 years). The primary outcome was survival to hospital discharge, and the secondary outcomes were return of spontaneous circulation (ROSC) at the emergency department (ED) and good neurological status at discharge. Multivariate logistic analyses were performed. RESULTS: The incidence rate of pediatric OHCA in group 1 increased from 45.57 to 60.89 per 100,000 person-years, while that of the overall population decreased over the 10 years. The rates of ROSC at the ED, survival to hospital discharge, and good neurologic outcome were highest in group 4 (37.9%, 9.7%, 4.9%, respectively) and lowest in group 1 (28.3%, 7.1%, 3.2%). The positive factors for survival to discharge were event location of a public/commercial building or place of recreation, type of first responder, prehospital delivery of automated external defibrillator shock, initial shockable rhythm at the ED. The factors affecting survival outcomes differed by age group. CONCLUSION: This study reports comprehensive trends in pediatric OHCA in the Republic of Korea. Our findings imply that preventive methods for the targeted population should be customized by age group.

Pediatric out-of-hospital cardiac arrest in Denmark.
Holgersen MG(1)(2)(3), Jensen TW(2)(4), Breindahl N(2)(4)(5), Kjerulff JLB(6), Breindahl SH(1)(2), Blomberg SNF(7), Wolthers SA(2)(4), Andersen LB(4), Torp-Pedersen C(8)(9), Mikkelsen S(10), Lippert F(2)(11), Christensen HC(2)(4)(12); Danish Cardiac Arrest Registry Group.
ABSTRACT
BACKGROUND: Pediatric out-of-hospital cardiac arrest (POHCA) has received limited attention. All causes of POHCA and outcomes were examined during a 4-year period in a Danish nationwide register and prehospital medical records. The aim was to describe the incidence, reversible causes, and survival rates for POHCA in Denmark. METHODS: This is a registry-based follow-up cohort study. All POHCA for a 4-year period (2016-2019) in Denmark were included. All prehospital medical records for the included subjects were reviewed manually by five independent raters establishing whether a presumed reversible cause could be assigned. RESULTS: We identified 173 cases within the study period. The median incidence of POHCA in the population below 17 years of age was 4.2 per 100,000 persons at risk. We found a presumed reversible cause in 48.6% of cases, with hypoxia being the predominant cause of POHCA (42.2%). The thirty-day survival was 40%. Variations were seen across age groups, with the lowest survival rate in cases below 1 year of age. Defibrillators were used more frequently among survivors, with 16% of survivors defibrillated bystanders as opposed to 1.9% in non-survivors and 24% by EMS personnel as opposed to 7.8% in non-survivors. The differences in initial rhythm being shockable was 34% for survivors and 16% for non-survivors. CONCLUSION: We found pediatric out-of-hospital cardiac arrests was a rare event, with higher

incidence and mortality in infants compared to other age groups of children. Use of defibrillators was disproportionally higher among survivors. Hypoxia was the most common presumed cause among all age groups.

EXTRACORPOREAL LIFE SUPPORT

Predictors and Hospital Outcomes in Pregnant Patients Undergoing Extracorporeal Membrane Oxygenation: A Nationwide Study.
van den Bosch OFC(1), Chaudhry R(1), Wicker J(2), Mubashir T(3), Limb D(3), Jogendran R(4), Munshi L(5), Balki M(1)(6)(7)(8).
ABSTRACT
BACKGROUND: Extracorporeal membrane oxygenation (ECMO) is increasingly used in patients with severe cardiorespiratory collapse. Although prior large database reviews of ECMO use in the peripartum population exist, they do not stratify by ECMO indication nor do they include obstetric conditions such as preeclampsia. Our objective was to characterize the incidence, indication-associated mortality, and factors associated with mortality in pregnant patients who underwent ECMO. METHODS: We examined the United States National Inpatient Sample database to identify hospitalizations for pregnancy from January 1, 2010 to December 31, 2016. We identified pregnant patients who underwent ECMO using International Classification of Diseases ninth and tenth revisions codes. The primary outcome was in-hospital all-cause mortality across pregnant patients who underwent ECMO for any indication. We evaluated the indication for ECMO, incidence, prevalence of risk factors, comorbidities and conditions, and their association with in-hospital mortality. RESULTS: Fifty-nine of 5'346,517 pregnant patients underwent ECMO during our study period (incidence, 1.1; 95% confidence interval [CI], 0.84-1.4 per 100,000 hospitalizations). Indications for ECMO support included respiratory failure (79.7%), cardiogenic shock (64.4%), or circulatory arrest (25.4%). Most patients (57.6%) had more than 1 indication. The overall in-hospital mortality rate was 30.5%. Mortality was 29.8% in patients with respiratory failure, 39.5% with cardiogenic shock, 46.7% with cardiac arrest, and 42.4% in those with combined diagnoses. Cardiogenic shock was associated with a significantly higher mortality rate and adjusted odds ratio 5.0 (95% CI, 1.25-27.0). Most patients (62.7%) had one or more comorbidities. CONCLUSIONS: The frequency of ECMO use across the pregnant population was low over this time period, with a mortality rate of 1 in 3 patients. Mortality was greatest in patients with cardiogenic shock. Further work is needed to understand how best to improve ECMO outcomes in pregnant patients.

Multi-Lobar Atelectasis in Children Receiving Venoarterial Extracorporeal Membrane Oxygenation for Cardiac Indications.
Nader MA(1), Friedman ML(2), Mastropietro CW(2).
ABSTRACT
BACKGROUND: Respiratory complications are common in patients who require venoarterial (VA) extracorporeal membrane oxygenation (ECMO) for cardiac indications. We aimed to examine the frequency and characteristics of patients who develop multi-lobar atelectasis early in the course of VA ECMO and to identify factors associated with its occurrence. METHODS: We performed a single-center retrospective review of consecutive pediatric subjects on VA ECMO in the cardiovascular ICU from 2014 to 2019. Chest radiographs before VA ECMO initiation and daily for up to 5 d of VA ECMO support were reviewed. Multi-lobar atelectasis was defined as the collapse of ≥2 lobes of the same lung. Patients with multi-lobar atelectasis before or immediately after VA ECMO cannulation were

excluded. Bivariate comparisons and multivariable logistic regression analyses were performed to identify factors independently associated with lung collapse. Results of the multivariable analysis are provided as odds ratio (OR) with 95% CI. RESULTS: We reviewed 119 VA ECMO runs in 101 unique subjects. Multi-lobar atelectasis occurred in 36 runs (30%), with an isolated collapse of the left lung occurring most frequently (no. runs = 20). VA ECMO runs complicated by multi-lobar atelectasis were significantly longer and associated with lower hospital survival (51% vs 77%, survival in subjects without multi-lobar atelectasis; P = .01). Multivariable logistic regression analysis identified a subsequent ECMO run during the same admission to be independently associated with multi-lobar atelectasis (OR 5.4, 95% CI 1.2-21.5). Subanalysis of the subjects with isolated left lung collapse revealed male sex (OR 8.9, 95% CI 1.6-48.2) and subsequent ECMO run during the same admission (OR 4.0, 95% CI 1.2-13.6) to be independently associated with this complication, and mechanical ventilation at least 12 h before ECMO may be protective (OR 0.22, 95% CI 0.07-0.76). CONCLUSIONS: Multi-lobar atelectasis commonly occurred in children who were receiving VA ECMO for cardiac failure and was associated with worse outcomes. Male patients, a subsequent VA ECMO run during the same hospitalization, and patients in whom mechanical ventilation was initiated shortly before ECMO cannulation may be at increased risk for this complication.

EXPERIMENTAL RESEARCH

Resuscitation with epinephrine worsens cerebral capillary no-reflow after experimental pediatric cardiac arrest: An in vivo multiphoton microscopy evaluation.
Oghifobibi OA(1)(2), Toader AE(3), Nicholas MA(1)(2), Nelson BP(1)(2), Alindogan NG(2), Wolf MS(2)(4), Kline AE(2)(5), Nouraie SM(6), Bondi CO(2)(5), Iordanova B(7), Clark RS(1)(2)(4)(8), Bayır H(1)(2)(4)(8), Loughran PA(9), Watkins SC(10), St Croix CM(10), Kochanek PM(1)(2)(4)(8), Vazquez AL(11)(7), Manole MD(1)(2)(8).
ABSTRACT
Epinephrine is the principal resuscitation therapy for pediatric cardiac arrest (CA). Clinical data suggest that although epinephrine increases the rate of resuscitation, it fails to improve neurological outcome, possibly secondary to reductions in microvascular flow. We characterized the effect of epinephrine vs. placebo administered at resuscitation from pediatric asphyxial CA on microvascular and macrovascular cortical perfusion assessed using in vivo multiphoton microscopy and laser speckle flowmetry, respectively, and on brain tissue oxygenation (PbO2), behavioral outcomes, and neuropathology in 16-18-day-old rats. Epinephrine-treated rats had a more rapid return of spontaneous circulation and brisk immediate cortical reperfusion during 1-3 min post-CA vs. placebo. However, at the microvascular level, epinephrine-treated rats had penetrating arteriole constriction and increases in both capillary stalling (no-reflow) and cortical capillary transit time 30-60 min post-CA vs. placebo. Placebo-treated rats had increased capillary diameters post-CA. The cortex was hypoxic post-CA in both groups. Epinephrine treatment worsened reference memory performance vs. shams. Hippocampal neuron counts did not differ between groups. Resuscitation with epinephrine enhanced immediate reperfusion but produced microvascular alterations during the first hour post-resuscitation, characterized by vasoconstriction, capillary stasis, prolonged

cortical transit time, and absence of compensatory cortical vasodilation. Targeted therapies mitigating the deleterious microvascular effects of epinephrine are needed.

CASE REPORTS

Tracheobronchial rupture in children due to chest compression: A case report.
Fukumizu K(1), Iio K(2), Abe K(3), Hagiwara Y(2).
ABSTRACT
A tracheobronchial rupture can be lethal. Its etiology in children varies and includes blunt trauma and iatrogenic injury. Most of the latter are associated with tracheal intubation, with other, iatrogenic causes scarcely being reported. We herein reported the first case of tracheobronchial rupture caused by chest compression during cardiopulmonary resuscitation. The present case highlights the importance of close follow-up after cardiopulmonary resuscitation, even if the patients are not intubated.

Case report of a ventricular fibrillation storm with a cardiac conduction disorder and HCN4 variant 18 years after ablation of atrial flutter.
Nakamura T(1), Fukuzawa K(1)(2), Aiba T(3), Ohno S(4).
ABSTRACT
BACKGROUND: Genetic abnormalities causing various arrhythmias including atrial arrhythmias, specialized cardiac conduction disorders, and malignant ventricular arrhythmias have been reported. However, it is sometimes difficult to diagnose and treat patients with various arrhythmias. CASE SUMMARY: A 49-year-old woman who underwent ablation of typical atrial flutter (AFL) at 31 years of age visited the emergency room due to a cardiopulmonary arrest. Her 12-lead electrocardiogram during sinus rhythm after resuscitation exhibited first-degree atrioventricular block with right bundle branch block and right axis deviation. No structural heart disease was evident on standard imaging screening. An implantation of a single-chamber implantable cardioverter defibrillator (ICD) was indicated. After the ICD implantation, she then experienced multiple ventricular fibrillation (VF) episodes. Radiofrequency catheter ablation of triggered ventricular premature contractions (VPCs) was performed but failed because the clinical VPCs could not be induced during the session. Although no pathogenic variants associated with Brugada syndrome or long-QT syndrome were found, a rare HCN4 variant, c.1209+2_1209+3insGAGT (rs786205418), was identified in a gene panel analysis. Because high-frequency clinical pacing was effective for suppressing the VF, the single-chamber ICD was upgraded to a dual-chamber ICD. Thereafter, high-rate pacing successfully prevented any further ventricular arrhythmias during the follow up. DISCUSSION: A clinical course with prominent wide QRS complexes and AFL in one's early 30s followed by sudden onset of a VF storm about 20 years later is extremely rare. Her clinical phenotype expression was possibly associated with a rare HCN4 variant; however, further study is needed to confirm whether this variant was pathological or not.

Case of Mitral Valve Prolapse - Associated Sudden Cardiac Death in Pregnancy.
Truong NNK(1), Vu VH(1), Truong BQ(2).
ABSTRACT

BACKGROUND Mitral valve prolapse (MVP) is a frequent echocardiographic finding that can be accompanied by symptoms ranging from a benign course to occasionally catastrophic complications, such as heart failure, and rarely, sudden cardiac death. Female sex, younger age, physiological or psychological stress, electrical instability, and changes in the structure of the mitral apparatus all seem to be risk factors for fatal ventricular arrhythmias in patients with MVP. We report a case of MVP-related cardiac arrest in a pregnant woman, which is rarely reported. CASE REPORT A 34-year-old woman who had collapsed at home from cardiac arrest was transported to the hospital. She had no history of cardiac diseases and was 8 weeks pregnant. Premature ventricular complexes and sinus tachycardia were observed on the 12-lead electrocardiogram as she arrived at the Emergency Department. The second cardiac arrest she experienced while in the hospital was observed to be from torsades de pointes. Further investigations revealed severe mitral valve regurgitation due to posterior leaflet prolapse and regional hypokinesis of the inferior wall and interventricular septum. CONCLUSIONS Ventricular arrhythmia is a frequent finding of mitral valve regurgitation. However, it rarely results in serious consequences. Malignant arrhythmic mitral valve regurgitation can result in sudden cardiac death; therefore, physicians need to be aware of patients with MVP who exhibit characteristics of a potential high-risk profile in order to avoid tragic outcomes.