This week's PubMed 26th September – 2nd October 2021: articles of interest n = 47

1. Open Access Emerg Med. 2021 Sep 22;13:431-438. doi: 10.2147/OAEM.S334808. eCollection 2021.
Out of Hospital Cardiac Arrest: Saudi Red Crescent Experience Throughout COVID-19 Era.
Alsofayan YM(1), Althunayyan SM(2), Mohamed MA(1), Alhabeeb SH(1), Altuwaijri MI(1), Alhajjaj FS(3), Alowais JM(4).
ABSTRACT
PURPOSE: The quality of resuscitation for out hospital cardiac arrest (OHCA) during the COVID-19 era could be affected. We aim to describe prehospital healthcare providers' resuscitative efforts for OHCA cases and their definitive outcomes. PATIENTS AND METHODS: This retrospective cross-sectional study included all OHCA cases between April and June 2021 across all regions in the Kingdom of Saudi Arabia (KSA). Demographic variables, response times, CPR providers, initial rhythm, use of AED/Defibrillator, medical interventions, ROSC data, and dispatch codes were extracted from a central electronic platform. RESULTS: A total of 1307 OHCA cases were included in this study, males constituted 65% and 42% were ≥65 years. Although the median response time to initiate CPR was 13 min, 11% of OHCA cases had a response time between 0 and 6 min. About 75% of CPR was provided on scene by BLS units, 78% of OHCA cases had asystole as their initial rhythm, an AED/Defibrillator was used more than 90% of the time for pulseless VT/VF rhythm, and ROSC was achieved in 8% of OHCA patients. CONCLUSION: During the COVID-19 pandemic, maintaining resuscitative efforts for OHCA continues in KSA. Closing knowledge gaps in the community and a better description of OHCA for the dispatcher could guide dispatch-assisted CPR and minimize OHCA response times.

2. Curr Opin Crit Care. 2021 Sep 27. doi: 10.1097/MCC.0000000000000895. Online ahead of print.
Changing resuscitation strategies during a pandemic: lessons from the consecutive surges in New York and global challenges.
Jafari D(1), Cohen AL, Monsieurs K, Becker LB.
ABSTRACT
PURPOSE OF REVIEW: To provide a framework for resuscitation of COVID-19 critical illness for emergency and intensive care clinicians with the most up to date evidence and recommendations in the care of COVID-19 patients in cardiac arrest or in extremis. RECENT FINDINGS: Performing cardiopulmonary resuscitation (CPR) on COVID-19 patients requires the clinicians to adopt infection mitigation strategies such as full personal protective equipment, mechanical chest compression devices, and restricting the number of people present during the resuscitation. The time of intubation is a subject of ongoing research and clinicians should use their best judgment for each patient. Clinicians should prepare for CPR in prone position. Particular attention should be given to the psychological well-being of the staff. Point of care ultrasound has proved to be an invaluable diagnostic tool in assessing ventricular dysfunction and parenchymal lung disease. Although novel therapies to supplant the function of diseased lungs have shown promise in select patients the evidence is still being collected. The end-of-life discussions have been negatively impacted by prognostic uncertainty as well as barriers to in person meetings with families. SUMMARY: The resuscitation of critically ill COVID-19 patients poses new challenges, but the principles remain largely unchanged.

CPR/MECHANICAL CHEST COMPRESSION

No articles identified.

REGISTRIES, REVIEWS AND EDITORIALS

1. Resuscitation. 2021 Sep 27:S0300-9572(21)00373-7. doi: 10.1016/j.resuscitation.2021.09.019. Online ahead of print.
What are the care needs of families experiencing cardiac arrest?: A survivor and family led scoping review.
Douma MJ(1), Ad Graham T(2), Ali S(2), Dainty KN(3), Bone A(4), Smith KE(2), Dennet L(2), Brindley PG(2), Kroll T(5), Fraser K(5).

ABSTRACT
AIM: The sudden and unexpected cardiac arrest of a family member can be a grief-filled and life-altering event. Every year many hundreds of thousands of families experience the cardiac arrest of a family member. However, care of the family during the cardiac arrest and after, is poorly understood and incompletely described. This review has been performed with person with lived experience of cardiac arrest to describe, "What are the needs of families experiencing cardiac arrest?" from the moment of collapse until the outcome is known. METHODS: This review was guided by specific methodological framework and reporting items (PRISMA-ScR) as well as best practices in patient and public involvement in research and reporting (GRIPP2). A search strategy was developed for eight online databases and a grey literature review. Two reviewers independently assessed all articles for inclusion and extracted relevant study information. RESULTS: We included 47 articles examining the experience and care needs of families experiencing cardiac arrest of a family member. Forty-one articles were analysed as six represented duplicate data. Ten family care need themes were identified across five domains. The domains and themes transcended cardiac arrest setting, aetiology, family-member age and family composition. The five domains were i) focus on the family member in cardiac arrest, ii) collaboration of the resuscitation team and family, iii) consideration of family context, iv) family post-resuscitation needs, and v) dedicated policies and procedures. We propose a conceptual model of family centred cardiac arrest. CONCLUSION: Our review provides a comprehensive mapping and description of the experience of families and their care needs during the cardiac arrest of a family-member. Furthermore, our review was conducted with co-investigators and collaborators with lived experience of cardiac arrest (survivors and family members of survivors and non-survivors alike). The conceptual framework of family centred cardiac arrest care presented may aid resuscitation scientists and providers in adopting greater family centeredness to their work.

2. J Clin Med. 2021 Sep 21;10(18):4285. doi: 10.3390/jcm10184285.
Symptom Prevalence of Anxiety and Depression in Older Cardiac Arrest Survivors: A Comparative Nationwide Register Study.
Årestedt K(1)(2), Israelsson J(1)(3), Djukanovic I(1), Herlitz J(4), Carlsson J(1)(3), Petersson S(1)(5), Bremer A(6)(7).

ABSTRACT
Knowledge about psychological distress in older cardiac arrest (CA) survivors is sparse, and the lack of comparisons with general populations make it difficult to draw any strong conclusions about prevalence and potential changes caused by CA. Our aim was to compare psychological distress between older CA survivors and a general population. This study included survivors 65-80 years old and an age- and sex-matched general population. Data on survivors was collected from the Swedish Register of Cardiopulmonary Resuscitation. The Hospital Anxiety and Depression Scale was used to

measure psychological distress. Data were analyzed with non-parametric statistics. The final sample included 1027 CA survivors and 1018 persons from the general population. In both groups, the mean age was 72 years (SD = 4) and 28% were women. The prevalence of anxiety was 9.9% for survivors and 9.5% for the general population, while the corresponding prevalence for depression was 11.3% and 11.5% respectively. Using the cut-off scores, no significant differences between the groups were detected. However, CA survivors reported significantly lower symptom levels using the subscale scores (ΔMdn = 1, p < 0.001). In conclusion, the CA survivors did not report higher symptom levels of anxiety and depression than the general population. However, since psychological distress is related to poor quality-of-life and recovery, screening for psychological distress remains important.

Balancing thrombosis and bleeding after out-of-hospital cardiac arrest related to acute coronary syndrome: A literature review.
Gall E(1), Lafont A(2), Varenne O(2), Dumas F(3), Cariou A(4), Picard F(5).
ABSTRACT
Balance between thrombosis and bleeding is now well recognized in patients treated for acute coronary syndrome, with impact on short- and long-term prognosis, including survival. Recent data suggest that patients who are resuscitated after out-of-hospital cardiac arrest related to myocardial infarction are at an even higher risk of bleeding and thrombosis than those with uncomplicated acute coronary syndrome. Delayed enteral absorption of medication due to induced hypothermia and systemic inflammation increases thrombosis risk, whereas transfemoral access site, cardio-pulmonary resuscitation manoeuvres and mechanical circulatory support devices increase bleeding risk. In addition, post-resuscitation syndrome and renal or hepatic impairment are potential risk factors for both bleeding and thrombotic complications. There are currently no randomized controlled trials comparing various P2Y12 inhibitor and/or anticoagulation strategies in the setting of out-of-hospital cardiac arrest, and current practice is largely derived from management of patients with uncomplicated acute coronary syndrome. The aim of this review is therefore to describe the bleeding and thrombosis risk factors in this specific population, and to review recent data on antithrombotic drugs in this patient subset.

IN-HOSPITAL CARDIAC ARREST

No articles identified.

INJURIES AND CPR

No articles identified.

CAUSE OF THE ARREST

Comparison of Circadian Variation for In-Hospital Versus Out-of-Hospital Sudden Cardiac Arrest Survivors.
Tang Y(1), Tertulien T(1), Bhonsale A(1), Kancharla K(1), Estes NAM 3rd(1), Jain SK(1), Saba S(2).
ABSTRACT

Several studies have reported circadian periodicity of sudden cardiac arrest (SCA). It remains unclear to what extent this circadian rhythm is influenced by variation in patients' activities. One way to elucidate this is to compare patients with out-of-hospital cardiac arrests (OHCAs) with those with in-hospital cardiac arrests (IHCAs). We therefore examined the presence of a circadian pattern of SCA in a large cohort of OHCA and IHCA survivors. A total of 1,433 consecutive survivors of SCA in the Pittsburgh area from 2002 to 2012 were included. Patient demographics, including clinical histories and details of SCA, were collected. The distribution of SCA throughout the day was tested for differences using the chi-square test. Of the 1,224 patients analyzed, 706 had IHCA and 518 OHCA. We observed a nadir of SCA in the nighttime hours between 12 a.m. and 6 a.m. in both IHCA and OHCA groups (p <0.001), although this pattern was more blunted in the IHCA group. Patients who had an SCA in the nighttime window had more co-morbidities (p = 0.01). The circadian pattern was noted to be absent in patients with higher co-morbidity burden in IHCA only. In conclusion, the typical pattern of nighttime nadir in SCA is observed in patients with both OHCA and IHCA but is blunted in the hospital and especially in sicker patients. This suggests a common mechanistic pathway of SCA transcending differences in physical activities of patients and a difference in how co-morbidities interact with the timing of SCA in the inpatient setting.

Beyond 5Hs and 5Ts: a rare cause of cardiac arrest.
Kuan KK(1), Rahalkar K(2).
NO ABSTRACT AVAILABLE

Do Women Have a Higher Mortality Risk Than Men following ICU Admission after Out-of-Hospital Cardiac Arrest? A Retrospective Cohort Analysis.
van Wees C(1)(2), Rietdijk W(2)(3), Mandigers L(1), van der Graaf M(2), Scholte NTB(2), Adriaansens KO(2), van den Berg RCM(4), den Uil CA(1)(2)(5).
ABSTRACT
PURPOSE: previous studies showed that women have a higher mortality risk than men after out-of-hospital cardiac arrest (OHCA). This sex difference may disappear after adjustment for cardiac arrest characteristics. Most studies also included patients who were not admitted to the intensive care unit (ICU). We analyzed whether sex impacts the mortality of ICU-admitted OHCA patients. METHODS: a retrospective cohort analysis of 1240 OHCA patients admitted to the ICU (310 women, 25%, AgeMedian 64.0 (IQR 53.8-73.0)) at an academic hospital in the Netherlands between 1 January 2007 and 31 December 2018. The primary outcome was 90-day mortality; the secondary outcome was a favorable cerebral performance category (CPC) score at ICU discharge and ICU length of stay (ICU LOS). RESULTS: we found no association between sex and 90-day mortality (hazard ratio (HR) 0.867; 95% confidence interval (95% CI) 0.678-1.108) after adjusting for relevant cardiac arrest characteristics. Similarly, we found no difference for favorable CPC score (OR 1.117; 95% CI 0.777-1.608) or ICU LOS between sexes (Beta 0.428; 95% CI -0.442 to 1.298). CONCLUSIONS: after adjusting for cardiac arrest characteristics, we found no difference between women and men with respect to 90-day mortality, ICU LOS, and CPC score.

Daylight savings time transitions and risk of out-of-hospital cardiac arrest:an interrupted time series analysis.
Hook J(1), Smith K(2), Andrew E(3), Ball J(4), Nehme Z(5).

ABSTRACT

BACKGROUND: Many studies have reported increases in the risk of acute cardiovascular events following daylight savings time (DST) transitions. We sought to investigate the effect of DST transition on the incidence of out-of-hospital cardiac arrest (OHCA). METHODS: Between January 2000 and December 2020, we performed an interrupted time series analysis of the daily number of OHCA cases of medical aetiology from the Victorian Ambulance Cardiac Arrest Registry. The effect of DST transition on OHCA incidence was estimated using negative binomial models, adjusted for temporal trends, population growth, and public holidays. RESULTS: A total of 89,409 adult OHCA of medical aetiology were included. Following the spring DST transition (i.e. shorter day), there was an immediate 13% (IRR 1.13, 95% CI: 1.02, 1.25; p=0.02) increased risk of OHCA on the day of transition (Sunday) and the cumulative risk of OHCA remained higher over the first 2 days (IRR 1.17, 95% CI: 1.02, 1.34; p=0.03) compared to non-transitional days. Following the autumn DST transition (i.e. longer day), there was a significant lagged effect on the Tuesday with a 12% (IRR 0.88, 95% CI: 0.77, 0.99; p=0.04) reduced risk of OHCA. The cumulative effect following the autumn DST transition was also significant, with a 30% (IRR 0.70, 95% CI: 0.51, 0.96; p=0.03) reduction in the incidence of OHCA by the end of the transitional week. CONCLUSION: We observed both harmful and protective effects from DST transitions on the risk of OHCA. Strategies to reduce this risk in vulnerable populations should be considered.

Seasonal Variation In Management And Outcomes Of Cardiac Arrest Complicating Acute Myocardial Infarction.
Patlolla SH(1), Kanwar A(2), Sundaragiri PR(3), Cheungpasitporn W(4), Doshi RP(5), Mandeep S(6), Vallabhajosyula S(7).
ABSTRACT

BACKGROUND: There are limited data on the influence of seasons on the outcomes of acute myocardial infarction-cardiac arrest (AMI-CA). METHODS: Using the National Inpatient Sample from 2000-2017, adult (>18 years) admissions with AMI-CA were identified. Seasons were defined by the month of admission as spring, summer, fall, and winter. The outcomes of interest were prevalence of AMI-CA, in-hospital mortality, use of coronary angiography, percutaneous coronary intervention (PCI), hospital length of stay, hospitalization costs and discharge disposition. RESULTS: Of the 10,880,856 AMI admissions, 546,334 (5.0%) were complicated by CA, with a higher prevalence in fall and winter (5.1% each) compared to summer (5.0%) and spring (4.9%). Baseline characteristics of AMI-CA admissions admitted in various seasons were largely similar. Compared to AMI-CA admissions in spring, summer, and fall, AMI-CA admissions in winter had slightly lower rates of coronary angiography (63.3%-64.3% vs 61.4%) and PCI (47.2-48.4% vs 45.6%). Compared to those admitted in the spring, adjusted in-hospital mortality was higher for winter (46.8% vs. 44.2%; odds ratio [OR] 1.08 [95% confidence interval {CI} 1.06-1.10]; p < 0.001), lower for summer (43% vs. 44.2%; OR 0.97 [95% CI 0.95-0.98]; p < 0.001) and comparable for fall (44.4% vs. 44.2%; OR 1.01 [95% CI 0.99-1.03]; p = 0.31) AMI-CA admissions. Length of hospital stay, total hospitalization charges, and discharge dispositions for AMI-CA admissions were comparable across the seasons. CONCLUSIONS: AMI-CA admissions in the winter were associated with lower rates of coronary angiography and PCI, and higher rates of in-hospital mortality compared to the other seasons.

END-TIDAL CO$_2$

No articles identified.

No articles identified.

No articles identified.

1. JAMA. 2021 Sep 29. doi: 10.1001/jama.2021.16628. Online ahead of print.

Effect of Vasopressin and Methylprednisolone vs Placebo on Return of Spontaneous Circulation in Patients With In-Hospital Cardiac Arrest: A Randomized Clinical Trial.

Andersen LW(1)(2)(3), Isbye D(4), Kjærgaard J(5), Kristensen CM(4), Darling S(6), Zwisler ST(6), Fisker S(6), Schmidt JC(6), Kirkegaard H(1)(3), Grejs AM(2), Rossau JRG(2), Larsen JM(7)(8), Rasmussen BS(8)(9), Riddersholm S(7)(8)(10), Iversen K(11)(12), Schultz M(13), Nielsen JL(14), Løfgren B(1)(10), Lauridsen KG(1)(10)(15), Sølling C(16), Pælestik K(16), Kjærgaard AG(17), Due-Rasmussen D(17), Folke F(12)(18)(19), Charlot MG(18), Jepsen RMHG(20), Wiberg S(20), Donnino M(21)(22), Kurth T(23), Høybye M(1), Sindberg B(1), Holmberg MJ(1)(24), Granfeldt A(2).

ABSTRACT

IMPORTANCE: Previous trials have suggested that vasopressin and methylprednisolone administered during in-hospital cardiac arrest might improve outcomes. OBJECTIVE: To determine whether the combination of vasopressin and methylprednisolone administered during in-hospital cardiac arrest improves return of spontaneous circulation. DESIGN, SETTING, AND PARTICIPANTS: Multicenter, randomized, double-blind, placebo-controlled trial conducted at 10 hospitals in Denmark. A total of 512 adult patients with in-hospital cardiac arrest were included between October 15, 2018, and January 21, 2021. The last 90-day follow-up was on April 21, 2021. INTERVENTION: Patients were randomized to receive a combination of vasopressin and methylprednisolone (n = 245) or placebo (n = 267). The first dose of vasopressin (20 IU) and methylprednisolone (40 mg), or corresponding placebo, was administered after the first dose of epinephrine. Additional doses of vasopressin or corresponding placebo were administered after each additional dose of epinephrine for a maximum of 4 doses. MAIN OUTCOMES AND MEASURES: The primary outcome was return of spontaneous circulation. Secondary outcomes included survival and favorable neurologic outcome at 30 days (Cerebral Performance Category score of 1 or 2). RESULTS: Among 512 patients who were randomized, 501 met all inclusion and no exclusion criteria and were included in the analysis (mean [SD] age, 71 [13] years; 322 men [64%]). One hundred of 237 patients (42%) in the vasopressin and methylprednisolone group and 86 of 264 patients (33%) in the placebo group achieved return of spontaneous circulation (risk ratio, 1.30 [95% CI, 1.03-1.63]; risk difference, 9.6% [95% CI, 1.1%-18.0%]; P = .03). At 30 days, 23 patients (9.7%) in the intervention group and 31 patients (12%) in the placebo group were alive (risk ratio, 0.83 [95% CI, 0.50-1.37]; risk difference: -2.0% [95% CI, -7.5% to 3.5%]; P = .48). A favorable neurologic outcome was observed in 18 patients (7.6%) in the intervention group and 20 patients (7.6%) in the placebo group at 30 days (risk ratio, 1.00 [95% CI, 0.55-1.83]; risk difference, 0.0% [95% CI, -4.7% to 4.9%]; P > .99). In patients with return of spontaneous circulation, hyperglycemia occurred in 77 (77%) in the intervention group and 63 (73%) in the placebo group. Hypernatremia occurred in 28 (28%) and 27 (31%), in the intervention and placebo groups, respectively. CONCLUSIONS AND RELEVANCE: Among patients with in-hospital cardiac arrest, administration of vasopressin and methylprednisolone, compared with placebo,

significantly increased the likelihood of return of spontaneous circulation. However, there is uncertainty whether this treatment results in benefit or harm for long-term survival.

2. JAMA. 2021 Sep 29. doi: 10.1001/jama.2021.15460. Online ahead of print.
Vasopressin and Steroids as Adjunctive Treatment for In-Hospital Cardiac Arrest.
Haukoos J(1)(2), Douglas IS(3), Sasson C(4).
NO ABSTRACT AVAILABLE

TRAUMA

No articles identified.

VENTILATION

No articles identified.

CERERBRAL MONITORING

1. Neurocrit Care. 2021 Sep 30. doi: 10.1007/s12028-021-01344-8. Online ahead of print.
Status Myoclonus with Post-cardiac-arrest Syndrome: Implications for Prognostication.
Chakraborty T(1)(2)(3), Braksick S(1), Rabinstein A(1), Wijdicks E(4).
ABSTRACT
BACKGROUND: Status myoclonus (SM) after cardiac arrest (CA) may signify devastating brain injury. We hypothesized that SM correlates with severe neurologic and systemic post-cardiac-arrest syndrome (PCAS). METHODS: Charts of patients admitted with CA to Mayo Clinic Saint Marys Hospital between 2005 and 2019 were retrospectively reviewed. Data included the neurologic examination, ancillary neurologic tests, and systemic markers of PCAS. Nonsustained myoclonus was clinically differentiated from SM. The cerebral performance category score at discharge was assessed; poor outcome was a cerebral performance category score > 2 prior to withdrawal of life-sustaining therapies or death. RESULTS: Of 296 patients included, 276 (93.2%) had out-of-hospital arrest and 202 (68.5%) had a shockable rhythm; the mean time to return of spontaneous circulation was 32 ± 19 min. One hundred seventy-six (59.5%) patients had a poor outcome. One hundred one (34.1%) patients had myoclonus, and 74 (73.2%) had SM. Neurologic predictors of poor outcome were extensor or absent motor response to noxious stimulus (p = 0.02, odds ratio [OR] 3.8, confidence interval [CI] 1.2-12.4), SM (p = 0.01, OR 10.3, CI 1.5-205.4), and burst suppression on EEG (p = 0.01, OR 4.6, CI 1.4-17.4). Of 74 patients with SM, 73 (98.6%) had a poor outcome. A nonshockable rhythm (p < 0.001, OR 4.5, CI 2.6-7.9), respiratory arrest (p < 0.001, OR 3.5, CI 1.7-7.2), chronic kidney disease (p < 0.001, OR 3.1, CI 1.6-6.0), and a pressor requirement (p < 0.001, OR 4.4, CI 1.8-10.6) were associated with SM. No patients with SM, anoxic-ischemic magnetic resonance imaging findings, and absent electroencephalographic reactivity had a good outcome. CONCLUSIONS: Sustained status myoclonus after CPR is observed in patients with other reliable indicators of severe acute brain injury and systemic PCAS. These clinical determinants should be incorporated as part of a comprehensive approach to prognostication after CA.

2. Biomed Res Int. 2021 Sep 17;2021:9590131. doi: 10.1155/2021/9590131. eCollection 2021.
Machine Learning Models for Survival and Neurological Outcome Prediction of Out-of-Hospital Cardiac Arrest Patients.

Cheng CY(1)(2), Chiu IM(1)(2), Zeng WH(2), Tsai CM(3), Lin CR(2).

ABSTRACT

BACKGROUND: Out-of-hospital cardiac arrest (OHCA) is a major health problem worldwide, and neurologic injury remains the leading cause of morbidity and mortality among survivors of OHCA. The purpose of this study was to investigate whether a machine learning algorithm could detect complex dependencies between clinical variables in emergency departments in OHCA survivors and perform reliable predictions of favorable neurologic outcomes. METHODS: This study included adults (≥18 years of age) with a sustained return of spontaneous circulation after successful resuscitation from OHCA between 1 January 2004 and 31 December 2014. We applied three machine learning algorithms, including logistic regression (LR), support vector machine (SVM), and extreme gradient boosting (XGB). The primary outcome was a favorable neurological outcome at hospital discharge, defined as a Glasgow-Pittsburgh cerebral performance category of 1 to 2. The secondary outcome was a 30-day survival rate and survival-to-discharge rate. RESULTS: The final analysis included 1071 participants from the study period. For neurologic outcome prediction, the area under the receiver operating curve (AUC) was 0.819, 0.771, and 0.956 in LR, SVM, and XGB, respectively. The sensitivity and specificity were 0.875 and 0.751 in LR, 0.687 and 0.793 in SVM, and 0.875 and 0.904 in XGB. The AUC was 0.766 and 0.732 in LR, 0.749 and 0.725 in SVM, and 0.866 and 0.831 in XGB, for survival-to-discharge and 30-day survival, respectively. CONCLUSIONS: Prognostic models trained with ML technique showed appropriate calibration and high discrimination for survival and neurologic outcome of OHCA without using prehospital data, with XGB exhibiting the best performance.

Association of deranged cerebrovascular reactivity with brain injury following cardiac arrest: a post-hoc analysis of the COMACARE trial.

Laurikkala J(1), Aneman A(2)(3)(4), Peng A(2), Reinikainen M(5), Pham P(6), Jakkula P(7), Hästbacka J(7), Wilkman E(7), Loisa P(8), Toppila J(9), Birkelund T(10), Blennow K(11)(12), Zetterberg H(11)(12)(13)(14), Skrifvars MB(15).

ABSTRACT

BACKGROUND: Impaired cerebrovascular reactivity (CVR) is one feature of post cardiac arrest encephalopathy. We studied the incidence and features of CVR by near infrared spectroscopy (NIRS) and associations with outcome and biomarkers of brain injury. METHODS: A post-hoc analysis of 120 comatose OHCA patients continuously monitored with NIRS and randomised to low- or high-normal oxygen, carbon dioxide and mean arterial blood pressure (MAP) targets for 48 h. The tissue oximetry index (TOx) generated by the moving correlation coefficient between cerebral tissue oxygenation measured by NIRS and MAP was used as a dynamic index of CVR with TOx > 0 indicating impaired reactivity and TOx > 0.3 used to delineate the lower and upper MAP bounds for disrupted CVR. TOx was analysed in the 0-12, 12-24, 24-48 h time-periods and integrated over 0-48 h. The primary outcome was the association between TOx and six-month functional outcome dichotomised by the cerebral performance category (CPC1-2 good vs. 3-5 poor). Secondary outcomes included associations with MAP bounds for CVR and biomarkers of brain injury. RESULTS: In 108 patients with sufficient data to calculate TOx, 76 patients (70%) had impaired CVR and among these, chronic hypertension was more common (58% vs. 31%, p = 0.002). Integrated TOx for 0-48 h was higher in patients with poor outcome than in patients with good outcome (0.89 95% CI [- 1.17 to 2.94] vs. - 2.71 95% CI [- 4.16 to - 1.26], p = 0.05). Patients with poor outcomes had a decreased upper MAP bound of CVR over time (p = 0.001), including the high-normal oxygen (p = 0.002), carbon dioxide (p = 0.012) and MAP (p = 0.001) groups. The MAP range of maintained CVR was narrower in all time intervals and intervention groups (p < 0.05). NfL concentrations were higher in patients with

impaired CVR compared to those with intact CVR (43 IQR [15-650] vs 20 IQR [13-199] pg/ml, p = 0.042). CONCLUSION: Impaired CVR over 48 h was more common in patients with chronic hypertension and associated with poor outcome. Decreased upper MAP bound and a narrower MAP range for maintained CVR were associated with poor outcome and more severe brain injury assessed with NfL. Trial registration ClinicalTrials.gov, NCT02698917 .

4. Ann N Y Acad Sci. 2021 Sep 27. doi: 10.1111/nyas.14699. Online ahead of print.
Outcome and prognostication after cardiac arrest.

Henson T(1), Rawaduzy C(2), Salazar M(2), Sebastian A(2), Weber H(2), Al-Mufti F(1)(2), Mayer SA(1)(2).

ABSTRACT

The outcome after out-of-hospital cardiac arrest has historically been grim at best. The current overall survival rate of patients admitted to a hospital is approximately 10%, making cardiac arrest one of the leading causes of death in the United States. The situation is improving with the incorporation of therapeutic temperature modulation, aggressive prevention of secondary brain injury, and improved access to advanced cardiovascular support, all of which have decreased mortality and allowed for better outcomes. Mortality after cardiac arrest is often the direct result of active withdrawal of life-sustaining therapy based on the perception that neurological recovery is not possible. This reality highlights the importance of providing accurate estimates of neurological prognosis to decision makers when discussing goals of care. The current standard of care for assessing neurological status in patients with hypoxic-ischemic encephalopathy emphasizes a multimodal approach that includes five elements: (1) neurological examination off sedation, (2) continuous electroencephalography, (3) serum neuron-specific enolase levels, (4) magnetic resonance brain imaging, and (5) somatosensory-evoked potential testing. Sophisticated decision support systems that can integrate these clinical, imaging, and biomarker and neurophysiologic data and translate it into meaningful projections of neurological outcome are urgently needed.

ULTRASOUND AND CPR

1. J Cardiovasc Dev Dis. 2021 Sep 15;8(9):112. doi: 10.3390/jcdd8090112.
DNR Code Status Is Not Associated with Under-Utilization of Inpatient Transthoracic Echocardiograms.

Katamreddy A(1), Wengrofsky AJ(2), Li W(1), Taub CC(3).

ABSTRACT

In the strictest sense, do-not-resuscitate (DNR) status means that cardiopulmonary resuscitation should not be performed after death has occurred; all other medical interventions in line with a patient's goals of care should be implemented. The use of transthoracic echocardiography (TTE) in patients with DNR status is unknown. Therefore, we aim to evaluate the utilization of TTE among patients with DNR status using this retrospective data analysis. A total of 16,546 patient admissions were included in the final study. A total of 4370 (26.4%) of the patients had a TTE during hospitalization; among full code patients, 3976 (25.7%) underwent TTE, whereas TTEs were performed in 394 (37.4%) of DNR patients. On univariate logistic regression analysis, full code status had OR (95% confidence interval, CI) 0.57 (0.51-0.66), p < 0.01 compared with DNR status for the performance of inpatient TTE. In the final multivariate model adjusted for age, sex, race, and clinical comorbidities, the full code patients had OR (95% CI) 0.91 (0.79-1.05), p = 0.22 compared with DNR patients for the performance of inpatient TTE. DNR status is not associated with a decrease in inpatient transthoracic echocardiography performance.

ORGANISATION AND TRAINING

The 10-Year Trend of Out-of-hospital Cardiac Arrests: a Korean Nationwide Population-Based Study.
Roh SY(1), Choi JI(2), Park SH(3), Kim YG(1), Shim J(1), Kim JS(1), Han KD(4), Kim YH(1).
ABSTRACT
BACKGROUND AND OBJECTIVES: It is crucial to understand the exact public health burden of out-of-hospital cardiac arrest (OHCA) cases; this is presently unknown since sufficient episodes are not reported in registry studies. We aimed to evaluate the epidemiologic features and outcomes of non-traumatic OHCA. METHODS: During January 2008 to December 2017, we enrolled 387,665 patients who had been assigned a code for sudden cardiac arrest or had undergone cardiopulmonary resuscitation in the emergency room using the Korean National Health Insurance Service database. Those whose arrest was of non-cardiac origin were excluded. RESULTS: The incidence of OHCA per 100,000 patients increased steadily from 48.2 in 2008 to, 53.8 in 2011, 60.1 in 2014, and 66.7 in 2017, with a 1-year survival rate of 8.2%. Age and sex-adjusted mortality rates showed a decreasing trend. The hazard ratio was 1.0015 in 2009, 0.9865 in 2012, 0.9769 in 2015, and 0.9629 in 2017 (p for trend <0.0001), with coronary artery disease-related OHCA accounting for 59.8% of the total. Subgroups with coronary artery disease-related OHCA were more likely to be older and have a higher prevalence of all related comorbidities, excluding malignancy, than those with non-coronary artery disease-related OHCA. CONCLUSIONS: This nationwide population-based study showed that the incidence of OHCA in Korea had increased during the last decade. The post OHCA 1-year mortality rate showed a poor outcome but improved gradually.

Community first responders for out-of-hospital cardiac arrest in adults and children.
[Article in English, Spanish]
Barry T(1), C Doheny M(1), Masterson S(2), Conroy N(3), Klimas J(4), Segurado R(5), Codd M(5), Bury G(1).
NO ABSTRACT AVAILABLE

Advanced do-not-attempt-resuscitation directives and emergency medical services for out-of-hospital cardiopulmonary arrest patients in Japan: a pilot study.
Maruhashi T(1), Oi M(1), Asakuma S(1), Kotoh R(1), Shibuya H(1), Kurihara Y(1), Asari Y(1).
ABSTRACT
AIMS: We investigated how do-not-attempt-resuscitation (DNAR) orders are currently used, and we examined the emergency medical team responses for out-of-hospital cardiac arrest (OHCA) cases in Japan. METHODS: The sample for this prospective study comprised all OHCA cases attended to by the Sagamihara Municipal Fire Department emergency medical services between May 30, 2019 and February 15, 2020. Data were recorded by the responding emergency medical team. RESULTS: There were 396 OHCA cases. The mean age was 75 ± 18 years, and individuals aged 65 years or older accounted for 80.6%. Approximately 70% of the patients had an underlying disease. A DNAR order was available in only 45 (11.4%) of the cases, of which 12 (26.7%) were written, 27 (60%) were verbally confirmed, and six (13.3%) were confirmed in some other way or both. The home physician was present and able to confirm the patient's death in only one of the DNAR cases. In 43 (95.6%) of the cases, the emergency medical team carried out cardiopulmonary resuscitation despite a DNAR order; of them, a total of 17 (37.8%) patients were transported to a tertiary emergency hospital.

CONCLUSIONS: Our analyses indicate the under-utilization of DNAR advance directives and advance care planning (which are important for better end-of-life care) in Japan. Currently, an emergency medical team could be required to attempt resuscitation against an individuals' clear DNAR order. In the future, legal arrangements regarding the handling of DNAR directives on site may be required to respect patients' wishes.

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Correction to: CPR with restricted patient access using alternative rescuer positions: a randomised cross-over manikin study simulating the CPR scenario after avalanche burial.
Wallner B(1)(2), Moroder L(3), Salchner H(4), Mair P(4), Wallner S(4), Putzer G(4), Strapazzon G(5), Falk M(5)(6), Brugger H(5).
NO ABSTRACT AVAILABLE

5. Curr Opin Crit Care. 2021 Sep 27. doi: 10.1097/MCC.0000000000000892. Online ahead of print.
Cardiopulmonary resuscitation 2021: the new guidelines on cardiopulmonary resuscitation, the BIG FIVE et al. will help to save hundreds of thousands of lives annually in the world.
Böttiger BW(1), Rott N.
NO ABSTRACT AVAILABLE

6. Resuscitation. 2021 Sep 24:S0300-9572(21)00374-9. doi: 10.1016/j.resuscitation.2021.09.020. Online ahead of print.
Free distance learning of cardiopulmonary resuscitation for laypeople - a reasonable way for improving cardiac arrest outcomes in low-resource settings.
Birkun A(1).
NO ABSTRACT AVAILABLE

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Effects of cardiopulmonary resuscitation on direct versus video laryngoscopy using a mannequin model.
Kei J(1), Mebust DP(2).
ABSTRACT
INTRODUCTION: During the last decade, guidelines for cardiopulmonary resuscitation has shifted, placing chest compressions and defibrillation first and airway management second. Physicians are being forced to intubate simultaneously with uninterrupted, high quality chest compressions. Using a mannequin model, this study examines the differences between direct and video laryngoscopy, comparing their performance with and without simultaneous chest compressions. METHODS: Fifty emergency medicine physicians were randomly assigned to intubate a mannequin six times, using direct laryngoscopy (DL) and with two video laryngoscopy (VL) systems, a C-MAC traditional Macintosh blade and a GlideScope hyperangulated blade, with and without simultaneous chest compressions. A total of 300 intubations were completed and variables including intubation times, accuracy, difficulty, success rates and glottic views were recorded. RESULTS: The C-MAC VL system resulted in quicker intubations compared to DL (p = 0.007) and the GlideScope VL system (p = 0.039) during active chest compressions. Compared to DL, intubations were rated easier for both the C-MAC (p < 0.0001) and the GlideScope (p < 0.0001). Intubation failure rates were also higher when DL was used compared to either the C-MAC or GlideScope (p = 0.029). VL devices provided a superior overall Cormack-Lehane grade view compared to DL (p < 0.0001). The presence of chest compressions significantly impaired Cormack-Lehane views during direct laryngoscopy (p = 0.007).

Chest compressions made the intubation more difficult under DL (p = 0.002) and when using the C-MAC (p = 0.031). Chest compressions also made ETT placement less accurate when using DL (p = 0.004). CONCLUSION: Using a mannequin model, the C-MAC conventional VL blade resulted in decrease intubation times compared with DL or the GlideScope hyperangulated VL blade system. Overall, VL outperformed DL in terms of providing a superior glottic view, minimizing failed attempts, and improving physician's overall perception of intubation difficulty. Chest compressions resulted in worse Cormack-Lehane views and higher rates of inaccurate endotracheal tube placement with DL, compared to VL.

Validation of the NUE Rule to Predict Futile Resuscitation of Out-of-Hospital Cardiac Arrest.
Glober NK, Lardaro T, Christopher S, Tainter CR, Weinstein E, Kim D.
ABSTRACT
AIM: We validated the NUE rule, using three criteria (Non-shockable initial rhythm, Unwitnessed arrest, Eighty years or older) to predict futile resuscitation of patients with out-of-hospital cardiac arrest (OHCA). METHODS: We performed a retrospective cohort analysis of all recorded OHCA in Marion County, Indiana, from January 1, 2014 to December 31, 2019. We described patient, arrest, and emergency medical services (EMS) response characteristics, and assessed the performance of the NUE rule in identifying patients unlikely to survive to hospital discharge. RESULTS: From 2014 to 2019, EMS responded to 4370 patients who sustained OHCA. We excluded 329 (7.5%) patients with incomplete data. Median patient age was 62 years (IQR 49 - 73), 1599 (39.6%) patients were female, and 1728 (42.8%) arrests were witnessed. The NUE rule identified 290 (7.2%) arrests, of whom none survived to hospital discharge. CONCLUSION: In external validation, the NUE rule (Non-shockable initial rhythm, Unwitnessed arrest, Eighty years or older) correctly identified 7.2% of OHCA patients unlikely to survive to hospital discharge. The NUE rule could be used in EMS protocols and policies to identify OHCA patients very unlikely to benefit from aggressive resuscitation.

Previous Intensive Running or Swimming Negatively Affects CPR Effectiveness.
Abraldes JA(1), Fernandes RJ(2)(3), Morán-Navarro R(4).
ABSTRACT
Survival outcomes increase significantly when cardiopulmonary resuscitation (CPR) is provided correctly, but rescuers' fatigue can compromise its delivery. We investigated the effect of two exercise modes on CPR effectiveness and physiological outputs. After 4 min baseline conditions, 30 lifeguards randomly performed a 100 m run and a combined water rescue before 4 min CPR (using an adult manikin and a 30:2 compression-ventilation ratio). Physiological variables were continuously measured during baseline and CPR using a portable gas analyzer (K4b2, Cosmed, Rome, Italy) and CPR effectiveness was analyzed using two HD video cameras. Higher oxygen uptake (23.0 ± 9.9 and 20.6 ± 9.1 vs. 13.5 ± 6.2 mL·kg·min-1) and heart rate (137 ± 19 and 133 ± 15 vs. 114 ± 15 bpm), and lower compression efficacy (63.3 ± 29.5 and 62.2 ± 28.3 vs. 69.2 ± 28.0%), were found for CPRrun and CPRswim compared to CPRbase. In addition, ventilation efficacy was higher in the rescues preceded by intense exercise than in CPRbase (49.5 ± 42.3 and 51.9 ± 41.0 vs. 33.5 ± 38.3%), but no differences were detected between CPRrun and CPRswim. In conclusion, CPRrun and CPRswim protocols induced a relevant physiological stress over each min and in the overall CPR compared with CPRbase. The CPRun protocol reduces the compression rate but has a higher effectiveness percentage than the CPRswim protocol, in which there is a considerably higher compression rate but with less efficacy.

POST-CARDIAC ARREST TREATMENTS

Cardiovascular complications of prehospital emergency anaesthesia in patients with return of spontaneous circulation following medical cardiac arrest: a retrospective comparison of ketamine-based and midazolam-based induction protocols.

King C(1), Lewinsohn A(2), Keeliher C(2), McLachlan S(3)(4), Sherrin J(5), Khan-Cheema H(5), Sherren P(2).

ABSTRACT

BACKGROUND: Hypotension following intubation and return of spontaneous circulation (ROSC) after cardiac arrest is associated with poorer patient outcomes. In patients with a sustained ROSC requiring emergency anaesthesia, there is limited evidence to guide anaesthetic practice. At the Essex & Herts Air Ambulance Trust, a UK-based helicopter emergency medical service, we assessed the relative haemodynamic stability of two different induction agents for post-cardiac arrest medical patients requiring prehospital emergency anaesthesia (PHEA). METHODS: We performed a retrospective database review over a 5-year period between December 2014 and December 2019 comparing ketamine-based and midazolam-based anaesthesia in this patient cohort. Our primary outcome was clinically significant hypotension within 30 min of PHEA, defined as a new systolic BP less than 90 mm Hg, or a 10% drop if less than 90 mm Hg before induction. RESULTS: One hundred ninety-eight patients met inclusion criteria. Forty-eight patients received a ketamine-based induction, median dose (IQR) 1.00 (1.00-1.55) mg/kg, and a 150 midazolam-based regime, median dose 0.03 (0.02-0.04) mg/kg. Hypotension occurred in 54.2% of the ketamine group and 50.7% of the midazolam group (p=0.673). Mean maximal HRs within 30 min of PHEA were 119 beats/min and 122 beats/min, respectively (p=0.523). A shock index greater than 1.0 beats/min/mm Hg and age greater than 70 years were both associated with post-PHEA hypotension with ORs 1.96 (CI 1.02 to 3.71) and 1.99 (CI 1.01 to 3.90), respectively. Adverse event rates did not significantly differ between groups. CONCLUSION: PHEA following a medical cardiac arrest is associated with potentially significant cardiovascular derangements when measured up to 30 min after induction of anaesthesia. There was no demonstrable difference in post-induction hypotension between ketamine-based and midazolam-based PHEA. Choice of induction agent alone is insufficient to mitigate haemodynamic disturbance, and alternative strategies should be used to address this.

High Oxygen Does Not Increase Reperfusion Injury Assessed with Lipid Peroxidation Biomarkers after Cardiac Arrest: A Post Hoc Analysis of the COMACARE Trial.

Humaloja J(1), Vento M(2), Kuligowski J(2), Andersson S(3), Piñeiro-Ramos JD(2), Sánchez-Illana Á(2), Litonius E(4), Jakkula P(4), Hästbacka J(4), Bendel S(5), Tiainen M(6), Reinikainen M(5), Skrifvars MB(1).

ABSTRACT

The products of polyunsaturated fatty acid peroxidation are considered reliable biomarkers of oxidative injury in vivo. We investigated ischemia-reperfusion-related oxidative injury by determining the levels of lipid peroxidation biomarkers (isoprostane, isofuran, neuroprostane, and neurofuran) after cardiac arrest and tested the associations between the biomarkers and different arterial oxygen tensions (PaO2). We utilized blood samples collected during the COMACARE trial (NCT02698917). In the trial, 123 patients resuscitated from out-of-hospital cardiac arrest were treated with a 10-15 kPa or 20-25 kPa PaO2 target during the initial 36 h in the intensive care unit. We measured the biomarker levels at admission, and 24, 48, and 72 h thereafter. We compared

biomarker levels in the intervention groups and in groups that differed in oxygen exposure prior to randomization. Blood samples for biomarker determination were available for 112 patients. All four biomarker levels peaked at 24 h; the increase appeared greater in younger patients and in patients without bystander-initiated life support. No association between the lipid peroxidation biomarkers and oxygen exposure either before or after randomization was found. Increases in the biomarker levels during the first 24 h in intensive care suggest continuing oxidative stress, but the clinical relevance of this remains unresolved.

Elevated Plasma Soluble PD-L1 Levels in Out-of-Hospital Cardiac Arrest Patients.
Sumiyoshi M(1)(2), Kawamoto E(2)(3), Nakamori Y(2), Esumi R(2)(3), Ikejiri K(3), Shinkai T(3), Akama Y(2)(3), Ito-Masui A(2)(3), Imai H(3), Gaowa A(2), Park EJ(2), Shimaoka M(2).
ABSTRACT
Background: A deregulated immune system has been implicated in the pathogenesis of post-cardiac arrest syndrome (PCAS). A soluble form of programmed cell death-1 (PD-1) ligand (sPD-L1) has been found at increased levels in cancer and sustained inflammation, thereby deregulating immune functions. Here, we aim to study the possible involvement of sPD-L1 in PCAS. Methods: Thirty out-of-hospital cardiac arrest (OHCA) patients consecutively admitted to the ER of Mie University Hospital were prospectively enrolled. Plasma concentrations of sPD-L1 were measured by an enzyme-linked immunosorbent assay in blood samples of all 30 OHCA patients obtained during cardiopulmonary resuscitation (CPR). In 13 patients who achieved return-of-spontaneous-circulation (ROSC), sPD-L1 levels were also measured daily in the ICU. Results: The plasma concentrations of sPD-L1 in OHCA were significantly increased; in fact, to levels as high as those observed in sepsis. sPD-L1 levels during CPR correlated with reduced peripheral lymphocyte counts and increased C-reactive protein levels. Of 13 ROSC patients, 7 cases survived in the ICU for more than 4 days. A longitudinal analysis of sPD-L1 levels in the 7 ROSC cases revealed that sPD-L1 levels occurred in parallel with organ failure. Conclusions: This study suggests that ischemia- reperfusion during CPR may aberrantly activate immune and endothelial cells to release sPD-L1 into circulation, which may play a role in the pathogenesis of immune exhaustion and organ failures associated with PCAS.

Sublingual Microcirculation predicts Survival after Out-of-Hospital Cardiac Arrest.
Voß F(1), Karbenn M(1), Hoffmann T(2), Schweitzer J(1), Jung C(1), Bernhard M(3), Kienbaum P(4), Kelm M(1)(5), Westenfeld R(1).
ABSTRACT
BACKGROUND: Despite successful resuscitation with return of spontaneous circulation (ROSC) prediction of survival in patients suffering out-of-hospital cardiac arrest (OHCA) remains difficult. Several studies have shown alterations in sublingual microcirculation in the critical ill. We hypothesized that early alterations in sublingual microcirculation may predict short-term survival after OHCA. METHODS: We prospectively included all adults admitted to our university hospital between April and September 2019 with ROSC following OHCA. Sidestream darkfield microscopy to obtain sublingual microcirculation was performed at admission and after 6, 12 and 24 hours. Primary outcome was survival until discharge. RESULTS: 25 patients were included. Six hours after ROSC the proportion of perfused small vessels (PPVsmall) was lower in non-survivors than in survivors (85 ± 7.9 vs. 75 ± 6.6 %; p= 0.01). PPVsmall did not correlate with serum lactate. Stratification for survival with cut-off values >78.4% for PPVsmall 6 hours post admission and <5.15 mmol/l for initial serum lactate as suggested by ROC-Analyses results in a positive predictive value of 100% and a negative one of 67% for our study population. CONCLUSION: Estimating short-term prognosis of OHCA patients with ROSC may be supported by measuring the PPVsmall at the sublingual microcirculation 6 hours after admission.

TARGETED TEMPERATURE MANAGEMENT

Increasing the Effectiveness of Targeted Temperature Management.
Moreda M(1), Beacham PS(2), Reese A(3), Mulkey MA(4).
ABSTRACT
TOPIC: Targeted temperature management and therapeutic hypothermia are essential components of the multimodal approach to caring for compromised patients after cardiac arrest and severe traumatic brain injury. CLINICAL RELEVANCE: The continuously evolving science necessitates summation of individual facets and concepts to enhance knowledge and application for optimally delivering care. Targeted temperature management is a complex therapy that requires fine-tuning the most effective interventions to maintain high-quality targeted temperature management and maximize patient outcomes. PURPOSE: To describe the underlying pathophysiology of fever and the importance of manipulating water temperature and of preventing and treating shivering during that process. CONTENT COVERED: This article discusses nursing considerations regarding the care of patients requiring targeted temperature management that are necessary to improve patient outcomes.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

Prognostic value of changes in the cardiac arrest rhythms from the prehospital stage to the emergency department in out-of-hospital cardiac arrest patients without prehospital returns of spontaneous circulation: A nationwide observational study.
Kim JG(1)(2), Shin H(3), Cho JH(4), Choi HY(1), Kim W(1), Kim J(5), Moon S(6), Ahn C(7), Lee J(8), Cho Y(9), Shin DG(10), Lee Y(1).
ABSTRACT
BACKGROUND: This study aimed to assess the prognostic value of the changes in cardiac arrest rhythms from the prehospital stage to the ED (emergency department) in out-of-hospital cardiac arrest (OHCA) patients without prehospital returns of spontaneous circulation (ROSC). METHODS: This retrospective analysis was performed using nationwide population-based OHCA data from South Korea between 2012 and 2016. Patients with OHCA with medical causes and without prehospital ROSC were included and divided into four groups according to the nature of their cardiac arrest rhythms (shockable or non-shockable) in the prehospital stage and in the ED: (1) the shockable and shockable (Shock-Shock) group, (2) the shockable and non-shockable (Shock-NShock) group, (3) the non-shockable and shockable (NShock-Shock) group, and (4) the non-shockable and non-shockable (NShock-NShock) group. The presence of a shockable rhythm was confirmed based on the delivery of an electrical shock. Propensity score matching and multivariate logistic regression analyses were used to assess the effect of changes in the cardiac rhythms on patient outcomes. The primary outcome was sustained ROSC in the ED; the secondary outcomes were survival to hospital discharge and good neurological outcomes at hospital discharge. RESULTS: After applying the exclusion criteria, 51,060 eligible patients were included in the study (Shock-Shock, 4223; Shock-NShock, 3060; NShock-Shock, 11,509; NShock-NShock, 32,268). The propensity score-matched data were extracted from the six comparative subgroups. For sustained ROSC in the ED, Shock-Shock showed a higher likelihood than Shock-NShock (P <0.01) and NShock-NShock (P <0.01), Shock-NShock showed a lower likelihood than NShock-Shock (P <0.01) and NShock-NShock (P <0.01), NShock-Shock showed a higher likelihood NShock-NShock (P <0.01). For survival to hospital

discharge, Shock-Shock showed a higher likelihood than Shock-NShock (P <0.01), NShock-Shock (P <0.01), and NShock-NShock (P <0.01), Shock-NShock showed a higher likelihood than NShock-Shock (P <0.01) and NShock-NShock (P <0.01), of sustained ROSC in the ED. For good neurological outcomes, Shock-Shock showed higher likelihood than Shock-NShock (P <0.01), NShock-Shock (P <0.01), and NShock-NShock (P <0.01), Shock-NShock showed better likelihood than NShock-NShock (P <0.01), NShock-Shock showed a better likelihood than NShock-NShock (P <0.01). CONCLUSION: Sustained ROSC in the ED may be expected for patients with shockable rhythms in the ED compared with those with non-shockable rhythms in the ED. For the clinical outcomes, survival to hospital discharge and neurological outcomes, patients with Shock-Shock showed the best outcome, whereas patients with NShock-NShock showed the poorest outcome and Shock-NShock showed a higher likelihood of achieving survival to hospital discharge with no significant differences in the neurological outcomes compared with NShock-Shock.

Analysis of the Way and Correctness of Using Automated External Defibrillators Placed in Public Space in Polish Cities-Continuation of Research.
Ślęzak D(1), Robakowska M(2), Żuratyński P(1), Synoweć J(3), Pogorzelczyk K(2), Krzyżanowski K(1), Błażek M(4), Woroń J(5).
ABSTRACT
Immediate resuscitation is required for any sudden cardiac arrest. To improve the survival of the patient, a device to be operated by witnesses of the event-automated external defibrillator (AED)-has been produced. The aim of this study is to analyze the way and correctness of use of automated external defibrillators placed in public spaces in Polish cities. The data analyzed (using Excel 2019 and R 3.5.3 software) are 120 cases of use of automated external defibrillators, placed in public spaces in the territory of Poland in 2008-2018. The predominant location of AED use is in public transportation facilities, and the injured party is the traveler. AED use in non-hospital settings is more common in male victims aged 50-60 years. Owners of AEDs inadequately provide information about their use. The documentation that forms the basis of the emergency medical services intervention needs to be refined. There is no mention of resuscitation performed by a witness of an event or of the use of an AED. In addition, Poland lacks the legal basis for maintaining a register of automated external defibrillators. There is a need to develop appropriate documents to determine the process of reporting by the owners of the use of AEDs in out-of-hospital conditions (OHCA).

Insights From the Ventricular Fibrillation Waveform Into the Mechanism of Survival Benefit From Bystander Cardiopulmonary Resuscitation.
Bessen B(1), Coult J(2)(3), Blackwood J(3)(4), Hsu CH(5)(6), Kudenchuk P(2)(3)(4), Rea T(2)(3)(4), Kwok H(3)(7).
ABSTRACT
Background The mechanism by which bystander cardiopulmonary resuscitation (CPR) improves survival following out-of-hospital cardiac arrest is unclear. We hypothesized that ventricular fibrillation (VF) waveform measures, as surrogates of myocardial physiology, mediate the relationship between bystander CPR and survival. Methods and Results We performed a retrospective cohort study of adult, bystander-witnessed patients with out-of-hospital cardiac arrest with an initial rhythm of VF who were treated by a metropolitan emergency medical services system from 2005 to 2018. Patient, resuscitation, and outcome variables were extracted from emergency medical services and hospital records. A total of 3 VF waveform measures (amplitude spectrum area, peak frequency, and median peak amplitude) were computed from a 3-second ECG segment before

the initial shock. Multivariable logistic regression estimated the association between bystander CPR and survival to hospital discharge adjusted for Utstein elements. Causal mediation analysis quantified the proportion of survival benefit that was mediated by each VF waveform measure. Of 1069 patients, survival to hospital discharge was significantly higher among the 814 patients who received bystander CPR than those who did not (0.52 versus 0.43, respectively; P<0.01). The multivariable-adjusted odds ratio for bystander CPR and survival was 1.6 (95% CI, 1.2, 2.1), and each VF waveform measure attenuated this association. Depending on the specific waveform measure, the proportion of mediation varied: 53% for amplitude spectrum area, 31% for peak frequency, and 29% for median peak amplitude. Conclusions Bystander CPR correlated with more robust initial VF waveform measures, which in turn mediated up to one-half of the survival benefit associated with bystander CPR. These results provide insight into the biological mechanism of bystander CPR in VF out-of-hospital cardiac arrest.

PEDIATRICS AND CHILDREN

1. Resuscitation. 2021 Sep 29:S0300-9572(21)00377-4. doi: 10.1016/j.resuscitation.2021.09.023. Online ahead of print.
Deviations from NIRS-derived optimal blood pressure are associated with worse outcomes after pediatric cardiac arrest.
Kirschen M(1), Majmudar T(2), Beaulieu F(3), Burnett R(4), Shaik M(3), Morgan RW(5), Baker W(6), Ko T(4), Balu R(6), Agarwal K(7), Lourie K(7), Sutton R(5), Kilbaugh T(5), Diaz-Arrastia R(2), Berg R(5), Topjian A(5).
ABSTRACT
AIM: Evaluate cerebrovascular autoregulation (CAR) using near-infrared spectroscopy (NIRS) after pediatric cardiac arrest and determine if deviations from CAR-derived optimal mean arterial pressure (MAPopt) are associated with outcomes. METHODS: CAR was quantified by a moving, linear correlation between time-synchronized mean arterial pressure (MAP) and regional cerebral oxygenation, called cerebral oximetry index (COx). MAPopt was calculated using a multi-window weighted algorithm. We calculated burden (magnitude and duration) of MAP less than 5mmHg below MAPopt (MAPopt-5), as the area between MAP and MAPopt-5 curves using numerical integration and normalized as percentage of monitoring duration. Unfavorable outcome was defined as death or pediatric cerebral performance category (PCPC) at hospital discharge ≥3 with ≥1 change from baseline. Univariate logistic regression tested association between burden of MAP less than MAPopt-5 and outcome. RESULTS: Thirty-four children (median age 2.9 [IQR 1.5,13.4] years) were evaluated. Median COx in the first 24 hours post-cardiac arrest was 0.06 [0,0.20]; patients spent 27% [19,43] of monitored time with COx ≥0.3. Patients with an unfavorable outcome (n=24) had a greater difference between MAP and MAPopt-5 (13 [11,19] vs. 9 [8,10] mmHg, p=0.01) and spent more time with MAP below MAPopt-5 (38% [26,61] vs. 24% [14,28], p=0.03). Patients with unfavorable outcome had a higher burden of MAP less than MAPopt-5 than patients with favorable outcome in the first 24 hours post-arrest (187 [107,316] vs. 62 [43,102] mmHg×Min/Hr; OR 4.93 [95% CI 1.16 to 51.78]). CONCLUSIONS: Greater burden of MAP below NIRS-derived MAPopt-5 during the first 24 hours after cardiac arrest was associated with unfavorable outcomes.

2. BMJ Paediatr Open. 2021 Sep 14;5(1):e001092. doi: 10.1136/bmjpo-2021-001092. eCollection 2021.
Neonatal resuscitation practices in Uganda: a video observational study.
Helldén D(#)(1), Myrnerts Höök S(#)(1)(2)(3), Pejovic NJ(1)(2)(3), Mclellan D(1), Lubulwa C(4), Tylleskär T(2)(5), Alfven T(1)(3).

ABSTRACT

BACKGROUND: Neonatal mortality, often due to birth asphyxia, remains stubbornly high in sub-Saharan Africa. Guidelines for neonatal resuscitation, where achieving adequate positive pressure ventilation (PPV) is key, have been implemented in low-resource settings. However, the actual clinical practices of neonatal resuscitation have rarely been examined in these settings. The primary aim of this prospective observational study was to detail the cumulative proportion of time with ventilation during the first minute on the resuscitation table of neonates needing PPV at the Mulago National Referral Hospital in Kampala, Uganda. METHODS: From November 2015 to January 2016, resuscitations of non-breathing neonates by birth attendants were video-recorded using motion sensor cameras. The resuscitation practices were analysed using the application NeoTapAS and compared between those taking place in the labour ward and those in theatre through Fisher's exact test and Wilcoxon rank-sum test. RESULTS: From 141 recorded resuscitations, 99 were included for analysis. The time to initiation of PPV was 66 (42-102) s overall, and there was minimal PPV during the first minute in both groups with 0 (0-10) s and 0 (0-12) s of PPV, respectively. After initiating PPV the overall duration of interruptions during the first minute was 28 (18-37) s. Majority of interruptions were caused by stimulation (28%), unknown reasons (25%) and suction (22%). CONCLUSIONS: Our findings show a low adherence to standard resuscitation practices in 2015-2016. This emphasises the need for continuous educational efforts and investments in staff and adequate resources to increase the quality of clinical neonatal resuscitation practices in low-resource settings.

EXTRACORPOREAL LIFE SUPPORT

Association between a Multidisciplinary Team Approach and Clinical Outcomes in Patients Undergoing Extracorporeal Cardiopulmonary Resuscitation in the Emergency Department.
Lee JH(1), Ko RE(2), Park TK(3), Cho YH(4), Suh GY(2), Yang JH(2)(5).

ABSTRACT

BACKGROUND AND OBJECTIVES: Despite recent improvements in advanced life support, the overall survival rate after cardiac arrest remains low. We aimed to examine the association of a multidisciplinary team approach with clinical outcomes in patients undergoing extracorporeal cardiopulmonary resuscitation (ECPR) in the emergency department (ED). METHODS: This retrospective, single-center, observational study included 125 patients who underwent ECPR in the ED between May 2004-December 2018. In January 2014, our institution implemented a multi-disciplinary extracorporeal membrane oxygenation (ECMO) team. Eligible patients were classified into pre-ECMO-team (n=65) and post-ECMO-team (n=60) groups. The primary outcome was in-hospital mortality. RESULTS: In-hospital mortality (72.3% vs. 58.3%, p=0.102) and poor neurological outcomes (78.5% vs. 68.3%, p=0.283) did not differ significantly between the pre- and post-ECMO-team groups. However, among the 60 patients who experienced in-hospital cardiac arrest, in-hospital mortality (75.8% vs. 40.7%, p=0.006) and poor neurological outcomes (78.8% vs. 48.1%, p=0.015) significantly decreased after the multidisciplinary team formation. Multivariable logistic regression analysis showed that the multidisciplinary team approach (adjusted odds ratio, 0.20; 95% confidence interval, 0.07-0.61; p=0.005) was an independent prognostic factor for in-hospital mortality in in-hospital cardiac arrest patients. CONCLUSIONS: A multidisciplinary team approach was associated with improved clinical outcomes in in-hospital cardiac arrest patients undergoing ECPR in the ED. These findings may help in improving the selection criteria for ECPR in the ED. Further studies to overcome the study limitations may help improving the outcomes of out-of-hospital cardiac arrest patients.

Prognosis of Hypothermic Patients Undergoing ECLS Rewarming-Do Alterations in Biochemical Parameters Matter?

Hymczak H(1)(2), Podsiadło P(3), Kosiński S(4), Pasquier M(5), Mendrala K(6), Hudziak D(7), Gocoł R(7), Plicner D(8), Darocha T(6).

ABSTRACT

BACKGROUND: While ECLS is a highly invasive procedure, the identification of patients with a potentially good prognosis is of high importance. The aim of this study was to analyse changes in the acid-base balance parameters and lactate kinetics during the early stages of ECLS rewarming to determine predictors of clinical outcome. METHODS: This single-centre retrospective study was conducted at the Severe Hypothermia Treatment Centre at John Paul II Hospital in Krakow, Poland. Patients ≥18 years old who had a core temperature (Tc) < 30 °C and were rewarmed with ECLS between December 2013 and August 2018 were included. Acid-base balance parameters were measured at ECLS implantation, at Tc 30 °C, and at 2 and 4 h after Tc 30 °C. The alteration in blood lactate kinetics was calculated as the percent change in serum lactate concentration relative to the baseline. RESULTS: We included 50 patients, of which 36 (72%) were in cardiac arrest. The mean age was 56 ± 15 years old, and the mean Tc was 24.5 ± 12.6 °C. Twenty-one patients (42%) died. Lactate concentrations in the survivors group were significantly lower than in the non-survivors at all time points. In the survivors group, the mean lactate concentration decreased -2.42 ± 4.49 mmol/L from time of ECLS implantation until 4 h after reaching Tc 30 °C, while in the non-survivors' group (p = 0.024), it increased 1.44 ± 6.41 mmol/L. CONCLUSIONS: Our results indicate that high lactate concentration is associated with a poor prognosis for hypothermic patients undergoing ECLS rewarming. A decreased value of lactate kinetics at 4 h after reaching 30 °C is also associated with a poor prognosis.

The impact of selection criteria and study design on reported survival outcomes in extracorporeal oxygenation cardiopulmonary resuscitation (ECPR): a systematic review and meta-analysis.

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ABSTRACT

BACKGROUND: The use of extracorporeal membrane oxygenation (ECMO) during cardiac arrest (ECPR) has increased exponentially. However, reported outcomes vary considerably due to differing study designs and selection criteria. This review assessed the impact of pre-defined selection criteria on ECPR survival. METHODS: Systematic review applying PRISMA guidelines. We searched Medline, Embase, and Evidence-Based Medicine Reviews for RCTs and observational studies published from January 2000 to June 2021. Adult patients (> 12 years) receiving ECPR were included. Two investigators reviewed and extracted data on study design, number and type of inclusion criteria. Study quality was assessed using the Newcastle-Ottawa Scale (NOS). Outcomes included overall and neurologically favourable survival. Meta-analysis and meta-regression were performed. RESULTS: 67 studies were included: 14 prospective and 53 retrospective. No RCTs were identified at time of search. The number of inclusion criteria to select ECPR patients (p = 0.292) and study design (p = 0.962) was not associated with higher favourable neurological survival. However, amongst prospective studies, increased number of inclusion criteria was associated with improved outcomes in both OHCA and IHCA cohorts. (β = 0.12, p = 0.026) and arrest to ECMO flow time was predictive of survival. (β = -0.023, p < 0.001). CONCLUSIONS: Prospective studies showed number of selection criteria and, in particular, arrest to ECMO time were associated with significant improved survival. Well-designed prospective studies assessing the relative importance of criteria as well as larger efficacy studies are required to ensure appropriate application of what is a costly intervention.

The first year of experience with an extracorporeal resuscitation program for refractory in-hospital cardiac arrest.

Chico-Carballas JI(1), Touceda-Bravo A(2), Freita-Ramos S(2), Mosquera-Rodriguez D(2), Gómez-Casal V(2), Piñon-Esteban M(3).

NO ABSTRACT AVAILABLE

Neurophysiological Findings and Brain Injury Pattern in Patients on ECMO.

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ABSTRACT

Introduction. Brain injury is a major determinant of outcomes in extracorporeal membrane oxygenation (ECMO). Neurologic prognostication in ECMO has not been established. Absent electroencephalogram (EEG) reactivity and absent N20 on somatosensory evoked potential (SSEP) are associated with poor outcome in other types of brain injuries, especially following cardio-pulmonary arrest. It is currently known if the same criteria are applicable in patients on ECMO. Methods. Continuous EEG (cEEG) was performed for patients with a Glasgow Coma Scale (GCS) <8 and SSEP data were performed for patients with a motor GCS < 4 in a prospective observational cohort undergoing ECMO at a tertiary center. EEG variables including reactivity were collected. SSEPs were categorized into absence, delay, or presence of N20. Poor outcome was defined as cerebral performance category 3 to 5 at discharge. Results. We present 13 consecutive patients who underwent both cEEG and SSEP. The median time from cannulation to EEG and SSEP were 3 (interquartile range [IQR] = 1-6) and 5 (IQR = 2-7) days, respectively. All patients were in coma and 12 (92%) had poor outcomes. Ten (77%) underwent brain computed tomography, the findings of which explained coma in only 2. Patients (n = 12) with poor outcome had poor variability, absent reactivity, and lack of sleep features with diffusely slow theta-delta background on the EEG. Despite poor outcomes, all had relatively preserved or normal N20 responses. One patient with preserved reactivity and sleep features on the EEG and intact SSEP had a good outcome. Conclusions. Absent EEG reactivity with the preservation of SSEP N20 was associated with poor outcome in comatose ECMO patients. We advise caution in interpreting electrophysiological tests in prognosticating ECMO patients until the patterns and outcomes are better understood.

EXPERIMENTAL RESEARCH

The effect of Glibenclamide on somatosensory evoked potentials after cardiac arrest in rats.

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ABSTRACT

BACKGROUND: Science continues to search for a neuroprotective drug therapy to improve outcomes after cardiac arrest (CA). The use of glibenclamide (GBC) has shown promise in preclinical studies, but its effects on neuroprognostication tools are not well understood. We aimed to investigate the effect of GBC on somatosensory evoked potential (SSEP) waveform recovery post CA and how this relates to the early prediction of functional outcome, with close attention to arousal and somato-sensory recovery, in a rodent model of CA. METHODS: Sixteen male Wistar rats were subjected to 8-min asphyxia CA and assigned to GBC treatment (n = 8) or control (n = 8) groups. GBC was administered as a loading dose of 10 µg/kg intraperitoneally 10 min after the return of spontaneous circulation, followed by a maintenance dosage of 1.6 µg/kg every 8 h for 24 h. SSEPs were recorded from baseline until 150 min following CA. Coma recovery, arousal, and brainstem function, measured by subsets of the neurological deficit score (NDS), were compared between both groups. SSEP N10 amplitudes were compared between the two groups at 30, 60, 90, and 120 min post CA.

RESULTS: Rats treated with GBC had higher sub-NDS scores post CA, with improved arousal and brainstem function recovery (P = 0.007). Both groups showed a gradual improvement of SSEP N10 amplitude over time, from 30 to 120 min post CA. Rats treated with GBC showed significantly better SSEP recovery at every time point (P < 0.001 for 30, 60, and 90 min; P = 0.003 for 120 min). In the GBC group, the N10 amplitude recovered to baseline by 120 min post CA. Quantified Cresyl violet staining revealed a significantly greater percentage of damage in the control group compared with the GBC treatment group (P = 0.004). CONCLUSIONS: Glibenclamide improves coma recovery, arousal, and brainstem function after CA with decreased number of ischemic neurons in a rat model. GBC improves SSEP recovery post CA, with N10 amplitude reaching the baseline value by 120 min, suggesting early electrophysiologic recovery with this treatment. This medication warrants further exploration as a potential drug therapy to improve functional outcomes in patients after CA.

CASE REPORTS

1. J Med Case Rep. 2021 Sep 27;15(1):485. doi: 10.1186/s13256-021-03031-w.
Successful use of extended cardiopulmonary resuscitation followed by extracorporeal oxygenation after venlafaxine-induced takotsubo cardiomyopathy and cardiac arrest: a case report.
Forsberg S(1)(2)(3), Abazi L(4)(5), Forsman P(6).
ABSTRACT
BACKGROUND: Severe venlafaxine intoxication may cause arrhythmias, cardiac failure, and even cardiac arrest. CASE PRESENTATION: A 48-year-old caucasian male with an extensive psychiatric history ingested a high dose of venlafaxine causing a serum venlafaxine concentration of 12.6 mg/L 24 hours after ingestion. Seven hours post-ingestion, he experienced tonic-clonic seizures, and 8 hours later, takotsubo cardiomyopathy was recognized followed by cardiac arrest. The patient was resuscitated with prolonged cardiopulmonary resuscitation including ongoing automatic external compressions during helicopter transportation to a tertiary hospital for extracorporeal membrane oxygenation treatment. Despite a cardiopulmonary resuscitation duration of 2 hours, 36 hours of extracorporeal membrane oxygenation, and a total of 30 days of intensive care, the patient made a full recovery. CONCLUSION: In cases of intoxication-induced cardiac arrests among otherwise young and healthy patients, prolonged cardiopulmonary resuscitation and extracorporeal circulation can be a life-saving bridge to recovery.

2. Ann Emerg Med. 2021 Oct;78(4):e69-e70. doi: 10.1016/j.annemergmed.2021.04.006.
A Man With Out-of-Hospital Cardiac Arrest.
Chu SE(1), Chen JM(1), Chiu YC(1), Huang CY(1), Chang CJ(1), Chiang WC(2), Huang EP(3), Hsieh MJ(4), Ma MH(2), Sun JT(1).
NO ABSTRACT AVAILABLE

3. Ann Emerg Med. 2021 Oct;78(4):566-575. doi: 10.1016/j.annemergmed.2021.04.004.
Out-of-hospital Cardiac Arrest Patient with Distended Abdomen.
Chen FC(1), Pai FC(2), Kuo FC(3), Tsai SH(2), Lai KC(2).
NO ABSTRACT AVAILABLE

4. Pediatr Cardiol. 2021 Oct;42(7):1650-1652. doi: 10.1007/s00246-021-02700-3. Epub 2021 Aug 10.
Idiopathic Ventricular Fibrillation: Look for the Hidden Guilty-A case of aborted cardiac death.
Cicenia M(1)(2), Tamborrino PP(3), Silvetti MS(3), Albanese S(4), Gnazzo M(5), Baban A(3), Carotti A(4), Secinaro A(6), Drago F(3).
ABSTRACT

We report a unique case of a 6-year-old male child with aborted sudden cardiac death due to ventricular fibrillation. A rare anomalous aortic origin of the right coronary artery was detected and supposed to be the cause of the malignant arrhythmia. Clinical exome sequencing did not reveal any pathogenic variant related to channelopathies nor other known heart-related genes. The patient underwent cardiac surgery and a cardiac defibrillator was implanted for secondary prevention.

Manual external chest compression reverses respiratory failure in children with severe air trapping.
Brooks R(1), Cohen-Cymberknoh M(2), Glicksman C(1), Eisenstein EM(3), Shoseyov D(2).
ABSTRACT
We report manual external chest compression (MECC) as an effective treatment for acute respiratory failure due to severe air trapping. In this retrospective study, we describe our experience with MECC administered to five children suffering from severe air trapping as a consequence of severe asthma or bronchiolitis. These children were admitted to the Pediatric Intensive Care Unit (PICU) with clinical and blood gases parameters compatible with acute respiratory failure. Before intubation MECC was performed. The results of blood gasses before, during, and after MECC showed gradual changes in PCO2 over time indicating the improvement in tidal volume and ventilation. Respiratory failure resolved in all five children within 4 h with no complications. The need for intubation and mechanical ventilation was avoided, and all children were discharged from the PICU within 48 h.