**This week's PubMed 17th – 23rd April 2022: articles of interest n = 40**

**CPR AND COVID-19**

**1.** Int J Gen Med. 2022 Apr 11;15:3943-3950. doi: 10.2147/IJGM.S361582. eCollection 2022.
**The Vicissitude of Do Not Attempt Cardiopulmonary Resuscitation (DNACPR) Order During COVID-19 Pandemic in Japan - A Retrospective Cohort Study.**
Morishita N(1), Iwata K(2).
**ABSTRACT**
INTRODUCTION: Japan went through five surges of coronavirus disease 2019 (COVID-19) or "waves". However, their impacts on the do not attempt cardiopulmonary resuscitation (DNACPR) of the patients are not known. METHODS: A retrospective single-center cohort study was conducted for all hospitalized patients with COVID-19 from March 1, 2020, to September 30, 2021. Their code status was retrieved, and its association with the waves and other parameters, such as in-hospital mortality, was investigated. The relationship between DNACPR status and each wave was examined, as well as the effect on in-hospital mortality. RESULTS: A total of 1153 patients were hospitalized with the diagnosis of COVID-19 during the study period. On admission, 117 patients (10.1%) had DNACPR orders, 373 patients (32.4%) were on full code, 45 patients (3.9%) stated that they cannot decide code status. DNACPR rate appeared to increase at the summit of each wave. Subsequently, 160 patients (13.9%) became DNACPR status, 385 patients (33.4%) became full code, and 12 patients (1.0%) stated that they remained unable to decide code status. There was no association between DNACPR status and each wave, and DNACPR status was not associated with higher mortality (P = 0.87), both by logistic regression analysis. CONCLUSION: DNACPR status among hospitalized COVID-19 patients appeared to have changed over multiple waves in Japan, but it is more likely due to the change of the patients' demographics, particularly their age. DNACPR was common among the elderly, but it was not independently associated with higher mortality.

**2.** J Contin Educ Health Prof. 2022 Apr 18. doi: 10.1097/CEH.0000000000000429. Online ahead of print.
**Creating a Learning Scenario for Cardiopulmonary Resuscitation Training During the COVID-19 Pandemic.**
Caballero Valderrama MR(1), Allande Cussó R, Cervera Barajas A, Pérez Ruz R, Pérez López E, Caballero Oliver A.
**ABSTRACT**
INTRODUCTION: Different organizations have recommended changes in life support in the COVID-19 pandemic, just when maintaining the competence in cardiopulmonary resuscitation is compromised because on-site training must be avoided. We developed a pilot teaching-learning experience to promote cardiopulmonary resuscitation skills acquisition in this situation. The aim of this study was to describe that tool and to analyze its usefulness. METHODS: The experience consisted of three phases: first, reviewing the scientific literature; second, defining written local recommendations and recording a short video simulating the initial attention to a cardiac arrest in this COVID-19 context; third, creating a test to be answered by hospital health professionals. RESULTS: The final sample was 121 subjects; 66.1% were women; the mean age was 45.8 years (SD = 10.24). Among them, 43% were doctors, 43% nurses, 4.1% nursing assistants, and 9.9% others. 89.3% participants had received prior training in life support. In the test, questions 1, 2, 5, 6, 7, and 8 were answered correctly by more than 80%; questions 3 and 4 were answered correctly by 57.9% and 41.3%, respectively. All participants expressed that the video helped them to refresh their knowledge and skills in life support. DISCUSSION: When on-site training is not possible, distance learning-as in our teaching-

learning innovation because of the COVID-19 pandemic-may be a valid option to acquire/refresh cardiopulmonary resuscitation skills.

**CPR/MECHANICAL CHEST COMPRESSION**

**1.** J Emerg Trauma Shock. 2022 Jan-Mar;15(1):41-46. doi: 10.4103/JETS.JETS_36_21. Epub 2021 Nov 23.

**Chest Compression Fraction and Factors influencing it.**

Mathew D(1), Krishnan SV(2), Abraham SV(1), Varghese S(1), Thomas MR(3), Palatty BU(1).

**ABSTRACT**

INTRODUCTION: Chest compression fraction (CCF) is the cumulative time spent providing chest compressions divided by the total time taken for the entire resuscitation. Targeting a CCF of at least 60% is intended to limit interruptions in compressions and maximize coronary perfusion during resuscitation. We aimed to identify the mean CCF and its relationship with various factors affecting it. METHODS: Patients presenting to the emergency department in cardiac arrest at a single center were prospectively included in this study. Resuscitation was provided by trained health-care providers. The feedback device Cprmeter2™ was placed on the patient's sternum at the beginning of resuscitation. The total time taken for the entire resuscitation was noted by the device and CCF calculated. RESULTS: The mean CCF was analyzed using descriptive statistics and was found to be 71.60% ± 7.52%. The total duration of resuscitation (R = -0.55, P = < 0.001, min-max, 2.02-34.31, mean 12.25 ± 6.54), number of people giving chest compressions (R = -0.48, P = < 0.001, min-max, 1-6, mean 4.04 ± 1.12), and total number of team members in resuscitation (R = -0.50, P = < 0.001, min-max, 4-10, mean 6.65 ± 1.32) had negative correlation with CCF. Diurnal variation (day, n = 35; mean 69.20% ± 7% and night, n = 20; mean 75.80% ± 5.6%, P = 0.001) and patients receiving defibrillation (receiving n = 10 mean 67.00% ± 4.11% and not receiving n = 45 mean 72.62 ± 7.42%, P = 0.005) were found to significantly affect CCF. CONCLUSION: The mean CCF for cardiac arrest patients was well within the targets of guideline recommendation. CCF decreased when resuscitation lasted longer, during daytime when the defibrillator was used, the total team members increased, and also when the number of people giving chest compressions increased. CCF during resuscitation may improve if there is a focus on improving these factors and requires validation in multicentric settings.

**2.** J Cardiovasc Dev Dis. 2022 Mar 27;9(4):100. doi: 10.3390/jcdd9040100.

**Optimal Landmark for Chest Compressions during Cardiopulmonary Resuscitation Derived from a Chest Computed Tomography in Arms-Down Position.**

Usawasuraiin P(1), Wittayachamnankul B(1), Chenthanakij B(1), Euathrongchit J(2), Phinyo P(3)(4), Tangsuwanaruk T(1).

**ABSTRACT**

Compressions at the left ventricle increase rate of return of spontaneous circulation. This study aimed to identify the landmark of the point of maximal left ventricular diameter on the sternum (LVmax) by using chest computed tomography (CCT) in the arms-down position, which was similar to an actual cardiac arrest patient. A retrospective study was conducted between September 2014 and November 2020. We included adult patients who underwent CCT in an arms-down position and measured the rescuer's hand. We measured the distance from the sternal notch to LVmax (DLVmax), to the lower half of sternum (DLH), and to the point of maximal force of hand, which placed the lowest palmar margin of the rescuer's reference hand at the xiphisternal junction. Thirty-nine patients were included. The LVmax was located below the lower half of the sternum; DLVmax and DLH were 12.6 and 10.0 cm, respectively (p < 0.001). Distance from the sternal notch to the point

of maximal force of the left hand, with the ulnar border located at the xiphisternal junction, was close to DLVmax; 11.3 and 12.6 cm, respectively (p = 0.076). In conclusion, LVmax was located below the lower half of the sternum, which is recommended by current guidelines.

## REGISTRIES, REVIEWS AND EDITORIALS

**1.** Eur Heart J. 2022 Apr 14;43(15):1457-1464. doi: 10.1093/eurheartj/ehab903.
**Fighting against sudden cardiac death: need for a paradigm shift-Adding near-term prevention and pre-emptive action to long-term prevention.**
Marijon E(1)(2)(3), Garcia R(4)(5), Narayanan K(1)(3)(6), Karam N(1)(2)(3), Jouven X(1)(2)(3).
**ABSTRACT**
More than 40 years after the first implantable cardioverter-defibrillator (ICD) implantation, sudden cardiac death (SCD) still accounts for more than five million deaths worldwide every year. Huge efforts in the field notwithstanding, it is now increasingly evident that the current strategy of long-term prevention based on left ventricular ejection fraction as the key selection criterion is actually of very limited impact, also because the largest absolute numbers of SCD are encountered in the general population not known to be at risk. It has been recently reemphasized that SCD is often not so sudden, with almost half of the victims experiencing typical warning symptoms preceding the event. Importantly, heeded and prompt medical attention can dramatically improve survival. Essentially, such timely action increases the chances of the SCD event being witnessed by emergency medical services and provides the opportunity for early intervention. In addition, newer technologies incorporating digital data acquisition, transfer between interconnected devices, and artificial intelligence, should allow dynamic, real-time monitoring of diverse parameters and therefore better identification of subjects at short-term SCD risk. Along with warning symptoms, these developments allow a new approach of near-term prevention based on the hours and minutes preceding SCD. In the present review, we challenge the current paradigm of mid- and long-term prevention using ICD in patients at the highest risk of SCD, and introduce a complementary concept applicable to the entire population that would aim to pre-empt SCD by timely detection and intervention within the minutes or hours prior to the event.

## IN-HOSPITAL CARDIAC ARREST

**1.** Resuscitation. 2022 Apr 16:S0300-9572(22)00111-3. doi: 10.1016/j.resuscitation.2022.04.007. Online ahead of print.
**Deterioration in Quality of Life and Long-term Mortality Among Survivors of In-hospital Cardiopulmonary Arrest: A Population-based Cohort Study in South Korea.**
Song IA(1), Hwan Jo Y(2), Kyu Oh T(3).
**ABSTRACT**
AIM: This study investigated the changes in quality of life (QOL) after in-hospital cardiopulmonary arrest (IHCA) among survivors and examined the association between worsening QOL and 3-year all-cause mortality. METHODS: This population-based cohort study used data from the National Health Insurance Service database in South Korea. Adult survivors who experienced IHCA between January 1, 2010, and December 31, 2018, and were alive for over 1 year after IHCA were included. Worsening QOL among IHCA survivors was determined using three criteria: decreased household income, unemployment, and acquired disability. RESULTS: A total of 22,611 IHCA survivors from 903 hospitals were included in the final analysis, and 7,796 (34.5%) experienced worsening QOL. Specifically, 5,595 (24.7%), 1,694 (7.5%), and 1,617 (7.2%) survivors experienced decreased household income, unemployment, and acquired disability, respectively. The proportion of brain

lesion disability increased from 6.3% to 10.8% after IHCA. In multivariable Cox regression, worsening QOL was not associated with 3-year all-cause mortality (adjusted hazard ratio [aHR]: 1.03, 95% confidence interval [CI]: 0.96, 1.11; P=0.372). However, among the QOL factors, acquired disability was associated with a 1.29-fold higher risk of 3-year all-cause mortality among IHCA survivors (aHR: 1.29, 95% CI: 1.15, 1.46; P<0.001). CONCLUSION: Approximately one-third of IHCA survivors experienced worsening QOL (decreased household income, unemployment, and acquired disability) at 1-year follow-up after IHCA in South Korea. Although overall worsening of QOL was not associated with 3-year all-cause mortality, acquired disability was associated with increased 3-year all-cause mortality among IHCA survivors.

**2.** Heart Lung. 2022 Apr 15;55:29-33. doi: 10.1016/j.hrtlng.2022.04.007. Online ahead of print.
**Determining consistency of care after resuscitation from in-hospital cardiac arrest, a retrospective analysis at a tertiary care academic medical center.**
Raikhel AV(1), Schulte V(2), Carlbom DJ(3), Town JA(4).
**ABSTRACT**
BACKGROUND: Few guidelines have focused on the care delivered after return of spontaneous circulation (ROSC). Post ROSC best practice guidelines lack clarity about important tasks to accomplish in the first hours after ROSC. OBJECTIVES AND METHODS: We conducted a retrospective cohort analysis of adults who had suffered an in hospital cardiac arrest (IHCA) with ROSC over a two-year period to determine the completion rate of critical tasks in the immediate post-ROSC period: ECG within one hour, ABG within one hour, physician documentation within six hours, and surrogate communication within six hours. RESULTS: In the 113 reviewed cases, there was significant variance between completion of all four (19.4%), three (35.3%), two (32.7%), one (20.6%) and none (1.7%) of these critical post ROSC tasks. We observed that 62.8% of IHCA with ROSC had an ECG obtained within one hour of ROSC. The rate of obtaining an ABG within one hour of ROSC was 76.9%. 49.5% of cases had physician documentation of the resuscitation within six hours of ROSC. The rate of documenting surrogate communication within six hours of ROSC was 69.9%. CONCLUSIONS: Our study demonstrated that the completion rates of critical tasks in the post ROSC setting were suboptimal within our patient cohort. This provides a baseline for the development of future best practice guidelines and clinical decision-making aids for post ROSC care after IHCA. This can lead to future research in coupling specific care tasks to post ROSC patient outcomes.

**INJURIES AND CPR**

**1.** J Clin Med. 2022 Apr 7;11(8):2071. doi: 10.3390/jcm11082071.
**Chest Compression-Related Flail Chest Is Associated with Prolonged Ventilator Weaning in Cardiac Arrest Survivors.**
Kunz K(1), Petros S(1), Ewens S(2), Yahiaoui-Doktor M(3), Denecke T(2), Struck MF(4), Krämer S(5).
**ABSTRACT**
Chest compressions during cardiopulmonary resuscitation (CPR) may be associated with iatrogenic chest wall injuries. The extent to which these CPR-associated chest wall injuries contribute to a delay in the respiratory recovery of cardiac arrest survivors has not been sufficiently explored. In a single-center retrospective cohort study, surviving intensive care unit (ICU) patients, who had undergone CPR due to medical reasons between 1 January 2018 and 30 June 2019, were analyzed regarding CPR-associated chest wall injuries, detected by chest radiography and computed tomography. Among 109 included patients, 38 (34.8%) presented with chest wall injuries, including 10 (9.2%) with flail chest. The multivariable logistic regression analysis identified flail chest to be independently associated with the need for tracheostomy (OR 15.5; 95% CI 2.77-86.27; p = 0.002). The linear regression analysis identified pneumonia (β 11.34; 95% CI 6.70-15.99; p < 0.001) and the presence of rib fractures (β 5.97; 95% CI 1.01-10.93; p = 0.019) to be associated with an increase in the length

of ICU stay, whereas flail chest (β 10.45; 95% CI 3.57-17.33; p = 0.003) and pneumonia (β 6.12; 95% CI 0.94-11.31; p = 0.021) were associated with a prolonged duration of mechanical ventilation. Four patients with flail chest underwent surgical rib stabilization and were successfully weaned from the ventilator. The results of this study suggest that CPR-associated chest wall injuries, flail chest in particular, may impair the respiratory recovery of cardiac arrest survivors in the ICU. A multidisciplinary assessment may help to identify patients who could benefit from a surgical treatment approach.

**CAUSE OF THE ARREST**

**1.** Am J Emerg Med. 2022 May;55:27-31. doi: 10.1016/j.ajem.2022.02.032. Epub 2022 Feb 24.
**Gender differences and survival after out of hospital cardiac arrest.**
Rob D(1), Kavalkova P(2), Smalcova J(2), Franek O(3), Smid O(2), Komarek A(4), Pisinger M(5), Belohlavek J(2).
**ABSTRACT**
BACKGROUND: Published evidence regarding the effect of gender on outcome after out of hospital cardiac arrest (OHCA) is inconsistent. We aimed to investigate the association of gender to outcome and resuscitation characteristics in OHCA patients admitted to the cardiac arrest center. METHODS: In this retrospective analysis of prospective registry data, all patients admitted for OHCA were included. The influence of gender on 30-day survival and good neurological outcome (cerebral performance category of 1 or 2) were examined using Kaplan-Meier estimates and multivariable logistic regression. RESULTS: In total, 932 patients were analysed (239 women, 26%). Women were older (64 vs 60 years, p < 0.001) and less commonly had a shockable rhythm (47% vs 65%, P < 0.001) compared to men. Women were less likely to have a cardiac cause of arrest (54% vs. 75%, p < 0.001), received less therapeutic hypothermia (74% vs 86%, p < 0.001) and coronary angiography (63% vs. 79%, p < 0.001). The overall 30-day survival was lower for women (45% vs. 53%, log-rank p = 0.005) as well as good neurological outcome (37% vs. 46%, p = 0.008). However, according to the multivariate logistic regression, gender was not associated with survival (OR 0.98, 95% CI 0.65-1.50, p = 0.94) nor with good neurological outcome (OR 0.91, 95% CI 0.59-1.40, p = 0.67). CONCLUSION: Women admitted for OHCA to a cardiac center had a different cause of arrest that had a different treatment and outcome compared to men. Survival and good neurological outcome were lower in women, however, after adjusting for baseline characteristics, gender was not associated with survival nor neurological outcome.

**2.** Am J Emerg Med. 2022 May;55:221-223. doi: 10.1016/j.ajem.2021.07.061. Epub 2021 Aug 8.
**Intensity of physical activity for out-of-hospital cardiac arrests during exercise and survival outcomes.**
Kim WH(1), Park JH(2), Jeong J(3), Ro YS(4), Hong KJ(4), Song KJ(5), Shin SD(4), Hwang S(6).
**NO ABSTRACT AVAILABLE**

**3.** Resuscitation. 2022 Apr 20:S0300-9572(22)00113-7. doi: 10.1016/j.resuscitation.2022.04.009. Online ahead of print.
**Gas asphyxiation precipitating out-of-hospital cardiac arrest: a call for more data and uniform definitions.**
Nehme Z(1), Smith K(2).
**NO ABSTRACT AVAILABLE**

**4.** Eur Heart J Case Rep. 2022 Apr 19;6(4):ytac122. doi: 10.1093/ehjcr/ytac122. eCollection 2022 Apr.

**Out-of-hospital cardiac arrest secondary to intramyocardial metastasis.**
El Aidi H(1), Haine SEF(1), Paelinck B(1), Heidbuchel H(1).
**NO ABSTRACT AVAILABLE**

**5.** BMC Cardiovasc Disord. 2022 Apr 19;22(1):185. doi: 10.1186/s12872-022-02628-3.
**Clinical features and predictors of outcome in patients with acute myocardial infarction complicated by out-of-hospital cardiac arrest.**
Sonoda T(1), Wada H(2), Ogita M(1), Takahashi D(1), Nishio R(1), Yasuda K(1), Takeuchi M(1), Yatsu S(1), Shitara J(1), Tsuboi S(1), Dohi T(3), Suwa S(1), Miyauchi K(3), Minamino T(3).
**ABSTRACT**
BACKGROUND: Although short-term mortality of acute myocardial infarction (AMI) has decreased dramatically in the past few decades, sudden cardiac arrest remains a serious complication. The aim of the study was to assess the clinical characteristics and predictors of prognosis in AMI patients who experienced out-of-hospital cardiac arrest (OHCA). METHODS: We retrospectively registered consecutive AMI patients who were treated with emergency percutaneous coronary intervention (PCI) between 2004 and 2017. Clinical characteristics and outcomes were compared between patients with OHCA and those without OHCA. RESULTS: Among 2101 AMI patients, 95 (4.7%) presented with OHCA. Younger age (odds ratio [OR]: 0.95; 95% confidence interval [CI]: 0.93-0.97; $p < 0.0001$), absence of diabetes mellitus (OR, 0.51; 95% CI, 0.30-0.85; $p = 0.01$) or dyslipidemia (OR, 0.56; 95% CI, 0.36-0.88; $p = 0.01$), left main trunk (LMT) or left anterior descending artery (LAD) as the culprit lesion (OR, 3.26; 95% CI, 1.99-5.33; $p < 0.0001$), and renal deficiency (OR, 3.64; 95% CI, 2.27-5.84; $p < 0.0001$) were significantly associated with incidence of OHCA. Thirty-day mortality was 32.6% in patients with OHCA and 4.5% in those without OHCA. Multivariate logistic analysis revealed LMT or LAD as the culprit lesion (OR, 12.18; 95% CI, 2.27-65.41; $p = 0.004$), glucose level (OR, 1.01; 95% CI, 1.00-1.01; $p = 0.01$), and renal deficiency (OR, 3.35; 95% CI, 1.07-10.53; $p = 0.04$) as independent predictors of 30-day mortality among AMI patients with OHCA. CONCLUSIONS: In patients with AMI who underwent emergency PCI, 30-day mortality was six times greater in those having presented initially with OHCA compared with those without OHCA. Younger age, absence of diabetes mellitus or dyslipidemia, LMT or LAD as the culprit lesion, and renal deficiency were independent predictors of OHCA. OHCA patient with higher blood glucose level on admission, LMT or LAD as the culprit lesion, or renal deficiency showed worse clinical outcomes.

**6.** Int J Cardiol Heart Vasc. 2022 Apr 8;40:101027. doi: 10.1016/j.ijcha.2022.101027. eCollection 2022 Jun.
**Sudden cardiac arrest in patients with schizophrenia: A population-based study of resuscitation outcomes and pre-existing cardiovascular disease.**
Edwards GG(1)(2), Uy-Evanado A(1), Stecker EC(3), Salvucci A(4), Jui J(3), Chugh SS(1), Reinier K(1).
**ABSTRACT**
OBJECTIVE: Individuals with schizophrenia carry a high burden of cardiovascular disease and elevated rates of sudden cardiac arrest (SCA), but little published data is available regarding survival from SCA in this population. The authors compared cardiovascular disease burden and resuscitation outcomes following SCA in individuals with and without schizophrenia. METHODS: Case-control analysis drawn from a prospective community-based study of SCA in a large community. The authors defined cases as having a pre-SCA history of schizophrenia, and controls as individuals with SCA without a history of schizophrenia. SCA cases with schizophrenia were compared to a 1:5 age- and sex-frequency-matched sample of SCA cases without schizophrenia. RESULTS: The 103 SCA schizophrenia cases were as likely as the 515 cases without schizophrenia to have resuscitation attempted (75% vs. 80%; $p = 0.24$) and had a shorter 911 call mean response time (5.8 min vs.

6.9 min, p < 0.001). However, they were significantly less likely to present with a shockable rhythm (ventricular fibrillation/pulseless ventricular tachycardia 16% vs. 43%, p < 0.001), and less likely to survive to hospital discharge (3% vs. 14%, p = 0.008). Pre-arrest cardiovascular disease burden was similar in patients with and without schizophrenia. CONCLUSIONS: Despite comparable resuscitation characteristics and cardiovascular disease burden, patients with schizophrenia had significantly lower rates of SCA survival. The paucity of previous research into this phenomenon warrants further investigation to identify factors that may improve survival.

## END-TIDAL $CO_2$

No articles identified.

## ORGAN DONATION

No articles identified.

## FEEDBACK

**1.** Resuscitation. 2022 Apr 18:S0300-9572(22)00112-5. doi: 10.1016/j.resuscitation.2022.04.008. Online ahead of print.
**A chest compression feedback device for cardiopulmonary resuscitation in the novel design of a weight-light card holder shape.**
Youn Lee S(1), Ahn C(2).
**NO ABSTRACT AVAILABLE**

## DRUGS

No articles identified.

## TRAUMA

No articles identified.

## VENTILATION

**1.** Healthcare (Basel). 2022 Apr 13;10(4):718. doi: 10.3390/healthcare10040718.
**Impact of the Over-the-Head Position with a Supraglottic Airway Device on Chest Compression Depth and Rate: A Post Hoc Analysis of a Randomized Controlled Trial.**
Stuby L(1), Suppan L(2), Jampen L(3), Thurre D(1).
**ABSTRACT**
There is considerable controversy regarding the optimal airway management strategy in the case of out-of-hospital cardiac arrest. Registry-based studies yield contradicting results and the actual impact of using supraglottic devices on survival and neurological outcomes remains unknown. In a recent simulation study, the use of an i-gel® device was associated with significantly shallower chest compressions. It was hypothesized that these shallower compressions could be linked to the provision of chest compressions in an over-the-head position, to the cumbersome airway

management apparatus, and to a shallower i-gel® insertion depth in the manikin. To test this hypothesis, we carried out a post hoc analysis, which is described in this report. Briefly, no association was found between the over-the-head position and compression depth.

## CERERBRAL MONITORING

No articles identified.

## ULTRASOUND AND CPR

No articles identified.

## ORGANISATION AND TRAINING

**1.** Int J Environ Res Public Health. 2022 Apr 17;19(8):4882. doi: 10.3390/ijerph19084882.
**Translation, Cross-Cultural Adaptation, and Validation of the Malay-Version of the Factors Influencing Community Willingness to Perform Cardiopulmonary Resuscitation and Use an Automated External Defibrillator Questionnaire.**
Daud A(1)(2), Mohammed Nawi A(1), Aizuddin AN(1), Yahya MF(2).
**ABSTRACT**
Limited factors influence community willingness to perform cardiopulmonary resuscitation and use an automated external defibrillator, making it difficult to take preventive and control measures to improve the survival of patients with out-of-hospital cardiac arrest. In this study, we translated and evaluated the Malay-language version of the cardiopulmonary resuscitation and an automated external defibrillator questionnaire. The translation and evaluation involved three phases: development, translation and cultural adaptation, and validation. Content validity was assessed by five experts, and demonstrated a content validity index of 0.98 and a Fleiss kappa index of 0.159. Construct validity for the multi-item scale performed using factor analysis and involving 100 participants was 0.777. Factor analysis using the varimax rotation method demonstrated the appropriateness of the data in the exploratory factor analysis. Cronbach's alpha was 0.849, suggesting high reliability. Test-retest reliability involving 45 participants calculated using the intraclass correlation coefficient had a value of 0.723. The findings demonstrate that the Malay-version FIXED questionnaire is a valid and reliable instrument and is ready to be used by health care workers and policymakers to evaluate the factors influencing the community's willingness to perform cardiopulmonary resuscitation and use an automated external defibrillator.

**2.** Kardiol Pol. 2022 Apr 21. doi: 10.33963/KP.a2022.0109. Online ahead of print.
**Does the presence of physician-staffed emergency medical service improve the prognosis in out-of-hospital cardiac arrest? A propensity score matching analysis.**
Bujak K(1), Nadolny K(2)(3), Trzeciak P(4), Gałązkowski R(5), Ładny JR(6), Gąsior M(4).
**ABSTRACT**
BACKGROUND: Substantial differences in survival after out-of-hospital cardiac arrest (OHCA) have been observed between countries. These might be attributed to the organization of Emergency Medical Service (EMS) systems, including prehospital physician involvement. However, limited data exist on the physician's role in survival after OHCA. AIMS: To compare prehospital and in-hospital outcomes of OHCA patients attended by physician-staffed EMS versus paramedic-staffed EMS units.

METHODS: Among all patients enrolled in the regional, prospective registry of OHCA in southern Poland, those aged <18, with unwitnessed or EMS-witnessed cardiac arrest, without attempted cardiopulmonary resuscitation (CPR), attended by more than one EMS, or with traumatic cardiac arrest, were excluded. The groups were matched 1:1 using propensity scores for baseline characteristics variables that might influence physician-staffed EMS dispatch. RESULTS: A total of 812 OHCA cases were included in the current analysis. Among them, 351 patients were attended by physician-staffed EMS. There were no differences in baseline characteristics in the propensity-score matched cohort consisting of 351 pairs. The return of spontaneous circulation (ROSC) was more often achieved in the physician-staffed EMS group (42.7% vs. 33.3%; P = 0.01). The prehospital survival rate was also higher in this group (34.1% vs. 19.2%; P <0.01). However, there were no significant differences in survival rate to discharge between cases treated by physician-staffed and paramedic-staffed EMS (9.7% vs. 7.0%; P = 0.22). CONCLUSIONS: OHCA patients attended by physician-staffed EMS were more likely to have ROSC and survive to hospital admission. However, better prehospital outcomes might not translate into improved in-hospital prognosis in these patients.

**3.** J Palliat Med. 2022 Apr 18. doi: 10.1089/jpm.2021.0584. Online ahead of print.
**Associations of Intellectual Disability with Cardiopulmonary Resuscitation and Endotracheal Intubation at End of Life.**
Viola M(1), Braun RT(2), Luth EA(3), Pan CX(4)(5), Lief L(5), Gang J(5), Adamou Z(5), Dodd P(6)(7), Prigerson HG(1)(5).
**ABSTRACT**
Background: Little is known about end-of-life intensive care provided to patients with intellectual disabilities (ID). Objectives: To identify differences in receipt of end-of-life cardiopulmonary resuscitation (CPR) and endotracheal intubation among adult patients with and without ID and examine whether do-not-resuscitate orders (DNRs) mediate associations between ID and CPR. Design: Exploratory matched cohort study using medical records of inpatient decedents treated between 2012 and 2018. Results: Patients with ID (n = 37) more frequently received CPR (37.8% vs. 21.6%) and intubation (78.4% vs. 47.8%) than patients without ID (n = 74). In multivariable models, ID was associated with receiving CPR (relative risk [RR] = 2.92, 95% confidence interval = 1.26-6.78, p = 0.012), but not intubation. Patients with ID less frequently had a DNR placed (67.6% vs. 91.9%), mediating associations between ID and CPR. Conclusions: In this pilot study, ID was associated with increased likelihood of receiving end-of-life CPR, likely due to lower utilization of DNRs among patients with ID. Further research is needed to confirm these results.

**4.** CJEM. 2022 Apr 19. doi: 10.1007/s43678-022-00291-3. Online ahead of print.
**Early or late booster for basic life support skill for laypeople: a simulation-based randomized controlled trial.**
Boet S(1)(2)(3)(4)(5)(6), Waldolf R(7)(8)(9), Bould C(10), Lam S(11), Burns JK(11), Moffett S(10), McBride G(10), Ramsay T(11), Bould MD(7)(11)(12).
**ABSTRACT**
PURPOSE: Retention of skills and knowledge has been shown to be poor after resuscitation training. The effect of a "booster" is controversial and may depend on its timing. We compared the effectiveness of an early versus late booster session after Basic Life Support (BLS) training for skill retention at 4 months. METHODS: We performed a single-blind randomized controlled trial in a simulation environment. Eligible participants were adult laypeople with no BLS training or practice in the 6 months prior to the study. We provided participants with formal BLS training followed by an

immediate BLS skills post-test. We then randomized participants to one of three groups: control, early booster, or late booster. Based on their group allocation, participants attended a brief BLS refresher at either 3 weeks after training (early booster), at 2 months after training (late booster), or not at all (control). All participants underwent a BLS skills retention test at 4 months. We measured BLS skill performance according to the Heart and Stroke Foundation's skills testing checklist for adult CPR and the use of an automated external defibrillator. RESULTS: A total of 80 laypeople were included in the analysis (control group, n = 28; early booster group, n = 23; late booster group, n = 29). The late booster group achieved better skill retention (mean difference in checklist score at retention compared to the immediate post-test = - 0.8 points out of 15, [95% CI - 1.7, 0.2], P = 0.10) compared to the early booster (- 1.3, [- 2.6, 0.0], P = 0.046) and control group (- 3.2, [- 4.7, - 1.8], P < 0.001). CONCLUSION: A late booster session improves BLS skill retention at 4 months in laypeople.

**5.** Notf Rett Med. 2022 Apr 14:1-2. doi: 10.1007/s10049-022-01018-8. Online ahead of print.
**[Dispatcher Assisted Cardiopulmonary Resuscitation: Self-assessments often prove futile].**
[Article in German]
Marung H(1)(2), Lohs T(3), Prückner S(4), Neumayr A(5), Baubin M(5).
**NO ABSTRACT AVAILABLE**

**6.** Am J Emerg Med. 2022 Mar 31;56:211-217. doi: 10.1016/j.ajem.2022.03.050. Online ahead of print.
**Effects of Smart Advanced Life Support protocol implementation including CPR coaching during out-of-hospital cardiac arrest.**
Kim GW(1), Moon HJ(2), Lim H(3), Kim YJ(4), Lee CA(5), Park YJ(6), Lee KM(7), Woo JH(8), Cho JS(8), Jeong WJ(9), Choi HJ(10), Kim CS(10), Choi HJ(11), Choi IK(12), Heo NH(13), Park JS(14), Lee YH(1), Park SM(4), Jeong DK(1).
**ABSTRACT**
PURPOSE: The aim of this study was to compare out-of-hospital cardiac arrest (OHCA) outcomes before and after implementation of Smart Advanced Life Support (SALS) protocol incorporating changes in cardiopulmonary resuscitation (CPR) assistance and coaching by physicians via real-time video calls. METHODS: A prospective before-and-after multi-regional observational study was conducted between January 2014 and December 2018. In January 2016, emergency medical service (EMS) providers adopted an integrated CPR coaching by physicians via real-time video call via SALS to treat patients with OHCA focusing on high-quality cardiopulmonary resuscitation. Propensity score matching was performed to match patients. Patients' outcomes using conventional protocol were then compared with those of patients using the SALS protocol. RESULTS: Among 26,349 OHCA cases, 2351 patients and 7261 patients were enrolled during the pre-intervention and the post-intervention periods, respectively. Multivariate analysis showed that SALS was independently associated with favorable neurological outcomes [odds ratio (OR): 2.20; 95% confidence interval (CI): 1.62-2.99]. A total of 2096 patients were propensity score-matched and the two groups were well balanced. In the matched cohort, the use of SALS protocol was still associated with increased prehospital return of spontaneous circulation (ROSC) (OR: 3.83, 95% CI: 2.80-5.26), survival to discharge (OR: 1.68; 95% CI: 1.20-2.34), and favorable neurological outcomes (OR: 1.83; 95% CI: 1.19-2.82). CONCLUSION: A multidisciplinary SALS protocol for the resuscitation of patients with OHCA was associated with increased prehospital ROSC, survival to discharge, and good neurologic outcomes compared with traditional resuscitation protocol.

**7.** Eur Heart J. 2022 Apr 14;43(15):1475-1477. doi: 10.1093/eurheartj/ehac028.

**Volunteer first responders for out-of-hospital cardiac arrest at home: the missing link for improved survival?**
Malta Hansen C(1)(2), Folke F(2)(3).
**NO ABSTRACT AVAILABLE**

**8.** Medwave. 2022 Apr 13;22(3):e8718. doi: 10.5867/medwave.2022.03.002100.
**Use of discrete event simulation and genetic algorithms to estimate the necessary resources to respond in a timely manner in the Medical Emergency System in Bogotá.**
[Article in English, Spanish; Abstract available in Spanish from the publisher]
Aguiar M LG(1), Rentería RR(2), Catumba-Ruiz J(3), Barrera JO(4), Redondo JM(5).
**ABSTRACT**
INTRODUCTION: Bogotá has a Medical Emergency System of public and private ambulances that respond to health incidents. However, its sufficiency in quantity, type and location of the resources demanded is not known. OBJECTIVE: Based on the data from the Medical Emergency System of Bogotá, Colombia, we first sought to characterize the prehospital re- sponse in cardiac arrest and determine with the model which is the least number of resources necessary to respond within eight minutes, taking into account their location, number, and type. METHODS: A database of incidents reported in administrative records of the district health authority of Bogotá (2014 to 2017) was obtained. Based on this information, a hybrid model based on discrete event simulation and genetic algorithms was designed to establish the amount, type and geographic location of resources according to the frequencies and typology of the events. RESULTS: From the database, Bogotá presented 938 671 ambulances dispatches in the period. 47.4% high priority, 18.9% medium and 33.74% low. 92% of these corresponded to 15 of 43 medical emergency codes. The response times recorded were longer than expected, especially in out-of-hospital cardiac arrest (median 19 minutes). In the proposed model, the best scenario required at least 281 ambulances, medicalized and basic in a 3:1 ratio, respectively, to respond in adequate time. CONCLUSIONS: Results suggest the need for an increase in the resources that respond to these incidents to bring these response times to the needs of our population.

**9.** Eur Heart J. 2022 Apr 14;43(15):1488-1490. doi: 10.1093/eurheartj/ehab565.
**Automated external defibrillator delivery by drones: are we ready for prime time?**
Karam N(1)(2)(3), Jost D(1)(4), Jouven X(1)(2)(3), Marijon E(1)(2)(3).
**NO ABSTRACT AVAILABLE**

**10.** Actas Dermosifiliogr. 2022 Apr 20:S0001-7310(22)00261-7. doi: 10.1016/j.ad.2022.03.004. Online ahead of print.
**Safety in Dermatologic Procedures: Basic and Advanced Cardiopulmonary Resuscitation.**
[Article in English, Spanish]
Lobo-Valbuena B(1), Martin-Gorgojo A(2).
**ABSTRACT**
This article in the series on safety in dermatologic procedures covers the delivery of cardio-pulmonary resuscitation through basic life support (using no devices), advanced life support (using an automated external defibrillator), and injecting adrenaline. We provide a brief overview of the updated 2021 European Resuscitation Council guidelines and offer an algorithm and visual aids to support recommended practices.

**11.** Am J Nurs. 2022 May 1;122(5):59-62. doi: 10.1097/01.NAJ.0000830772.77819.7f.
**Teaching Elementary School Students to Be Emergency Responders.**

Goedde E(1), Combe LG, Bowlen B, Kerry B.

**ABSTRACT**

School nurses from the Klein Independent School District in Harris County, Texas, have educated students, some as young as kindergarteners, on cardiopulmonary resuscitation (CPR) and how to recognize and use automatic external defibrillators and provide basic first aid. Through a collaboration with community partners and CPR-certified high school students, these school nurses are empowering the next generation with lifesaving skills.

**12.** Cent Eur J Public Health. 2022 Mar;30(1):58-64. doi: 10.21101/cejph.a6793.

**Burden of sudden cardiac death in persons aged 1-40 years in the Czech Republic.**

Rücklová K(1), Dobiáš M(2), Bílek M(3), Pohlová Kučerová Š(4), Kulvajtová M(5), Tavačová T(6), Nagy I(7), Tomášek P(3).

**ABSTRACT**

OBJECTIVES: The aim of the study was to ascertain the incidence, circumstances and causes of sudden cardiac death in persons aged 1-40 years in the Czech Republic. METHODS: De-identified autopsy reports of all individuals who died suddenly between the ages of 1-40 years during the period 2014-2019 inclusive in a selected area of the Czech Republic were analysed retrospectively. Persons with substantial cardiovascular pathology defined by histopathological criteria and those with a negative autopsy were included in the study. The latter were designated as sudden arrhythmic death syndrome. RESULTS: In total, 245 sudden cardiac death cases were identified resulting in an incidence rate of 2.4/100,000 person-years. Among the deceased, we found an enormous gender gap with men representing 81% of cases. More than 80% of deaths occurred during everyday activities or sleep, whereas only 7% were sports-related. The most common cause of death was coronary artery disease detected in 38%, which was followed by cardiomyopathies in 15%, sudden arrhythmic death syndrome in 12%, left ventricular hypertrophy in 10%, and congenital heart defects in 7%. CONCLUSIONS: Coronary artery disease is the predominant cause of sudden cardiac death in the young population of the Czech Republic. Hence, effective preventive measures targeted at the reduction of risk factors associated with early coronary artery disease should be reinforced. The second most prevalent cause in our population are potentially heritable heart conditions such as cardiomyopathies and sudden arrhythmic death syndrome. This fact has already prompted the introduction of molecular autopsy and cardiogenetic care for relatives in the Czech Republic.

**13.** Forensic Sci Int. 2022 May;334:111240. doi: 10.1016/j.forsciint.2022.111240. Epub 2022 Feb 25.

**Benefits and outcomes of a new multidisciplinary approach for the management and financing of sudden unexplained death cases in a forensic setting in Switzerland.**

Neubauer J(1), Kissel CK(2), Bolliger SA(1), Barbon D(1), Thali MJ(1), Kloiber D(3), Bode PK(4), Kovacs B(2), Graf U(5), Maspoli A(5), Berger W(6), Saguner AM(2), Haas C(7).

**ABSTRACT**

Sudden cardiac death (SCD) is an important public health issue. In young persons aged between 1 and 40 years, most SCDs are caused by potentially inherited cardiac diseases, often not detectable during conventional medico-legal investigations and therefore termed as sudden unexplained deaths (SUD). In this study, we describe the implementation, feasibility and importance of a standardized procedure to investigate SUD cases within the forensic framework at the Zurich Institute of Forensic Medicine in Switzerland. This new approach involves a multidisciplinary collaboration including forensic autopsy, second pathology expert opinion, post-mortem molecular genetic testing, cardiac counselling of relatives, and a tentative financing. This procedure is in line with the published Swiss and European recommendations on the management of SCDs. During a two-year pilot project, 39

sudden and unexpected death cases were collected, whereof 10 deceased remained without any identifiable cause of death after medico-legal investigation and second expert evaluation. Molecular autopsy, including 393 genes involved in cardio-vascular and metabolic diseases, identified eight pathogenic or likely pathogenic genetic variants in five out of the 10 deceased (50%). Cardio-genetic follow-up investigations in the families of the 10 deceased revealed phenotype-positive relatives in four families and required specific therapies, including an implantable cardioverter defibrillator (ICD) for primary prevention. Multidisciplinary collaboration is crucial for an optimal management of sudden unexplained death cases, to identify additional relatives at risk, and to prevent other tragic deaths within a family.

## POST-CARDIAC ARREST TREATMENTS

**1.** Resusc Plus. 2022 Apr 5;10:100231. doi: 10.1016/j.resplu.2022.100231. eCollection 2022 Jun.
**Impact of post-arrest care variation on hospital performance after out-of-hospital cardiac arrest.**
Huebinger R(1)(2), Thomas J(3), Abella BS(4), Waller-Delarosa J(1)(2), Al-Araji R(5), Witkov R(1)(2), Villa N(1)(2), Nikonowicz P(1), Renbarger T(2), Panczyk M(1)(2), Bobrow B(1)(2).

**ABSTRACT**
BACKGROUND: Large variation exists for out-of-hospital-cardiac-arrest (OHCA) prehospital care, but less is known about variations in post-arrest care. We sought to evaluate variation in post-arrest care in Texas as well as factors associated with higher performing hospitals. METHODS: We analyzed data in Texas Cardiac Arrest Registry to Enhance Survival (TX-CARES), including all adult, non-traumatic OHCAs from 1/1/2014 through 12/31/ 2020 that survived to hospital admission. We first evaluated variability in provisions of post-arrest care and outcomes. We then stratified hospitals into quartiles based on their rate of survival and evaluated the association between improving quartiles and care. Lastly, we evaluated for outliers in post-arrest care and outcomes using a mixed-effect regression model. RESULTS: We analyzed 7,842 OHCAs admitted to 146 hospitals. We identified large variations in post-arrest care, including targeted temperature management (TTM) (IQR 7.0-51.1%), left heart catheterization (LHC) (IQ 0-25%), and percutaneous coronary intervention (PCI) (IQR 0-10.3%). Higher performing hospital quartiles were associated with higher rates of TTM (aOR 1.42, 95% CI 1.36-1.49), LHC (aOR 2.07, 95% CI 1.92-2.23), and PCI (aOR 2.02, 95% CI 1.81-2.25); but lower rates of bystander CPR (aOR 0.90, 95% CI 0.87-0.94). We identified numerous performance outlier hospitals; 39 for TTM, 34 for PCI, 9 for survival to discharge, and 24 for survival with good neurologic function. CONCLUSIONS: Post-arrest care varied widely across Texas hospitals. Hospitals with higher rates of survival to discharge had increased rates of TTM, LHC, and PCI but not bystander CPR.

**2.** Resusc Plus. 2022 Apr 6;10:100230. doi: 10.1016/j.resplu.2022.100230. eCollection 2022 Jun.
**Survival and neurological outcome after out-of-hospital cardiac arrest treated with and without mechanical circulatory support.**
Mørk SR(1)(2), Bøtker MT(3)(2), Christensen S(4)(2), Tang M(5)(2), Terkelsen CJ(1)(2)(6).

**ABSTRACT**
AIM: The aim of this study was to describe the survival and neurological outcome in patients with OHCA treated with and without mechanical circulatory support (MCS). METHODS: This was a retrospective observational cohort study on patients with OHCA admitted to Aarhus University Hospital, Denmark, between January 2015 and December 2019. Kaplan-Meier estimates were used to evaluate 30-day and 30-180-day survival. Cox regression analysis was used to assess the association between covariates and one-year mortality. RESULTS: Among 1,015 patients admitted, 698 achieved return of spontaneous circulation (ROSC) before admission, 101 patients with refractory OHCA received mechanical circulatory support (MCS) and the remaining 216 patients with refractory OHCA did not receive MCS treatment. Survival to hospital discharge was 47% (478/1015). Good neurological outcome defined as Cerebral Performance Categories 1-2 were seen among 92%

(438/478) of the patients discharged from hospital. Median low-flow was 15 [8-22] minutes in the ROSC group and 105 [94-123] minutes in the MCS group. Mortality rates were high within the first 30 days, however; 30-180-day survival in patients discharged remained constant over time in both patients with ROSC on admission and patients admitted with MCS. Advanced age > 70 years (hazard ratio (HR) 1.98, 95% confidence interval (CI) 1.11-3.49), pulseless electrical activity (HR 2.39, 95% CI 1.25-4.60) and asystole HR 2.70, 95% CI 1.25-5.95) as initial rhythms were associated with one-year mortality in patients with ROSC. CONCLUSIONS: Short-term survival rates were high among patients with ROSC and patients receiving MCS. Among patients who survived to day 30, landmark analyses showed comparable 180-day survival in the two groups despite long low-flow times in the MCS group. Advanced age and initial non-shockable rhythms were independent predictors of one-year mortality in patients with ROSC on admission.

**3.** Resuscitation. 2022 Apr 16:S0300-9572(22)00110-1. doi: 10.1016/j.resuscitation.2022.03.036. Online ahead of print.

**Socioeconomic Status and Post-Arrest Care after Out-of-Hospital Cardiac Arrest in Texas.**

Huebinger R(1), Abella BS(2), Chavez S(3), Luber S(4), Al-Araji R(5), Panczyk M(6), Waller-Delarosa J(7), Villa N(8), Bobrow B(9).

**ABSTRACT**

INTRODUCTION: Post-arrest care after out-of-hospital cardiac arrest (OHCA) is critical to optimizing outcomes, but little is known about socioeconomic disparities in post-arrest care. We evaluated the association of socioeconomic status (SES) with post-arrest care and outcomes. METHODS: We included adult OHCAs surviving to hospital admission from the 2014-2020 Texas Cardiac Arrest Registry to Enhance Survival (CARES) and stratified cases into SES quartiles based on census tract data. Outcomes were targeted temperature management (TTM), percutaneous coronary intervention (PCI), survival to discharge, and survival with a Cerebral Performance Category (CPC) 1-2. We applied both a multivariable logistic regression and a mixed effects logistic regression, comparing lower quartiles to top quartile for outcomes. We modeled receiving hospital as a random intercept. RESULTS: We included 9,936 OHCAs. Using multivariable logistic regression and ignoring the receiving hospital, lower income had lower TTM (Q3 aOR 0.6, 95% CI 0.5-0.7; Q4 aOR 0.5, 95% CI 0.5-0.6), lower PCI (Q4 aOR 0.6, 95% CI 0.4-0.8), and lower survival with good CPC. Lower education had lower TTM (Q2 aOR 0.7, 95% CI 0.7-0.8; Q3 aOR, 0.6 95% CI 0.5-0.7; Q4 aOR 0.6, 95% CI 0.5-0.7), lower survival, and lower survival with good CPC. Lower employment had lower TTM (Q3 aOR 0.7, 95% CI 0.6-0.9; Q4 aOR 0.7, 95% CI 0.6-0.9) and survival with good CPC. These relationships for post-arrest care were not significant on mixed model analyses though. CONCLUSION: Lower SES was linked to lower rates of post-arrest care and outcomes, but many of the associations diminished when adjusting for receiving hospital random effect. Further study is needed to evaluate for inter-hospital disparities in care.

## TARGETED TEMPERATURE MANAGEMENT

No articles identified.

## ELECTROPHYSIOLOGY AND DEFIBRILLATION

**1.** Eur Heart J. 2022 Apr 14;43(15):1478-1487. doi: 10.1093/eurheartj/ehab498.

**Automated external defibrillators delivered by drones to patients with suspected out-of-hospital cardiac arrest.**

Schierbeck S(1), Hollenberg J(1), Nord A(1), Svensson L(1), Nordberg P(1), Ringh M(1), Forsberg S(1), Lundgren P(2)(3)(4), Axelsson C(2)(3), Claesson A(1).

**ABSTRACT**

AIMS: Early defibrillation is critical for the chance of survival in out-of-hospital cardiac arrest (OHCA). Drones, used to deliver automated external defibrillators (AEDs), may shorten time to defibrillation, but this has never been evaluated in real-life emergencies. The aim of this study was to investigate the feasibility of AED delivery by drones in real-life cases of OHCA. METHODS AND RESULTS: In this prospective clinical trial, three AED-equipped drones were placed within controlled airspace in Sweden, covering approximately 80 000 inhabitants (125 km2). Drones were integrated in the emergency medical services for automated deployment in beyond-visual-line-of-sight flights: (i) test flights from 1 June to 30 September 2020 and (ii) consecutive real-life suspected OHCAs. Primary outcome was the proportion of successful AED deliveries when drones were dispatched in cases of suspected OHCA. Among secondary outcomes was the proportion of cases where AED drones arrived prior to ambulance and time benefit vs. ambulance. Totally, 14 cases were eligible for dispatch during the study period in which AED drones took off in 12 alerts to suspected OHCA, with a median distance to location of 3.1 km [interquartile range (IQR) 2.8-3.4). AED delivery was feasible within 9 m (IQR 7.5-10.5) from the location and successful in 11 alerts (92%). AED drones arrived prior to ambulances in 64%, with a median time benefit of 01:52 min (IQR 01:35-04:54) when drone arrived first. In an additional 61 test flights, the AED delivery success rate was 90% (55/61). CONCLUSION: In this pilot study, we have shown that AEDs can be carried by drones to real-life cases of OHCA with a successful AED delivery rate of 92%. There was a time benefit as compared to emergency medical services in cases where the drone arrived first. However, further improvements are needed to increase dispatch rate and time benefits.

**2.** JACC Clin Electrophysiol. 2022 Apr;8(4):411-423. doi: 10.1016/j.jacep.2022.02.004. Epub 2022 Mar 30.

**Prediction of Sudden Cardiac Death Manifesting With Documented Ventricular Fibrillation or Pulseless Ventricular Tachycardia.**

Chugh SS(1), Reinier K(2), Uy-Evanado A(2), Chugh HS(2), Elashoff D(3), Young C(4), Salvucci A(5), Jui J(6).

**ABSTRACT**

OBJECTIVES: This study aimed to develop a novel clinical prediction algorithm for avertable sudden cardiac death. BACKGROUND: Sudden cardiac death manifests as ventricular fibrillation (VF)/ ventricular tachycardia (VT) potentially treatable with defibrillation, or nonshockable rhythms (pulseless electrical activity/asystole) with low likelihood of survival. There are no available clinical risk scores for targeted prediction of VF/VT. METHODS: Subjects with out-of-hospital sudden cardiac arrest presenting with documented VF or pulseless VT (33% of total cases) were ascertained prospectively from the Portland, Oregon, metro area with population ≈1 million residents (n = 1,374, 2002-2019). Comparisons of lifetime clinical records were conducted with a control group (n = 1,600) with ≈70% coronary disease prevalence. Prediction models were constructed from a training dataset using backwards stepwise logistic regression and applied to an internal validation dataset. Receiver operating characteristic curves (C statistic) were used to evaluate model discrimination. External validation was performed in a separate, geographically distinct population (Ventura County, California, population ≈850,000, 2015-2020). RESULTS: A clinical algorithm (VFRisk) constructed with 13 clinical, electrocardiogram, and echocardiographic variables had very good discrimination in the training dataset (C statistic = 0.808; [95% CI: 0.774-0.842]) and was successfully validated in internal (C statistic = 0.776 [95% CI: 0.725-0.827]) and external (C statistic = 0.782 [95% CI: 0.718-0.846]) datasets. The algorithm substantially outperformed the left ventricular ejection fraction (LVEF) ≤35% (C statistic = 0.638) and performed well across the LVEF spectrum. CONCLUSIONS: An algorithm for prediction of sudden cardiac arrest manifesting with VF/VT was successfully constructed using

widely available clinical and noninvasive markers. These findings have potential to enhance primary prevention, especially in patients with mid-range or preserved LVEF.

**3.** Open Access Emerg Med. 2022 Apr 12;14:141-146. doi: 10.2147/OAEM.S361335. eCollection 2022.

**Application of Automated External Defibrillators in Motorcycle Ambulances in Thailand's Emergency Medical Services.**

Apiratwarakul K(1), Tiamkao S(2), Cheung LW(3)(4), Celebi I(5), Suzuki T(6), Ienghong K(1).

**ABSTRACT**

BACKGROUND: Access time to emergency patients is a critical factor that affects the outcomes of life-or-death situations, especially in the cases of out-of-hospital cardiac arrests (OHCA). This study focused on developing a new model of emergency medical services (EMS) using a motorcycle-based ambulance (motorlance) with an automated external defibrillator (AED). There are currently no studies regarding access time for this vehicle. This study aimed at utilization of an AED in conjunction with motorlance and comparing the response time between a traditional ambulance and a motorlance. METHODS: This was a prospective study conducted in the EMS department of Srinagarind Hospital, located in Khon Kaen, Thailand, over a five-month period, from September 2021 to January 2022. Data were recorded employing a national standard of operations record form used for Thailand EMS departments nationwide. RESULTS: The 891 cases were divided into two groups which were motorlance and ambulance. The activation times for motorlance and ambulance were 0.44 minutes and 1.42 minutes, respectively ($p < 0.001$) and the response time in the motorlance group was 7.20 minutes compared with 9.25 minutes in the ambulance group. In OHCA, the motorlance with AED arrived at patients location and assisted to continue resuscitation at the hospital 88.9% of the time. CONCLUSION: AED used in conjunction with motorcycle ambulances had shorter periods of both activation time and response time compared to ambulances. The use of AEDs clearly increases the number of continuous resuscitations in out-of-hospital cardiac arrest patients.

## PEDIATRICS AND CHILDREN

**1.** Front Pediatr. 2022 Apr 4;10:834746. doi: 10.3389/fped.2022.834746. eCollection 2022.

**Risk Factors and Neurologic Outcomes Associated With Resuscitation in the Pediatric Intensive Care Unit.**

Lee EP(1)(2), Chan OW(1)(2), Lin JJ(1)(2), Hsia SH(1)(2), Wu HP(3)(4).

**ABSTRACT**

In the pediatric intensive care unit (PICU), cardiac arrest (CA) is rare but results in high rates of morbidity and mortality. A retrospective chart review of 223 patients who suffered from in-PICU CA was analyzed from January 2017 to December 2020. Outcomes at discharge were evaluated using pediatric cerebral performance category (PCPC). Return of spontaneous circulation was attained by 167 (74.8%) patients. In total, only 58 (25%) patients survived to hospital discharge, and 49 (21.9%) of the cohort had good neurologic outcomes. Based on multivariate logistic regression analysis, vasoactive-inotropic drug usage before CA, previous PCPC scale >2, underlying hemato-oncologic disease, and total time of CPR were risk factors associated with poor outcomes. Furthermore, we determined the cutoff value of duration of CPR in predicting poor neurologic outcomes and in-hospital mortality in patients caused by in-PICU CA as 17 and 23.5 min respectively.

**2.** Paediatr Anaesth. 2022 Apr;32(4):497-503. doi: 10.1111/pan.14389. Epub 2022 Feb 8.

**New European Resuscitation Council guidelines for pediatric life support and their implications for pediatric anesthesia: An educational article.**

Buis ML(1), Turner NM(2).

**ABSTRACT**

In this educational article, we summarize the changes in the new European Resuscitation Council guidelines for Pediatric Life Support, emphasizing the most important aspects for the anesthesiologist. Among these are: the use of two-thumb-encircling technique for thorax compressions in infants, 10 ml/kg as the standard volume fluid bolus and ventilation after intubation at an age-dependent rate. Using a fictitious case, we present a point-by-point summary of the changes and briefly mention some of the evidence behind them, referring the reader to the full guidelines for further evidence. We also give a summary of the incidence, causes, challenges, treatment, and prognosis of pediatric cardiac arrest in the operating room.

## EXTRACORPOREAL LIFE SUPPORT

**1.** World J Pediatr Congenit Heart Surg. 2022 May;13(3):379-382. doi: 10.1177/21501351221084304.

**Compression Device-Assisted Extracorporeal Cardiopulmonary Resuscitation Cannulation in Pediatric Patients-A Simulation Study.**

Peer SM(1), Bukhari S(1), Desai M(1), Tongut A(1), Ho A(2), Yerebakan C(1), Ramakrishnan K(1), Sinha P(1), Jonas RA(1), Yurasek G(3), Cleary K(2).

**ABSTRACT**

Background: Surgical neck cannulation for pediatric extracorporeal cardiopulmonary resuscitation (ECPR) requires multiple interruptions of manual chest compressions to facilitate the procedure. Effective uninterrupted CPR is essential to prevent neurological injury. We hypothesized that an automated chest compression device can be used to provide effective and uninterrupted chest compressions during pediatric neck ECPR cannulation. The feasibility of surgically cannulating the right carotid artery and right internal jugular vein in an infant during ongoing automated chest compressions was tested in a simulation study. Methods: A working prototype of a pediatric chest compression device was designed to provide automated chest compressions on an infant CPR manikin at the rate of 120 compressions/minute. A feedback device attached to the manikin was used to monitor the effectiveness of CPR. A synthetic artery, vein along with carotid sheath and skin was utilized to simulate surgical neck exploration. ECPR simulation was conducted using the compression device to provide chest compressions. Results: Four ECPR simulations were conducted during which vessel sparing (n = 2) and non-vessel sparing (n = 2) cannulation of the right internal carotid artery and right internal jugular vein were performed during ongoing mechanical chest compressions. All four cannulations were successfully performed without the need to interrupt chest compressions. Conclusions: In a simulated environment, pediatric ECPR neck cannulation with uninterrupted chest compressions may be accomplished using an automated chest compression device. The strategy of compression device-assisted ECPR cannulation requires further study and could potentially reduce the neurological complications of ECPR.

**EXPERIMENTAL RESEARCH**

**1.** J Clin Med. 2022 Apr 11;11(8):2111. doi: 10.3390/jcm11082111.

**Beneficial Effects of Adjusted Perfusion and Defibrillation Strategies on Rhythm Control within Controlled Automated Reperfusion of the Whole Body (CARL) for Refractory Out-of-Hospital Cardiac Arrest.**

Brixius SJ(1), Pooth JS(1), Haberstroh J(2), Damjanovic D(1), Scherer C(1), Greiner P(1), Benk C(1), Beyersdorf F(1), Trummer G(1).

**ABSTRACT**

Survival and neurological outcomes after out-of-hospital cardiac arrest (OHCA) remain low. The further development of prehospital extracorporeal resuscitation (ECPR) towards Controlled Automated Reperfusion of the Whole Body (CARL) has the potential to improve survival and outcome in these patients. In CARL therapy, pulsatile, high blood-flow reperfusion is performed combined with several modified reperfusion parameters and adjusted defibrillation strategies. We aimed to investigate whether pulsatile, high-flow reperfusion is feasible in refractory OHCA and whether the CARL approach improves heart-rhythm control during ECPR. In a reality-based porcine model of refractory OHCA, 20 pigs underwent prehospital CARL or conventional ECPR. Significantly higher pulsatile blood-flow proved to be feasible, and critical hypotension was consistently prevented via CARL. In the CARL group, spontaneous rhythm conversions were observed using a modified priming solution. Applying potassium-induced secondary cardioplegia proved to be a safe and effective method for sustained rhythm conversion. Moreover, significantly fewer defibrillation attempts were needed, and cardiac arrhythmias were reduced during reperfusion via CARL. Prehospital CARL therapy thus not only proved to be feasible after prolonged OHCA, but it turned out to be superior to conventional ECPR regarding rhythm control.

**2.** Arch Dis Child Fetal Neonatal Ed. 2022 May;107(3):311-316. doi: 10.1136/archdischild-2021-322638. Epub 2021 Aug 30.

**Comparison of intraosseous and intravenous epinephrine administration during resuscitation of asphyxiated newborn lambs.**

Roberts CT(1)(2)(3), Klink S(4), Schmölzer GM(5), Blank DA(4)(2)(3), Badurdeen S(4)(6), Crossley KJ(4), Rodgers K(4), Zahra V(4), Moxham A(4), Roehr CC(7)(8)(9), Kluckow M(10), Gill AW(11), Hooper SB(4)(12), Polglase GR(4)(12).

**ABSTRACT**

OBJECTIVE: Intraosseous access is recommended as a reasonable alternative for vascular access during newborn resuscitation if umbilical access is unavailable, but there are minimal reported data in newborns. We compared intraosseous with intravenous epinephrine administration during resuscitation of severely asphyxiated lambs at birth. METHODS: Near-term lambs (139 days' gestation) were instrumented antenatally for measurement of carotid and pulmonary blood flow and systemic blood pressure. Intrapartum asphyxia was induced by umbilical cord clamping until asystole. Resuscitation commenced with positive pressure ventilation followed by chest compressions and the lambs received either intraosseous or central intravenous epinephrine (10 µg/kg); epinephrine administration was repeated every 3 min until return of spontaneous circulation (ROSC). The lambs were maintained for 30 min after ROSC. Plasma epinephrine levels were measured before cord clamping, at end asphyxia, and at 3 and 15 min post-ROSC. RESULTS: ROSC was successful in 7 of 9 intraosseous epinephrine lambs and in 10 of 12 intravenous epinephrine lambs. The time and number of epinephrine doses required to achieve ROSC were similar between

the groups, as were the achieved plasma epinephrine levels. Lambs in both groups displayed a similar marked overshoot in systemic blood pressure and carotid blood flow after ROSC. Blood gas parameters improved more quickly in the intraosseous lambs in the first 3 min, but were otherwise similar over the 30 min after ROSC. CONCLUSIONS: Intraosseous epinephrine administration results in similar outcomes to intravenous epinephrine during resuscitation of asphyxiated newborn lambs. These findings support the inclusion of intraosseous access as a route for epinephrine administration in current guidelines.

**CASE REPORTS**

No articles identified.