This week's PubMed 12th February – 4th March 2023: articles of interest n = 124

CPR AND COVID-19

1. Am J Emerg Med. 2023 Feb 13:S0735-6757(23)00082-7. doi: 10.1016/j.ajem.2023.02.013. Online ahead of print.
Improving survival and outcome in those suffering an out-of-hospital cardiac arrest in the post-COVID-19 era.
Rottenberg EM(1).
NO ABSTRACT AVAILABLE

2. Int J Emerg Med. 2023 Feb 20;16(1):9. doi: 10.1186/s12245-023-00489-x.
The comparison of emergency medical service responses to and outcomes of out-of-hospital cardiac arrest before and during the COVID-19 pandemic in Thailand: a cross-sectional study.
Huabbangyang T(1), Klaiangthong R(2), Silakoon A(1), Sretimongkol S(3), Sangpakdee S(3), Khiaolueang M(3), Seancha P(3), Nuansamlee T(3), Kamsom A(4), Chaisorn R(5).
ABSTRACT
BACKGROUND: During the coronavirus disease 2019 (COVID-19) pandemic, the format of patients with out-of-hospital cardiac arrest (OHCA) management was modified. Therefore, this study compared the response time and survival at the scene of patients with OHCA managed by emergency medical services (EMS) before and during the COVID-19 pandemic in Thailand. METHODS: This retrospective, observational study used EMS patient care reports to collect data on adult patients with OHCA coded with cardiac arrest. Before and during the COVID-19 pandemic was defined as the periods of January 1, 2018-December 31, 2019, and January 1, 2020-December 31, 2021, respectively. RESULTS: A total of 513 and 482 patients were treated for OHCA before and during the COVID-19 pandemic, respectively, showing a decrease of 6% (% change difference =- 6.0, 95% confidence interval [CI] - 4.1, - 8.5). However, the average number of patients treated per week did not differ (4.83 ± 2.49 vs. 4.65 ± 2.06; p value = 0.700). While the mean response times did not significantly differ (11.87 ± 6.31 vs. 12.21 ± 6.50 min; p value = 0.400), the mean on-scene and hospital arrival times were significantly higher during the COVID-19 pandemic compared with before by 6.32 min (95% CI 4.36-8.27; p value < 0.001), and 6.88 min (95% CI 4.55-9.22; p value < 0.001), respectively. Multivariable analysis revealed that patients with OHCA had a 2.27 times higher rate of return of spontaneous circulation (ROSC) (adjusted odds ratio = 2.27, 95% CI 1.50-3.42, p value < 0.001), and a 0.84 times lower mortality rate (adjusted odds ratio = 0.84, 95% CI: 0.58-1.22, p value = 0.362) during the COVID-19 pandemic period compared with that before the pandemic. CONCLUSIONS: In the present study, there was no significant difference between the response time of patients with OHCA managed by EMS before and during COVID-19 pandemic period; however, markedly longer on-scene and hospital arrival times and higher ROSC rates were observed during the COVID-19 pandemic than those in the period before the pandemic.

3. Resusc Plus. 2023 Mar;13:100366. doi: 10.1016/j.resplu.2023.100366. Epub 2023 Feb 13.
The nationwide impact of COVID-19 on life support courses. A retrospective evaluation by Resuscitation Council UK.
Thorne CJ(1)(2), Kimani PK(3), Hampshire S(1), Hamilton-Bower I(1), Begum-Ali S(1), Benson-Clarke A(1), Couper K(1)(3)(4), Yeung J(1)(3)(4), Lockey A(1)(5)(6), Perkins GD(1)(3)(4), Soar J(1)(2).
ABSTRACT
AIM: To determine the impact of the COVID-19 pandemic on Resuscitation Council UK Advanced Life Support (ALS) and Immediate Life Support (ILS) course numbers and outcomes. METHODS: We

conducted a before-after study using course data from the Resuscitation Council UK Learning Management System between January 2018 and December 2021, using 23 March 2020 as the cut-off between pre- and post-pandemic periods. Demographics and outcomes were analysed using chi-squared tests and regression models. RESULTS: There were 90,265 ALS participants (51,464 pre-; 38,801 post-) and 368,140 ILS participants (225,628 pre-; 142,512 post-). There was a sharp decline in participants on ALS/ILS courses due to COVID-19. ALS participant numbers rebounded to exceed pre-pandemic levels, whereas ILS numbers recovered to a lesser degree with increased uptake of e-learning versions. Mean ALS course participants reduced from 20.0 to 14.8 post-pandemic ($P < 0.001$).Post-pandemic there were small but statistically significant decreases in ALS Cardiac Arrest Simulation Test pass rates (from 82.1 % to 80.1 % (OR = 0.90, 95 % CI = 0.86-0.94, $P < 0.001$)), ALS MCQ score (from 86.6 % to 86.0 % (mean difference = -0.35, 95 % CI -0.44 to -0.26, $P < 0.001$)), and overall ALS course results (from 95.2 %to 94.7 %, OR = 0.92, CI = 0.85-0.99, P = 0.023). ILS course outcomes were similar post-pandemic (from 99.4 % to 99.4 %, P = 0.037). CONCLUSION: COVID-19 caused a sharp decline in the number of participants on ALS/ILS courses and an accelerated uptake of e-learning versions, with the average ALS course size reducing significantly. The small reduction in performance on ALS courses requires further research to clarify the contributing factors.

4. Eur J Emerg Med. 2023 Feb 27. doi: 10.1097/MEJ.0000000000001014. Online ahead of print.
Effects of the 2020 COVID-19 pandemic on outcomes of out-of-hospital cardiac arrest and bystander resuscitation efforts: a nationwide cohort study in Japan.
Kurosaki H(1)(2), Okumura K(3), Nunokawa C(3), Yao S(3), Murasaka K(4), Inaba H(3)(4)(5).
ABSTRACT
Background and importance There is limited knowledge about the nationwide impact of the 2020 COVID-19 pandemic in Japan on out-of -hospital cardiac arrest (OHCA) outcomes.Objectives The aim of this study was to investigate the impact of the 2020 COVID-19 pandemic on OHCA outcomes and bystander resuscitation efforts in Japan. Design Retrospective analysis of a nationwide population-based registry of OHCA cases. Settings and participants To conduct this study, we created a comprehensive database comprising 821 665 OHCA cases by combining and reconciling the OHCA database for 835 197 OHCA cases between 2017 and 2020 with another database, including location and time records. After applying exclusion and inclusion criteria, we analysed 751 617 cases. Outcome measures and analysis The primary outcome measure for this study was survival with neurologically favourable outcome (cerebral performance category 1 or 2). Results We compare OHCA characteristics and outcomes between prepandemic and pandemic years, and also investigated differences in factors associated with outcomes. We found that survival with neurologically favourable outcome and the rates of bystander cardiopulmonary resuscitation (CPR) slightly increased in the pandemic year [2.8% vs. 2.9%; crude odds ratio (OR), 1.07; 95% confidence interval (CI), 1.03-1.10; 54.1% vs. 55.3%, 1.05 (1.04-1.06), respectively], although the incidence of public access defibrillation (PAD) slightly decreased [1.8% vs. 1.6%, 0.89 (0.86-0.93)]. Calls for hospital selection by emergency medical service (EMS) increased during the pandemic. Subgroup analysis showed that the incidence of neurologically favourable outcome increased in 2020 for OHCA cases that occurred on nonstate of emergency days, in unaffected prefectures, with noncardiac cause, nonshockable initial rhythm, and during daytime hours. Conclusions During the 2020 COVID-19 pandemic in Japan, survival with neurologically favourable outcome of OHCA patients and bystander CPR rate did not negatively change, despite the decrement in PAD incidence. However, these effects varied with the state of emergency, region, and characteristics of OHCA, suggesting an imbalance between medical demand and supply, and raising concerns about the pandemic.

CPR/MECHANICAL CHEST COMPRESSION

1. Ann Emerg Med. 2023 Feb 23:S0196-0644(23)00026-4. doi: 10.1016/ j.annemergmed. 2023.01.012. Online ahead of print.

Effectiveness of Lay Bystander Hands-Only Cardiopulmonary Resuscitation on a Mattress versus the Floor: A Randomized Cross-Over Trial.

Missel AL(1), Donnelly JP(2), Tsutsui J(3), Wilson N(4), Friedman C(5), Rooney DM(5), Neumar RW(6), Cooke JM(7).

ABSTRACT

STUDY OBJECTIVE: Bystander cardiopulmonary resuscitation increases the likelihood of out-of-hospital cardiac arrest survival by more than two-fold. A common barrier to the prompt initiation of compressions is moving victims to the floor, but compression quality on a "floor" versus a "mattress" has not been tested among lay bystanders. METHODS: We conducted a prospective, randomized, cross-over trial comparing lay bystander compression quality using a manikin on a bed versus the floor. Participants included adults without professional health care training. We randomized participants to the order of manikin placement, either on a mattress or on the floor. For both, participants were instructed to perform 2 minutes of chest compressions on a cardiopulmonary resuscitation Simon manikin Gaumard (Gaumard Scientific, Miami, FL). The primary outcome was mean compression depth (cm) over 2 minutes. We fit a linear regression model adjusted for scenario order, age, sex, and body mass index with robust standard errors to account for repeated measures and reported mean differences with 95% confidence intervals (CIs). RESULTS: Our sample of 80 adults was 66% female with a mean age of 50.5 years (SD 18.2). The mean compression depth on the mattress was 2.9 cm (SD 2.3) and 3.5 cm (SD 2.2) on the floor, a mean difference of 0.58 cm (95% CI 0.18, 0.98). Compression depth fell below the 5 to 6 cm depth recommended by the American Heart Association on both surfaces. In the adjusted model, the mean depth was greater when the manikin was on the floor than the mattress (adjusted mean difference 0.62 cm; 95% CI 0.23 to 1.01), and mean depth was less for females than males (adjusted mean difference -1.42 cm, 95% CI -2.59, -0.25). In addition, the difference in compression depth was larger for female participants (mean difference 0.94 cm; 95% CI 0.54, 1.34) than for male participants (mean difference -0.01 cm; 95% CI -0.80, 0.78), and the interaction was statistically significant (P = .04). CONCLUSION: The mean compression depth was significantly smaller on the mattress and with female bystanders. Further research is needed to understand the benefit of moving out-of-hospital cardiac arrest victims to the floor relative to the detrimental effect of delaying chest compressions.

2. Resuscitation. 2023 Feb 16;185:109738. doi: 10.1016/j.resuscitation.2023.109738. Online ahead of print.

Temporal analysis of continuous chest compression rate and depth performed by firefighters during out of hospital cardiac arrest.

McAlister O(1), Harvey A(2), Currie H(2), McCartney B(2), Adgey J(3), Owens P(4), Idris A(4).

ABSTRACT

BACKGROUND: Quality of chest compressions (CC) during cardiopulmonary resuscitation (CPR) often do not meet guideline recommendations for rate and depth. This may be due to the fatiguing nature of physically compressing a patient's chest, meaning that CPR quality reduces over time. OBJECTIVE: This analysis investigates the effect of CPR duration on the performance of continuous CCs delivered by firefighters equipped with CPR feedback devices. METHODS: Data were collected from a first responder group which used CPR feedback and automatic external defibrillator devices when attending out-of-hospital cardiac arrest events. Depth and rate of CC were analysed for 134 patients. Mean CC depth and rate were calculated every 5 s during two-minute episodes of CPR. Regression models were created to evaluate the relationship between applied CC depth and rate as a function

of time. RESULTS: Mean (SD) CC depth during the investigation was 48 (9) mm. An inverse relationship was observed between CC depth and CPR duration, where CC depth decreased by 3.39 mm, over two-minutes of CPR ($p < 0.001$). Mean (SD) CC rate was 112.06 (5.87) compressions per minute. No significant relationship was observed between CC rate and CPR duration ($p = 0.077$). Mean depth was within guideline range for 33.58% of patient events, while guideline rate was observed in 92.54% of cases. CONCLUSIONS: A reduction in CC depth was observed during two-minutes of continuous CCs while CC rate was not affected. One third of patients received a mean CC depth within guideline range (50 to 60 mm).

3. Am J Emerg Med. 2023 Mar;65:208-209. doi: 10.1016/j.ajem.2022.12.011. Epub 2022 Dec 12.
4-finger method of hand placement and head rotation effectiveness in bystander CPR.
Rottenberg EM.
NO ABSTRACT AVAILABLE

4. Prehosp Emerg Care. 2023 Mar 1:1-7. doi: 10.1080/10903127.2023.2183294. Online ahead of print.
LUCAS Device Use Associated with Prolonged Pauses During Application and Long Chest Compression Intervals.
Morgan S(1), Gray JJ(2), Sams W(3), Uhl K(4), Gundrum M(4), McMullan J(5).
ABSTRACT
Background Tenets of high-quality out-of-hospital cardiac arrest (OHCA) resuscitation include early recognition and treatment of shockable rhythms, and minimizing interruptions in compressions. Little is known about how use of a mechanical compression device affects these elements. We hypothesize that use of such a device is associated with prolonged pauses in compressions to apply the device, and long compression intervals overall.MethodsWe systematically abstracted CPR metrics from 4 months of adult non-traumatic OHCA cases, each of which had at least 10 minutes of resuscitation, used a LUCAS device, and had a valid monitor file attached to the patient care report. Our primary outcomes of interest were the duration of each pause in compressions and the duration of compressions between pauses, stratified by whether or not the LUCAS device was used/applied during the segment. Each pause was further evaluated for a possible associated procedure based on pre-defined criteria. Descriptive statistics, chi-square, and Kruskal-Wallis tests were used as appropriate.ResultsFifty-eight cases were included, median age 62.5 years (IQR 49.3-70.8), 47% female, 66% non-White. Overall, 633 compression-pause segments were analyzed (517 with and 116 without LUCAS applied). Spacing of pauses was significantly longer with the LUCAS than without [median (IQR) 133 (82-213) seconds vs. 38 (18-62) seconds, $p < 0.05$]. When using a LUCAS, compressions were continuous for at least 3 minutes in 166/517 segments, at least 4 minutes in 89/517 segments, and at least 5 minutes in 56/517 segments. Without a LUCAS, compressions were longer than 3 minutes in 7/116 segments. Pauses exceeded 10 seconds more frequently with LUCAS application (32/38) than airway management or defibrillation (27/80, $p < 0.05$). Peri-LUCAS pauses exceeded 30 seconds in 6/38 cases. Conclusion LUCAS use was associated with long compression intervals without identifiable pauses to assess for pulse or cardiac rhythm, and device application was associated with longer pauses than airway management or defibrillation. The clinical significance and effect on patient outcomes remain uncertain and require further study.

REGISTRIES, REVIEWS AND EDITORIALS

1. Resusc Plus. 2023 Jan 28;13:100360. doi: 10.1016/j.resplu.2023.100360. eCollection 2023 Mar.
The use of induced hypothermia in extracorporeal membrane oxygenation: A narrative review.

Moreau A(1)(2), Levy B(3)(4), Annoni F(1)(2), Lorusso R(5), Su F(1)(2), Belliato M(6), Taccone FS(1)(2).

ABSTRACT

Despite venovenous or venoarterial extracorporeal membrane oxygenation (ECMO) being increasingly used in patients with severe acute respiratory disease syndrome, severe cardiogenic shock, and refractory cardiac arrest, mortality rates still remain high mainly because of the severity of the underlying disease and the numerous complications associated with initiation of ECMO. Induced hypothermia might minimize several pathological pathways present in patients requiring ECMO; even though numerous studies conducted in the experimental setting have reported promising results, there are currently no recommendations suggesting the routine use of this therapy in patients requiring ECMO. In this review, we summarized the existing evidence on the use of induced hypothermia in patients requiring ECMO. Induced hypothermia was a feasible and relatively safe intervention in this setting; however, the effects on clinical outcomes remain uncertain. Whether controlled normothermia has an impact on these patients compared with no temperature control remains unknown. Further randomized controlled trials are required to better understand the role and impact of such therapy in patients requiring ECMO according to the underlying disease.

2. Crit Care. 2023 Feb 10;27(1):58. doi: 10.1186/s13054-023-04342-8.

Response to: The difference in the association between included ECPR patients and neurological outcomes.

Watanabe M(#)(1), Matsuyama T(#)(2), Kitamura T(3).

NO ABSTRACT AVAILABLE

3. Resuscitation. 2023 Feb 16;185:109736. doi: 10.1016/j.resuscitation.2023.109736. Online ahead of print.

The urban-rural divide in cardiac arrest survival.

Masterson S(1), Teljeur C(2).

ABSTRACT

This paper provides a commentary on the recently published "The incidence and outcomes of out-of-hospital cardiac arrest in metropolitan versus rural locations: A systematic review and meta-analysis". The importance of this work due to the systematic search for the evidence and relative consistency of studies in terms of the direction of effect is highlighted. The commentary includes discussion on the variability between studies and the urban-rural differences in clinical care. Opportunities for future research are described, as well as the need to adequately characterise the local conditions and community engagement so that the applicability of research findings can be determined for local contexts.

4. Nat Rev Cardiol. 2023 Mar;20(3):143-144. doi: 10.1038/s41569-022-00830-6.

Hidden disparities in the rising prevalence of bystander cardiopulmonary resuscitation.

Ong MEH(1)(2), Siddiqui FJ(3).

NO ABSTRACT AVAILABLE

5. Am J Emerg Med. 2023 Mar;65:191. doi: 10.1016/j.ajem.2022.10.050. Epub 2022 Nov 9.

Favorable outcome of early conversion into a shockable rhythm with OHCA patient.

Chiang CH(1), Ho MP(2).

NO ABSTRACT AVAILABLE

6. Circ Cardiovasc Qual Outcomes. 2023 Feb;16(2):e008856. doi: 10.1161/CIRCOUTCOMES.121.008856. Epub 2022 Dec 12.

Efforts to Improve Survival Outcomes of Out-of-Hospital Cardiac Arrest in China: BASIC-OHCA.

Xie X(#)(1)(2), Zheng J(#)(1), Zheng W(#)(1), Pan C(1), Ma Y(3), Zhu Y(1)(4), Tan H(5), Han X(4), Yan S(6), Zhang G(6), Li C(7), Shao F(8)(9)(10), Wang C(1), Zhang J(1), Bian Y(1), Ma J(1), Cheng K(1), Liu R(1), Sang S(11), Zhang Y(1), McNally B(12), Ong MEH(13), Lv C(2), Chen Y(1), Xu F(1); BASIC-OHCA Coordinators and Investigators.

ABSTRACT

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

7. Resuscitation. 2023 Feb 16;185:109737. doi: 10.1016/j.resuscitation.2023.109737. Online ahead of print.

Reply to: Does video laryngoscopy significantly improve clinical outcomes in patients with cardiac arrest?

Risse J(1), Fischer M(2), Fistera D(3).

NO ABSTRACT AVAILABLE

8. J Cardiothorac Vasc Anesth. 2023 Jan 28:S1053-0770(23)00040-X. doi: 10.1053/j.jvca.2023.01.018. Online ahead of print.

Con: We Should Not Routinely Intubate All Patients in Cardiac Arrest.

Milne B(1).

NO ABSTRACT AVAILABLE

9. Europace. 2023 Feb 16;25(2):263-269. doi: 10.1093/europace/euac154.

Prevalence of asystole during tilt test-induced vasovagal syncope may depend on test methodology.

Russo V(1), Parente E(1), Groppelli A(2), Rivasi G(3), Tomaino M(4), Gargaro A(5), Giacopelli D(5), Ungar A(3), Parati G(2), Fedorowski A(6)(7), Sutton R(8), van Dijk JG(9), Brignole M(2).

ABSTRACT

This review addresses tilt-testing methodology by searching the literature which reports timing of asystole and loss of consciousness (LOC). Despite the Italian protocol being the most widely adopted, its stipulations are not always followed to the letter of the European Society of Cardiology guidelines. The discrepancies permit reassessment of the incidence of asystole when tilt-down is early, impending syncope, compared with late, established LOC. Asystole is uncommon with early tilt down and diminishes with increasing age. However, if LOC is established as test-end, asystole is more common, and it is age-independent. Thus, the implications are that asystole is commonly under-diagnosed by early tilt-down. The prevalence of asystolic responses observed using the Italian protocol with a rigorous tilt down time is numerically close to that observed during spontaneous attacks by electrocardiogram loop recorder. Recently, tilt-testing has been questioned as to its validity but, in selection of pacemaker therapy in older highly symptomatic vasovagal syncope patients, the occurrence of asystole has been shown to be an effective guide for treatment. The use of head-up tilt test as an indication for cardiac pacing therapy requires pursuing the test until complete LOC. This review offers explanations for the findings and their applicability to practice. A novel interpretation is offered to explain why pacing induced earlier may combat vasodepression by raising the heart rate when sufficient blood remains in the heart.

10. Eur Heart J. 2023 Feb 21;44(8):678-679. doi: 10.1093/eurheartj/ehad001.

Ventricular arrhythmias and sudden cardiac death in heart failure with mildly reduced or preserved ejection fraction: knowledge gaps.

Waldmann V(1)(2), Barra S(2)(3), Marijon E(1)(2).

NO ABSTRACT AVAILABLE

11. Resusc Plus. 2023 Feb 18;13:100367. doi: 10.1016/j.resplu.2023.100367. eCollection 2023 Mar.

Extracorporeal cardio-pulmonary resuscitation in poisoning: A scoping review article.

Ng M(1), Wong ZY(1), Ponampalam R(1).

ABSTRACT

BACKGROUND: Extracorporeal cardiopulmonary resuscitation (ECPR) represents last-line salvage therapy for poisoning-induced cardiac arrest but no review has focused on this specific area. OBJECTIVE: This scoping review sought to evaluate the survival outcomes and characteristics of published cases of ECPR for toxicological arrest, with the aim of highlighting the potential and limitations of ECPR in toxicology. Eligibility Criteria. We searched PubMed and Cochrane for eligible papers from database inception to October 1, 2022 using the keywords "toxicology", "ECLS" and "CPR". References of included publications were searched to identify additional relevant articles. Qualitative synthesis was used to summarize the evidence. RESULTS: 85 articles were chosen: 15 case series, 58 individual cases and 12 other publications that were analyzed separately due to ambiguity. ECPR may improve survival outcomes in selected poisoned patients, although the extent of benefit is unclear. As ECPR for poisoning-induced arrest may have better prognosis compared to from other aetiologies, it is likely reasonable to apply ELSO ECPR consensus guideline recommendations to toxicological arrest. Out-of-hospital cardiac arrest alone may not be sufficient grounds to deny ECPR if effective resuscitation had been promptly instituted. Poisonings involving membrane-stabilizing agents and cardio-depressive drugs, and cardiac arrests with shockable rhythms appear to have better outcomes. ECPR may permit excellent neurologically-intact recovery despite prolonged low-flow time of up to four hours. Early ECLS activation and pre-emptive catheter placement can significantly shorten time-to-ECPR and possibly improve survival. CONCLUSION: As

effects of poisoning may be reversible, ECPR can potentially support poisoned patients through the critical peri-arrest state.

12. Resuscitation. 2023 Mar;184:109714. doi: 10.1016/j.resuscitation.2023.109714. Epub 2023 Feb 2.
Is continuous renal replacement therapy an option for hyperkalemic cardiocirculatory arrest?
Mendes JJ(1), Pietribiasi M(2).
NO ABSTRACT AVAILABLE

13. Med Klin Intensivmed Notfmed. 2023 Mar 3. doi: 10.1007/s00063-023-00999-9. Online ahead of print.
[INCEPTION: the beginning of the end of extracorporeal life support in out-of-hospital cardiac-arrest?]. [Article in German]
Macherey-Meyer S(1), Michels G(2), Adler C(3).
NO ABSTRACT AVAILABLE

14. J Am Med Dir Assoc. 2023 Feb 28:S1525-8610(23)00107-X. doi: 10.1016/j.jamda.2023.01.029. Online ahead of print.
Cardiac Resuscitation Procedures in US Nursing Facilities: Time to Reevaluate the Standard of Care?
Elon RD(1).
ABSTRACT
Although the use of automated external defibrillators (AEDs) in out-of-hospital cardiac arrest (OHCA) response has become the standard of care in many community settings over the past 20+ years, the adoption of AEDs in US nursing facilities is variable and the current number of facilities with AEDs is unknown. Recent research into the use of AEDs as part of cardiopulmonary resuscitation (CPR) procedures for nursing facility residents with sudden cardiac arrest demonstrates improved outcomes in the limited cohort with witnessed arrests, early bystander CPR, and an initial amenable rhythm, shocked with an AED before the arrival of Emergency Medical Services (EMS) personnel. This article reviews data about outcomes of CPR in older adults and nursing facility settings and proposes that standard procedures for CPR attempts in US nursing facilities should be reevaluated and continue to evolve, commensurate with the evidence and community standards.

15. Arrhythm Electrophysiol Rev. 2023 Jan;12:e03. doi: 10.15420/aer.2022.30.
Sudden Cardiac Arrest in Basketball and Soccer Stadiums, the Role of Automated External Defibrillators: A Review. For the BELTRAN Study (BaskEtbaLl and soccer sTadiums: Registry on Automatic exterNal defibrillators).
Bassi MD(1), Farina JM(2), Bombau J(3), Fitz Maurice M(4), Bortman G(5), Nuñez E(6), Márquez M(7), Bornancini N(8), Baranchuk A(1)(9).
ABSTRACT
Sudden cardiac arrest (SCA) during sports events has a dramatic impact on stadium-goers and the public and is often associated with poor outcomes unless treated with an automated external defibrillator (AED). Despite this, stadiums vary in AED use. This review aims to identify the risks and incidences of SCA, and the use of AEDs in soccer and basketball stadiums. A narrative review of all relevant papers was conducted. Athletes across all sports face an SCA risk of 1:50,000 athlete-years, with the greatest risk of SCA in young male athletes (1:35,000 person-years) and black male athletes (1:18,000 person-years). Africa and South America have the poorest soccer SCA outcomes at 3% and 4% survival. AED use on-site improves survival greater than defibrillation by emergency services.

Many stadiums do not have AEDs implemented into medical plans and the AEDs are often unrecognisable or are obstructed. Therefore, AEDs should be used on-site, use clear signalling, have certified trained personnel, and be incorporated into stadiums' medical plans.

16. J Cardiothorac Vasc Anesth. 2023 Feb 7:S1053-0770(23)00056-3. doi: 10.1053/j.jvca.2023.01.035. Online ahead of print.
Pro: We Should Routinely Intubate All Patients in Cardiac Arrest.
Gilbey T(1).
NO ABSTRACT AVAILABLE

17. Circulation. 2023 Feb 28;147(9):759-767. doi: 10.1161/CIRCULATIONAHA.122.062159. Epub 2023 Feb 27.
Declining Risk of Sudden Cardiac Death in Heart Failure: Fact or Myth?
Leyva F(1), Israel CW(2), Singh J(3).
ABSTRACT
The notion that the risk of sudden cardiac death (SCD) in patients with heart failure (HF) is declining seems to be gaining traction. Numerous editorials and commentaries have suggested that SCD, specifically arrhythmic SCD, is no longer a significant risk for patients with HF on guideline-directed medical therapy. In this review, we question whether the risk of SCD has indeed declined in HF trials and in the real world. We also explore whether, despite relative risk reductions, the residual SCD risk after guideline-directed medical therapy still suggests a need for implantable cardioverter defibrillator therapy. Among our arguments is that SCD has not decreased in HF trials, nor in the real world. Moreover, we argue that data from HF trials, which have not adhered to guideline-directed device therapy, do not obviate or justify delays to implantable cardioverter defibrillator therapy. In this context, we underline the challenges of translating the findings of HF randomized, controlled trials of guideline-directed medical therapy to the real world. We also make the case for HF trials that adhere to current guideline-directed device therapy so that we can better understand the role of implantable cardioverter defibrillators in chronic HF.

IN-HOSPITAL CARDIAC ARREST

1. medRxiv. 2023 Feb 8:2023.02.06.23285560. doi: 10.1101/2023.02.06.23285560. Preprint.
Using rapid response system trigger clusters to characterize patterns of clinical deterioration among hospitalized adult patients.
Piasecki RJ, Hunt EA, Perrin N, Spaulding EM, Winters B, Samuel L, Davidson PM, Strobos NC, Churpek M, Himmelfarb CR; American Heart Association's Get With The Guidelines®-Resuscitation Investigators.
ABSTRACT
BACKGROUND: Many rapid response system (RRS) events are activated using multiple triggers. However, the patterns in which RRS triggers co-occur to activate the medical emergency team (MET) to respond to RRS events is unknown. The purpose of this study was to identify and describe the patterns (RRS trigger clusters) in which RRS triggers co-occur when used to activate the MET and determine the association of these clusters with outcomes using a sample of hospitalized adult patients. METHODS: RRS events among adult patients from January 2015 to December 2019 in the Get With The Guidelines-Resuscitation registry's MET module were examined (n=134,406). A combination of cluster analyses methods was performed to group patients into RRS trigger clusters based on the triggers used to activate their RRS events. Pearson's chi-squared and ANOVA tests were used to examine differences in patient characteristics across RRS trigger clusters. Multilevel logistic

regression was used to examine the associations between RRS trigger clusters and outcomes following RRS events. RESULTS: Six RRS trigger clusters were identified in the study sample. The RRS triggers that predominantly identified each cluster were as follows: tachypnea, new onset difficulty in breathing, and decreased oxygen saturation (Cluster 1); tachypnea, decreased oxygen saturation, and staff concern (Cluster 2); respiratory depression, decreased oxygen saturation, and mental status changes (Cluster 3); tachycardia and staff concern (Cluster 4); mental status changes (Cluster 5); hypotension and staff concern (Cluster 6). Significant differences in patient characteristics were observed across RRS trigger clusters. Patients in Clusters 3 and 6 were associated with an increased likelihood of in-hospital cardiac arrest (IHCA [$p<0.01$]), while Cluster 4 was associated with a decreased likelihood of IHCA ($p<0.01$). All clusters were associated with an increased risk of mortality ($p<0.01$). CONCLUSIONS: We discovered six novel RRS trigger clusters with differing relationships to adverse patient outcomes following RRS events. RRS trigger clusters may prove crucial in clarifying the associations between RRS events and adverse outcomes and may aid in clinician decision-making during RRS events.

2. Resuscitation. 2023 Feb 16;185:109739. doi: 10.1016/j.resuscitation.2023.109739. Online ahead of print.

Heart rate and QRS duration as biomarkers predict the immediate outcome from pulseless electrical activity.

Norvik A(1), Kvaløy JT(2), Skjeflo GW(3), Bergum D(4), Nordseth T(1), Loennechen JP(5), Unneland E(6), Buckler DG(7), Bhardwaj A(8), Eftestøl T(9), Aramendi E(10), Abella BS(11), Skogvoll E(1).

ABSTRACT

INTRODUCTION: Pulseless electrical activity (PEA) is commonly observed in in-hospital cardiac arrest (IHCA). Universally available ECG characteristics such as QRS duration (QRSd) and heart rate (HR) may develop differently in patients who obtain ROSC or not. The aim of this study was to assess prospectively how QRSd and HR as biomarkers predict the immediate outcome of patients with PEA. METHOD: We investigated 327 episodes of IHCA in 298 patients at two US and one Norwegian hospital. We assessed the ECG in 559 segments of PEA nested within episodes, measuring QRSd and HR during pauses of compressions, and noted the clinical state that immediately followed PEA. We investigated the development of HR, QRSd, and transitions to ROSC or no-ROSC (VF/VT, asystole or death) in a joint longitudinal and competing risks statistical model. RESULTS: Higher HR, and a rising HR, reflect a higher transition intensity ("hazard") to ROSC ($p < 0.001$), but HR was not associated with the transition intensity to no-ROSC. A lower QRSd and a shrinking QRSd reflect an increased transition intensity to ROSC ($p = 0.023$) and a reduced transition intensity to no-ROSC ($p = 0.002$). CONCLUSION: HR and QRSd convey information of the immediateoutcome during resuscitation from PEA. These universally available and promising biomarkers may guide the emergency team in tailoring individual treatment.

3. Ann Emerg Med. 2023 Feb 23:S0196-0644(23)00041-0. doi:10.1016/j.annemergmed.2023.01.027. Online ahead of print.

Family-Witnessed Cardiopulmonary Resuscitation during Emergency Department Cardiac Arrest Care: A Resident Perspective.

Toy J(1).

NO ABSTRACT AVAILABLE

4. Resuscitation. 2023 Feb 22:109747. doi: 10.1016/j.resuscitation.2023.109747. Online ahead of print.

In-Hospital cardiac arrest complicating ST-elevation myocardial Infarction: Temporal trends and outcomes based on management strategy.

Bhat AG(1), Verghese D(2), Harsha Patlolla S(3), Truesdell AG(4), Batchelor WB(5), Henry TD(6), Cubeddu RJ(2), Budoff M(7), Bui Q(7), Matthew Belford P(8), X Zhao D(8), Vallabhajosyula S(9).

ABSTRACT
BACKGROUND: There are limited data on the relationship of ST-segment-elevation myocardial infarction (STEMI) management strategy and in-hospital cardiac arrest (IHCA). AIMS: To investigate the trends and outcomes of IHCA in STEMI by management strategy. METHODS: Adult with STEMI complicated by IHCA from the National Inpatient Sample (2000-2017) were stratified into early percutaneous coronary intervention (PCI) (day 0 of hospitalization), delayed PCI (PCI ≥ day 1), or medical management (no PCI). Coronary artery bypass surgery was excluded. Outcomes of interest included in-hospital mortality, adverse events, length of stay, and hospitalization costs. RESULTS: Of 3,967,711 STEMI admissions, IHCA was noted in 102,424 (2.6%) with an increase in incidence during this study period. Medically managed STEMI had higher rates of IHCA (3.6% vs 2.0% vs 1.3%, $p < 0.001$) compared to early and delayed PCI, respectively. Revascularization was associated with lower rates of IHCA (early PCI: adjusted odds ratio [aOR] 0.44 [95% confidence interval (CI) 0.43-0.44], $p < 0.001$; delayed PCI aOR 0.33 [95% CI 0.32-0.33], $p < 0.001$) compared to medical management. Non-revascularized patients had higher rates of non-shockable rhythms (62% vs 35% and 42.6%), but lower rates of multiorgan damage (44% vs 52.7% and 55.6%), cardiogenic shock (28% vs 65% and 57.4%) compared to early and delayed PCI, respectively (all $p < 0.001$). In-hospital mortality was lower with early PCI (49%, aOR 0.18, 95% CI 0.17-0.18), and delayed PCI (50.9%, aOR 0.18, 95% CI 0.17-0.19) ($p < 0.001$) compared to medical management (82.5%). CONCLUSION: Early PCI in STEMI impacts the natural history of IHCA including timing and type of IHCA.

5. Resuscitation. 2023 Feb 25:109752. doi: 10.1016/j.resuscitation.2023.109752. Online ahead of print.

Feasibility of accelerated code team activation with code button triggered smartphone notification.

Morris NA(1), Couperus C(2), Dezman Z(3), Rubinson L(4), Friedrich R(5), Gurmu S(5), Lemkin D(6).

ABSTRACT
INTRODUCTION: Studies support rapid interventions to improve outcomes in patients with in-hospital cardiac arrest. We sought to decrease the time to code team activation and improve dissemination of patient-specific data to facilitate targeted treatments. METHODS: We mapped code blue buttons behind each bed to patients through the electronic medical record. Pushing the button sent patient-specific data (admitting diagnosis, presence of difficult airway, and recent laboratory values) through a secure messaging system to the responding teams' smartphones. The code button also activated a hospital-wide alert through the operator. We piloted the system on seven medicine inpatient units from November 2019 through May 2022. We compared the time from code blue button press to smartphone message receipt vs traditional operator-sent overhead page. RESULTS: The code button was the primary mode of code team activation for 12/35 (34.3%) cardiac arrest events. The code team received smartphone notifications a median of 78 s (IQR = 47-127 s) before overhead page. The median time to adrenaline administration for codes activated with the code button was not significantly different (240 s (IQR 142-300 s for code button) vs 148 s (IQR = 34-367 s) for overhead page, $p = 0.89$). Survival to discharge was 3/12 (25.0%) for codes activated with the code button vs 4/23 (17.4%) when activated by calling the operator ($p = 0.67$). CONCLUSION: Implementation of a smartphone-based code button notification system reduced time to code team activation by 78 s. Larger cohorts are necessary to assess effects on patient outcomes.

6. Resuscitation. 2023 Feb 25:109750. doi: 10.1016/j.resuscitation.2023.109750. Online ahead of print.

The association between time of in hospital cardiac arrest and mortality; a retrospective analysis of two UK databases.

McGuigan PJ(1), Edwards J(2), Blackwood B(3), Dark P(4), Doidge JC(2), Harrison DA(2), Kitchen G(5), Lawson I(2), Nichol AD(6), Rowan KM(2), Shankar-Hari M(7), McAuley DF(8).

ABSTRACT

AIMS: The incidence of in hospital cardiac arrest (IHCA) varies throughout the day. This study aimed to report the variation in incidence of IHCA, presenting rhythm and outcome based on the hour in which IHCA occurred.METHODS: We conducted a retrospective analysis of the National Cardiac Arrest Audit (NCAA) including patients who suffered an IHCA from 1st April 2011 to 31st December 2019. We then linked the NCAA and intensive care Case Mix Programme databases to explore the effect of time of IHCA on hospital survival in the subgroup of patients admitted to intensive care following IHCA. RESULTS: We identified 115,690 eligible patients in the NCAA database. Pulseless electrical activity was the commonest presenting rhythm (54.8%). 66,885 patients died in the immediate post resuscitation period. Overall, hospital survival in the NCAA cohort was 21.3%. We identified 13,858 patients with linked ICU admissions in the Case Mix Programme database; 37.0% survived to hospital discharge. The incidence of IHCA peaked at 06.00. Rates of return of spontaneous circulation, survival to hospital discharge and good neurological outcome were lowest between 05.00 and 07.00. Among those admitted to ICU, no clear diurnal variation in hospital survival was seen in the unadjusted or adjusted analysis. This pattern was consistent across all presenting rhythms. CONCLUSIONS: We observed higher rates of IHCA, and poorer outcomes at night. However, in those admitted to ICU, this variation was absent. This suggests patient factors and processes of care issues contribute to the variation in IHCA seen throughout the day.

INJURIES AND CPR

1. Resusc Plus. 2023 Jan 31;13:100362. doi: 10.1016/j.resplu.2023.100362. eCollection 2023 Mar.
Injuries associated with mechanical chest compressions and active decompressions after out-of-hospital cardiac arrest: A subgroup analysis of non-survivors from a randomized study.
Petrovich P(1)(2), Berve PO(1)(3), Barth-Heyerdahl Roald B(4)(2), Wahl Kongsgård H(1), Stray-Pedersen A(2)(5), Kramer-Johansen J(1)(2)(3), Wik L(1)(3).

ABSTRACT

BACKGROUND: Both skeletal and visceral injuries are reported after cardiopulmonary resuscitation (CPR). This subgroup analysis of a randomized clinical study describes/compares autopsy documented injury patterns caused by two mechanical, piston-based chest compression devices: standard LUCAS® 2 (control) and LUCAS® 2 with active decompression (AD, intervention) in non-survivors with out-of-hospital cardiac arrest (CA). METHOD: We compared injuries documented by autopsies (medical/forensic) after control and intervention CPR based on written relatives consent to use patients' data. The pathologists were blinded for the device used. The cause of CA and injuries reported were based on a prespecified study autopsy template. We used Pearson's chi-squared test and logistic regression analysis with an alpha level of 0.05. RESULTS: 221 patients were included in the main study (April 2015-April 2017) and 207 did not survive. Of these, 114 (55%, 64 control and 50 intervention) underwent medical (N = 73) or forensic (N = 41) autopsy. The cause of CA was cardiac 53%, respiratory 17%, overdose/intoxication 14%, ruptured aorta 10%, neurological 1%, and other 5%. There were no differences between control and intervention in the incidence of rib fractures (67% vs 72%; p-value = 0.58), or sternal fractures (44% vs 48%; p-value = 0.65), respectively. The most frequent non-skeletal complication was bleeding (26% of all patients) and intrathoracic was the most common location. Ten of the 114 patients had internal organ injuries, where lungs were most affected. CONCLUSION: In non-survivors of OHCA patients, the most frequent cause of cardiac arrest was cardiogenic. Skeletal and non-skeletal fractures/injuries were found in both control and intervention groups. Bleeding was the most common non-skeletal complication. Internal organ injuries were rare.

2. Resuscitation. 2023 Feb 25;185:109748. doi: 10.1016/j.resuscitation.2023.109748. Online ahead of print.

Intestinal injury in cardiac arrest is associated with multiple organ dysfunction: A prospective cohort study.

Hoftun Farbu B(1), Langeland H(2), Ueland T(3), Michelsen AE(4), Jørstad Krüger A(5), Klepstad P(2), Nordseth T(2).

ABSTRACT

BACKGROUND: The impact of intestinal injury in cardiac arrest is not established. The first aim of this study was to assess associations between clinical characteristics in out-of-hospital cardiac arrest (OHCA) and a biomarker for intestinal injury, Intestinal Fatty Acid Binding Protein (IFABP). The second aim was to assess associations between IFABP and multiple organ dysfunction and 30-day mortality. METHODS: We measured plasma IFABP in 50 patients at admission to intensive care unit (ICU) after OHCA. Demographic and clinical variables were analysed by stratifying patients on median IFABP, and by linear regression. We compared Sequential Organ Failure Assessment (SOFA) score, haemodynamic variables, and clinical-chemistry tests at day two between the "high" and "low" IFABP groups. Logistic regression was applied to assess factors associated with 30-day mortality. RESULTS: Several markers of whole body ischaemia correlated with intestinal injury. Duration of arrest and lactate serum concentrations contributed to elevated IFABP in a multivariable model ($p < 0.01$ and $p = 0.04$, respectively). At day two, all seven patients who had died were in the "high" IFABP group, and all six patients who had been transferred to ward were in the "low" group. Of patients still treated in the ICU, the "high" group had higher total, renal and respiratory SOFA score ($p < 0.01$) and included all patients receiving inotropic drugs. IFABP predicted mortality (OR 16.9 per standard deviation increase, $p = 0.04$). CONCLUSION: Cardiac arrest duration and lactate serum concentrations were risk factors for intestinal injury. High levels of IFABP at admission were associated with multiple organ dysfunction and mortality.

CAUSE OF THE ARREST

1. Monaldi Arch Chest Dis. 2023 Feb 3. doi: 10.4081/monaldi.2023.2501. Online ahead of print.

Long-term prognosis of out-of-hospital cardiac arrest due to idiopathic ventricular arrhythmias.

Alves Pinto R(1), Proença T(2), Martins Carvalho M(3), Oliveira S(4), Adão L(5), Macedo F(6).

ABSTRACT

Life-threatening ventricular arrhythmias (VA) may occur in patients with unknown cardiac disease. A sizable part of them remains labeled as Idiopathic VA and limited data is available regarding their natural history. Our aim was to evaluate the long-term clinical outcomes of survivors of an idiopathic life-threatening VA. Patients who survived an idiopathic life-threatening VA referred to an ICD were included and followed for a median follow-up of 7 years. Clinical and device data were collected and a comparison between genders was made. A total of 29 patients, 41% female, mean age of 50 (19) years were studied; all were implanted with an ICD at index hospitalization. At follow-up, an etiological diagnosis was established in 38% of patients. Genetic testing improved the diagnosis and allowed the identification of a distinct clinical entity in 60% of patients ($p=0.04$, OR = 7.0), especially in women. Regarding ICD data, 31% received appropriate therapies with a median time to first appropriate shock of 39 months (IQR 12-46 months). Men had a significantly higher prevalence of appropriated shocks (50% vs 8%, $p=0.04$), with a similar time to the first arrhythmic event between genders. Two of the patients died, both from non-arrhythmic causes. Etiologic diagnosis and recurrence prediction in patients with idiopathic VA is challenging, even with long-term follow-up and sophisticated diagnostic evaluation. Genetic testing significantly improved the diagnostic yield, especially in women. Arrhythmia recurrence occurred in about one-third of patients and is significantly higher in men, underscoring the importance of ICD implantation.

2. Eur J Heart Fail. 2023 Feb 13. doi: 10.1002/ejhf.2793. Online ahead of print.
Late gadolinium enhancement and the risk of ventricular arrhythmias and sudden death in NYHA class I patients with non-ischaemic cardiomyopathy.
Di Marco A(1)(2)(3), Brown P(4), Mateus G(1), Faga V(1)(2), Nucifora G(4), Claver E(1)(2), Viedma J(1), Galvan F(1), Bradley J(4), Dallaglio PD(1)(2), de Frutos F(1)(2), Miller CA(3)(5)(6), Comín-Colet J(1)(2)(7), Anguera I(1)(2), Schmitt M(3)(4).
ABSTRACTAIM: To compare the risk of ventricular arrhythmias (VA) and sudden death (SD) between New York Heart Association (NYHA) class I and NYHA class II-III patients with non-ischaemic cardiomyopathy (NICM). METHODS AND RESULTS: Observational retrospective cohort study including patients with NICM who underwent cardiac magnetic resonance at two hospitals. The primary endpoint included appropriate implantable cardioverter defibrillator (ICD) therapies, sustained ventricular tachycardia, resuscitated cardiac arrest and SD. The secondary endpoint included heart failure (HF) hospitalizations, heart transplant, left ventricular assist device implant or HF death. Overall, 698 patients were included, 33% in NYHA class I. During a median follow-up of 31 months, the primary endpoint occurred in 57 patients (8%), with no differences between NYHA class I and NYHA class II-III cases (7% vs. 9%, p = 0.62). Late gadolinium enhancement (LGE) was the only independent predictor of the primary outcome both in NYHA class I and NYHA class II-III patients. LGE+ NYHA class I patients had a similar cumulative incidence of the primary endpoint as compared to LGE+ NYHA class II-III (p = 0.92) and a significantly higher risk as compared to LGE- NYHA class II-III cases (p < 0.001). The risk of the secondary endpoint was significantly higher in patients in NYHA class II-III as compared to those in NYHA class I (hazard ratio 3.2, p = 0.001). CONCLUSIONS: Patients with NICM in NYHA class I are not necessarily at low risk of VA and SD. Actually, LGE+ NYHA class I patients have a high risk. NYHA class I patients with high-risk factors, such as LGE, could benefit from primary prevention ICD at least as much as those in NYHA class II-III with the same risk factors.

3. Virchows Arch. 2023 Feb;482(2):385-406. doi: 10.1007/s00428-022-03458-6. Epub 2022 Dec 24.
Application of postmortem imaging modalities in cases of sudden death due to cardiovascular diseases-current achievements and limitations from a pathology perspective : Endorsed by the Association for European Cardiovascular Pathology and by the International Society of Forensic Radiology and Imaging.
Michaud K(1), Jacobsen C(2), Basso C(3), Banner J(2), Blokker BM(4), de Boer HH(5), Dedouit F(6), O'Donnell C(5), Giordano C(7), Magnin V(8)(9), Grabherr S(8)(9), Suvarna SK(10), Wozniak K(11), Parsons S(5), van der Wal AC(12).
ABSTRACT
Postmortem imaging (PMI) is increasingly used in postmortem practice and is considered a potential alternative to a conventional autopsy, particularly in case of sudden cardiac deaths (SCD). In 2017, the Association for European Cardiovascular Pathology (AECVP) published guidelines on how to perform an autopsy in such cases, which is still considered the gold standard, but the diagnostic value of PMI herein was not analyzed in detail. At present, significant progress has been made in the PMI diagnosis of acute ischemic heart disease, the most important cause of SCD, while the introduction of postmortem CT angiography (PMCTA) has improved the visualization of several parameters of coronary artery pathology that can support a diagnosis of SCD. Postmortem magnetic resonance (PMMR) allows the detection of acute myocardial injury-related edema. However, PMI has limitations when compared to clinical imaging, which severely impacts the postmortem diagnosis of myocardial injuries (ischemic versus non-ischemic), the age-dating of coronary occlusion (acute versus old), other potentially SCD-related cardiac lesions (e.g., the distinctive morphologies of

cardiomyopathies), aortic diseases underlying dissection or rupture, or pulmonary embolism. In these instances, PMI cannot replace a histopathological examination for a final diagnosis. Emerging minimally invasive techniques at PMI such as image-guided biopsies of the myocardium or the aorta, provide promising results that warrant further investigations. The rapid developments in the field of postmortem imaging imply that the diagnosis of sudden death due to cardiovascular diseases will soon require detailed knowledge of both postmortem radiology and of pathology.

4. Europace. 2023 Feb 16;25(2):627-633. doi: 10.1093/europace/euac172.
Sports-related sudden cardiac arrest in young adults.
Bohm P(1)(2), Meyer T(1), Narayanan K(3)(4), Schindler M(2), Weizman O(3), Beganton F(3), Schmied C(2), Bougouin W(3)(5), Barra S(3)(6), Dumas F(3)(5)(7), Varenne O(3)(5)(8), Cariou A(3)(5)(9), Karam N(3)(10)(11), Jouven X(3)(10)(11), Marijon E(3)(10)(11).
ABSTRACT
AIMS: Data on sports-related sudden cardiac arrest (SrSCA) among young adults in the general population are scarce. We aimed to determine the overall SrSCA incidence, characteristics, and outcomes in young adults. METHODS AND RESULTS: Prospective cohort study of all cases of SrSCA between 2012 and 2019 in Germany and Paris area, France, involving subjects aged 18-35 years. Detection of SrSCA was achieved via multiple sources, including emergency medical services (EMS) reporting and web-based screening of media releases. Cases and aetiologies were centrally adjudicated. Overall, a total of 147 SrSCA (mean age 28.1 ± 4.8 years, 95.2% males) occurred, with an overall burden of 4.77 [95% confidence interval (CI) 2.85-6.68] cases per million-year, including 12 (8.2%) cases in young competitive athletes. While bystander cardiopulmonary resuscitation (CPR) was initiated in 114 (82.6%), automated external defibrillator (AED) use by bystanders occurred only in a minority (7.5%). Public AED use prior to EMS arrival (odds ratio 6.25, 95% CI 1.48-43.20, P = 0.02) was the strongest independent predictor of survival at hospital discharge (38.1%). Among cases that benefited from both immediate bystander CPR and AED use, survival rate was 90.9%. Coronary artery disease was the most frequent aetiology (25.8%), mainly through acute coronary syndrome (86.9%). CONCLUSION: Sports-related sudden cardiac arrest in the young occurs mainly in recreational male sports participants. Public AED use remains disappointingly low, although survival may reach 90% among those who benefit from both bystander CPR and early defibrillation. Coronary artery disease is the most prevalent cause of SrSCA in young adults.

5. Singapore Med J. 2023 Feb;64(2):146-148. doi: 10.11622/smedj.2021120. Epub 2021 Sep 28.
Beyond 5Hs and 5Ts: a rare cause of cardiac arrest.
Kuan KK(1), Rahalkar K(2).
NO ABSTRACT AVAILABLE

6. J Cardiovasc Dev Dis. 2023 Feb 5;10(2):68. doi: 10.3390/jcdd10020068.
Sudden Cardiac Death in Athletes: Facts and Fallacies.
Han J(1), Lalario A(2), Merro E(2), Sinagra G(2), Sharma S(3), Papadakis M(3), Finocchiaro G(3).
ABSTRACT
The benefits of exercise for cardiovascular and general health are many. However, sudden cardiac death (SCD) may occur in apparently healthy athletes who perform at the highest levels. A diverse spectrum of diseases is implicated in SCD in athletes, and while atherosclerotic coronary artery disease predominates in individuals of >35 years of age, primary cardiomyopathies and ion channelopathies are prevalent in young individuals. Prevention of SCD in athletes relies on the implementation of health policies aimed at the early identification of arrhythmogenic diseases (such as cardiac screening) and successful resuscitation (such as widespread utilization of automatic

external defibrillators and training members of the public on cardiopulmonary resuscitation). This review will focus on the epidemiology and aetiologies of SCD in athletes, and examine fallacies in the approach to this controversial field. Furthermore, potential strategies to prevent these tragic events will be discussed, analysing current practice, gaps in knowledge and future directions.

7. Cardiovasc Diabetol. 2023 Feb 20;22(1):38. doi: 10.1186/s12933-023-01764-0.
Long-term increase in fasting blood glucose is associated with increased risk of sudden cardiac arrest.
Kim YG(#)(1), Roh SY(#)(2), Jeong JH(1), Lee HS(1), Min K(1), Choi YY(1), Han KD(3), Shim J(1), Choi JI(4), Kim YH(1).
ABSTRACT
BACKGROUND: Diabetes mellitus (DM) is associated with various cardiovascular complications, including sudden cardiac arrest (SCA). Furthermore, the severity of DM, as assessed by fasting blood glucose (FBG), is associated with the risk of SCA. However, whether long-term changes in FBG influence on SCA risk remains to be determined. METHODS: This study used sequential nationwide health screening data from 2009 and 2011. FBG was measured at each health screening, and ΔFBG was calculated as FBG in 2011-FBG in 2009. RESULTS: Overall, 2,801,153 people were analyzed, and the mean follow-up duration was 6.33 years. Compared with the euglycemic group (- 20 ≤ ΔFBG < 20), the 20 ≤ ΔFBG < 40, 40 ≤ ΔFBG < 100, and ΔFBG ≥ 100 groups had increased SCA risks of 25% (adjusted hazard ratio [HR] = 1.25; 95% confidence interval [CI] 1.16-1.35; p < 0.001), 66% (adjusted HR = 1.66; 95% CI 1.49-1.86; p < 0.001), and 2.9-fold (adjusted HR = 2.85; 95% CI 2.37-3.44; p < 0.001), respectively. The association between ΔFBG and SCA was maintained in people with DM but not in people without DM. However, sex, age, blood pressure, and presence of heart failure did not affect the association between ΔFBG and SCA. A decrease in ΔFBG over time was not associated with reduced risk of SCA: the adjusted HR was 1.11 (95% CI 0.98-1.27; p = 0.113) for the ΔFBG < -40 group and 1.12 (95% CI 1.03-1.22; p = 0.009) for the - 40 ≤ ΔFBG < - 20 group. CONCLUSIONS: A long-term increase in ΔFBG can be associated with increased risk of SCA in people with DM. However, a long-term decrease in ΔFBG was not associated with reduced risk of SCA. Actions to prevent increase in FBG can have significant effects on public health in terms of SCA prevention.

8. Cardiovasc Diabetol. 2023 Feb 20;22(1):36. doi: 10.1186/s12933-023-01769-9.
Association between low-density lipoprotein cholesterol and sudden cardiac arrest in people with diabetes mellitus.
Kim YG(#)(1), Jeong JH(#)(1), Han KD(2), Roh SY(3), Min K(4), Lee HS(1), Choi YY(1), Shim J(1), Choi JI(5), Kim YH(1).
ABSTRACT
BACKGROUND: Dyslipidemia measured as low-density lipoprotein (LDL)-cholesterol is an established risk factor of cardiovascular disease, which is more pronounced in diabetes population. Less is known about the association of LDL-cholesterol level and sudden cardiac arrest (SCA) risk in diabetes mellitus patients. This study investigated the association of LDL-cholesterol level and SCA risk in diabetes population. METHODS: This study was based on Korean National Health Insurance Service database. Patients who received general examination from 2009 to 2012 and diagnosed as type 2 diabetes mellitus were analyzed. Primary outcome was defined as SCA event identified with International Classification of Disease code. RESULTS: A total of 2,602,577 patients were included, with total follow-up duration of 17,851,797 person * year. Mean follow-up duration was 6.86 years, and 26,341 SCA cases were identified. Overall incidence of SCA was highest in the lowest LDL-cholesterol group (< 70 mg/dL) and decreased in a linear manner as LDL-cholesterol rises, till

160 mg/dL. Adjustment of covariates resulted in U-shape association, with highest risk of SCA in the highest LDL-cholesterol group (≥ 160 mg/dL) followed by lowest LDL-cholesterol group (< 70 mg/dL). In subgroup analysis, U-shape association between SCA risk and LDL-cholesterol was more pronounced in male, non-obese people, and those who did not use statins. CONCLUSIONS: In people with diabetes, the association between SCA and LDL-cholesterol level was U-shaped with highest and lowest LDL-cholesterol group having higher risk of SCA than others. Low LDL-cholesterol level can be a surrogate marker for increased risk of SCA in people with diabetes mellitus and this paradoxical association should be recognized and extended to clinical preventive measures.

END-TIDAL CO_2

1. Acta Anaesthesiol Scand. 2023 Mar 3. doi: 10.1111/aas.14224. Online ahead of print.
Veno-arterial CO(2) difference and lactate for prediction of early mortality after cardiac arrest.
Lundin A(1), Annborn M(2), Borgquist O(3), Düring J(4), Undén J(5), Rylander C(6).
ABSTRACT
BACKGROUND: Patients admitted to intensive care after cardiac arrest are at risk of circulatory shock and early mortality due to cardiovascular failure. The aim of this study was to evaluate the ability of the veno-arterial pCO2 difference (ΔpCO2 ; central venous CO2 - arterial CO2) and lactate to predict early mortality in post cardiac arrest patients. METHOD: This was a pre-planned prospective observational sub-study of the target temperature management 2 (TTM2) trial. The sub-study patients were included at five Swedish sites. Repeated measurements of ΔpCO2 and lactate were conducted at 4, 8, 12, 16, 24, 48 and 72 hours after randomization. We assessed the association between each marker and 96-hour mortality and their prognostic value for 96-hour mortality. RESULTS: 163 patients were included in the analysis. Mortality at 96 hours was 17%. During the initial 24 hours there was no difference in ΔpCO2 levels between 96-hour survivors and non-survivors. ΔpCO2 measured at four hours was associated with an increased risk of death within 96 hours (adjusted odds ratio: 1.15 [95%CI: 1.02-1.29; p = 0.018). Lactate levels were associated with poor outcome over multiple measurements. The area under the receiving operating curve to predict death within 96 hours was 0.59 (95%CI: 0.48-0.74) and 0.82 (95%CI: 0.72 - 0.92) for ΔpCO2 and lactate, respectively. CONCLUSIONS: Our results do not support the use of ΔpCO2 to identify patients with early mortality in the post resuscitation phase. In contrast, non-survivors demonstrated higher lactate levels in the initial phase and lactate identified patients with early mortality with moderate accuracy.

ORGAN DONATION

1. Transplant Proc. 2023 Jan-Feb;55(1):53-55. doi: 10.1016/j.transproceed.2022.11.006. Epub 2023 Jan 21.
Influence of Basic Life Support on Donor Organs in Uncontrolled Donors After Cardiac Death.
Alonso CC(1), Pascual JMN(1), Serrano FN(2), Rodriguez AM(3).
ABSTRACT
BACKGROUND: The aim of this study was to determine whether the application of basic life support (BLS) in patients who have experienced cardiac arrest and are subsequently referred to as uncontrolled asystole donors has any influence on the achievement of organs for subsequent transplantation. METHODS: Demographic data, BLS, cause of death, emergency response times, and organ donations were collected. The analysis of quantitative variables following normal distribution is shown as mean (SD), and Student t distribution was used for comparison purposes. The analysis of

variables that did not follow the normal distribution is shown as median (IQR), and Wilcoxon test was applied for comparison purposes. RESULTS: A total of 91 cases of possible uncontrolled donor transfers were analyzed. Basic life support was provided to 61 patients (67.7%), whereas no BLS was provided to 27 patients (23.3%). Of the group that received BLS, 39 (73.6%) were effective donors compared with the non-BLS group, in which 22 (62.9%) were effective donors (P = .28). CONCLUSIONS: We did not find an association between performing BLS compared with non-BLS and organ donation.

2. AJOB Empir Bioeth. 2023 Feb 28:1-7. doi: 10.1080/23294515.2023.2180106. Online ahead of print.

Coding the Dead: Cardiopulmonary Resuscitation for Organ Preservation.

Eversmann C(1), Shah A(2), Lazaridis C(3), Ross LF(4).

ABSTRACT

BACKGROUND: There is lack of consensus in the bioethics literature regarding the use of cardiopulmonary resuscitation (CPR) for organ-preserving purposes. In this study, we assessed the perspectives of clinicians in critical care settings to better inform donor management policy and practice. METHODS: An online anonymous survey of members of the Society of Critical Care Medicine that presented various scenarios about CPR for organ preservation. RESULTS: The email was sent to 10,340 members. It was opened by 5,416 (52%) of members and 405 members (4%) completed the survey with few missing data. A majority of respondents (81%) answered that donation status should not influence whether CPR is performed on an imminently dying patient. There was very strong agreement (>85%) that 1) CPR should be performed on a registered donor who experiences a cardiac arrest with an unknown code status before death by neurological criteria (DNC) and 2) CPR should be performed if the patient is not a registered donor and experiences cardiac arrest but the surrogate/power of attorney (POA) has not yet been approached regarding code status and donation. When a registered donor with a DNR order experiences cardiac arrest before DNC, 98% of respondents would not perform CPR. However, after DNC, respondents were evenly divided on whether they would (49%) or would not (51%) perform CPR on a registered donor with an undocumented code status. When asked whether consent should be required for CPR for organ-preserving purposes, 39% answered "Yes" when a patient arrests before DNC and 48% answered "Yes" when a patient arrests after DNC (P = 0.2). CONCLUSIONS: The majority of respondents did not consider donor status relevant to CPR decisions before DNC, and virtually all would respect a DNR order in a registered donor before DNC. Respondents were divided about the need for an affirmative consent for CPR for organ-preserving purposes both before and after DNC.

FEEDBACK

1. Nurse Educ Today. 2023 Feb 17;124:105755. doi: 10.1016/j.nedt.2023.105755. Online ahead of print.

Using real-time device-based visual feedback in CPR recertification programs: A prospective randomised controlled study.

Lee PH(1), Lai HY(2), Hsieh TC(3), Wu WR(4).

ABSTRACT

BACKGROUND: Receiving regular training to maintain CPR skills is critical for in-service health-care professionals, especially because motor skills diminish over time. OBJECTIVES: To compare the effects of real-time device-based visual feedback and conventional instructor-based feedback on the chest compression skills and self-efficacy of nurses receiving a CPR recertification program. DESIGN: A prospective randomised controlled study with repeated measurements was conducted according

to the CONSORT 2010 guidelines. METHODS: A total of 109 nurses were recruited, and 98 nurses were eligible for random allocation. The control group (CG, n = 49) was advised by instructors for skill correction, and the experimental group (EG, n = 49) adjusted their skills according to on-screen real-time feedback data. The study outcomes were CPR performance metrics and self-efficacy that were assessed immediately after the training session (T1) and retested after 12 weeks (T2). RESULTS: In the EG, the percentage of the appropriate rate, depth, and chest recoil at T1 significantly improved by 24.47 % (P < .001), 19.63 % (P < .001), and 11.52 % (P = .001), respectively. The EG exhibited significantly higher chest compression total scores at T1, and the difference remained significant at T2 (P < 0.001). Moreover, the self-efficacy in the EG significantly improved at T1 (2.76; P < .001) and T2 (2.58; P < .001). CONCLUSION: Compared with instructor-based feedback, real-time device-based visual feedback improved chest compression quality and CPR self-efficacy.

DRUGS

1. World J Clin Cases. 2023 Jan 26;11(3):487-492. doi: 10.12998/wjcc.v11.i3.487.
Protective effects of combined treatment with ciprofol and mild therapeutic hypothermia during cerebral ischemia-reperfusion injury.
Wang YC(1)(2), Wu MJ(3), Zhou SL(1)(2), Li ZH(1)(4).
ABSTRACT
Despite improvement in cardiopulmonary resuscitation (CPR) performance, cardiac arrest (CA) is still associated with poor prognosis. The high mortality rate is due to multi-organ dysfunction caused by cerebral ischemia and reperfusion injury (I/R). The guidelines for CPR suggest the use of therapeutic hypothermia (TH) as an effective treatment to decrease mortality and the only approach confirmed to reduce I/R injury. During TH, sedative agents (propofol) and analgesia agents (fentanyl) are commonly used to prevent shiver and pain. However, propofol has been associated with a number of serious adverse effects such as metabolic acidosis, cardiac asystole, myocardial failure, and death. In addition, mild TH alters the pharmacokinetics of agents (propofol and fentanyl) and reduces their systemic clearance. For CA patients undergoing TH, propofol can be overdosed, leading to delayed awakening, prolonged mechanical ventilation, and other subsequent complications. Ciprofol (HSK3486) is a novel anesthetic agent that is convenient and easy to administer intravenously outside the operating room. Ciprofol is rapidly metabolized and accumulates at low concentrations after continuous infusion in a stable circulatory system compared to propofol. Therefore, we hypothesized that treatment with HSK3486 and mild TH after CA could protect the brain and other organs.

2. Eur Heart J Acute Cardiovasc Care. 2023 Feb 16:zuad009. doi: 10.1093/ehjacc/zuad009. Online ahead of print.
Comparison of sedation using propofol versus midazolam in patients admitted to the intensive care unit after extracorporeal cardiopulmonary resuscitation for out-of-hospital cardiac arrest: a multicentre observational study.
Shibahashi K(1), Hifumi T(2), Sugiyama K(1), Inoue A(3), Sakamoto T(4), Kuroda Y(5).
ABSTRACT
BACKGROUND: Optimal sedation regimens for patients after extracorporeal cardiopulmonary resuscitation (ECPR) remain unclear. This study compared the outcomes of patients who received propofol and midazolam for sedation post-ECPR for out-of-hospital cardiac arrest (OHCA).
METHODS: A retrospective cohort study analysed data from the Study of Advanced life support for Ventricular fibrillation with Extracorporeal circulation in Japan, including patients admitted to 36 intensive care units (ICU) in Japan post-ECPR for OHCA of cardiac aetiology between 2013 and 2018.

One-to-one propensity score-matched analysis compared outcomes between patients post-ECPR for OHCA who received exclusive treatment with a continuous propofol infusion (propofol users) and those who received exclusive treatment with a continuous midazolam infusion (midazolam users). The cumulative incidence and competing risk methodology were used to compare the time to liberation from mechanical ventilation and ICU discharge. RESULTS: Propensity score-matching created 109 matched pairs of propofol and midazolam users with balanced baseline characteristics. Competing risk analysis for the 30-day ICU period showed no significant difference in the probability of liberation from mechanical ventilation (0.431 vs. 0.422, P = 0.882) and ICU discharge (0.477 vs. 0.440, P = 0.634). Furthermore, there was no significant difference in the proportion of 30-day survival (0.399 vs. 0.398, P = 0.999), 30-day favourable neurological outcome (0.176 vs. 0.185, P = 0.999), and vasopressor requirement within 24-h post-ICU admission (0.651 vs. 0.670, P = 0.784). CONCLUSIONS: This multicentre cohort study revealed no significant differences in mechanical ventilation duration, ICU stay length, survival, neurological outcomes, and vasopressor requirement between propofol and midazolam users admitted to the ICU after ECPR for OHCA.

3. Prehosp Emerg Care. 2023;27(2):177-183. doi: 10.1080/10903127.2022.2044416. Epub 2022 Apr 6.

Time to Antiarrhythmic and Association with Return of Spontaneous Circulation in the United States.

Huebinger R(1)(2), Chan HK(1)(3), Bobrow B(1)(2), Chavez S(1)(2), Schulz K(1)(2)(4), Gordon R(1)(2), Jarvis J(2)(5).

ABSTRACT

INTRODUCTION: Recent clinical trials have failed to identify a benefit of antiarrhythmic administration during cardiac arrest. However, little is known regarding the time to administration of antiarrhythmic drugs in clinical practice or its impact on return of spontaneous circulation (ROSC). We utilized a national EMS registry to evaluate the time of drug administration and association with ROSC. METHODS: We utilized the 2018 and 2019 NEMSIS datasets, including all non-traumatic, adult 9-1-1 EMS activations for cardiac arrests with initial shockable rhythm and that received an antiarrhythmic. We calculated the time from 9-1-1 call to administration of antiarrhythmic. We excluded cases with erroneous time stamps. Stratified by initial antiarrhythmic (amiodarone and lidocaine), we created a mixed-effect logistic regression model evaluating the association between every 5-minute increase in time to antiarrhythmic and ROSC. We modeled EMS agency as a random intercept and adjusted for confounders. RESULTS: There were 449,630 adults, non-traumatic cardiac arrests identified with 11,939 meeting inclusion criteria. 9,236 received amiodarone and 1,327 received lidocaine initially. The median time in minutes to initial dose for amiodarone was 19.9 minutes (IQR 15.8-25.6) and for lidocaine was 19.5 minutes (IQR 15.2-25.4). Increasing time to initial antiarrhythmic was associated with decreased odds of ROSC for both amiodarone (aOR 0.9; 95% CI 0.9-0.94) and lidocaine (aOR 0.9; 95% CI 0.8-0.97). CONCLUSION: Time to administration of anti-arrhythmic medication varied, but most patients received the first dose of anti-arrhythmic drug more than 19 minutes after the initial 9-1-1 call. Longer time to administration of an antiarrhythmic in patients with an initial shockable rhythm was associated with decreased ROSC rates.

4. Eur Heart J Qual Care Clin Outcomes. 2023 Feb 15:qcad013. doi: 10.1093/ehjqcco/qcad013. Online ahead of print.

Outcomes with intracoronary versus intravenous epinephrine in cardiac arrest.

Tantawy M(1), Selim G(2), Saad M(3)(4), Tamara M(5), Mosaad S(6).

ABSTRACT

BACKGROUND: Advanced Cardiovascular Life Support (ACLS) guidelines recommend intravenous (IV) and intraosseous (IO) epinephrine as a basic cornerstone in the resuscitation process. Data about the efficacy and safety of intracoronary (IC) epinephrine during cardiac arrest in the catheterization laboratory is lacking. OBJECTIVE: To examine the efficacy and safety of IC versus IV epinephrine for resuscitation during cardiac arrest in the catheterization laboratory. METHODS: This is a prospective observational study that included all patients who experienced cardiac arrest in the Cath Lab at two tertiary centers in Egypt from January 2015 to July 2022. Patients were divided into two groups according to the route of epinephrine given; IC vs IV. The primary outcome was survival to hospital discharge. Secondary outcomes included rate of return of spontaneous circulation (ROSC), time-to-ROSC, and favorable neurological outcome at discharge defined as Modified Rankin Scale (MRS) <3. RESULTS: A total of 162 patients met our inclusion criteria, mean age (60.69 ± 9.61), 34.6% women. Fifty-two patients received IC epinephrine, and 110 received IV epinephrine as part of the resuscitation. Survival to hospital discharge was significantly higher in the IC epinephrine group (84.62% vs 53.64%, P < 0.001] compared with the IV epinephrine group. The rate of ROSC was higher in the IC epinephrine group (94.23% vs 70%, P < 0.001), and achieved in a shorter time (2.6 ± 1.97 minutes vs 6.8 ± 2.11 minutes, P < 0.0001) compared with the IV group. Similarly, favorable neurological outcomes were more common in the IC epinephrine group (76.92% vs 47.27%, P < 0.001] compared to the IV epinephrine group. CONCLUSION: In this observational study, IC epinephrine during cardiac arrest in the Cath Lab appeared to be safe and may be associated with improved outcomes compared with the IV route. Larger randomized studies are encouraged to confirm these results.

5. Am J Emerg Med. 2023 Feb 7;67:63-69. doi: 10.1016/j.ajem.2023.02.003. Online ahead of print.
Epinephrine administration in adults with out-of-hospital cardiac arrest: A comparison between intraosseous and intravenous route.
Yang SC(1), Hsu YH(1), Chang YH(1), Chien LT(1), Chen IC(2), Chiang WC(3).
ABSTRACT
INTRODUCTION: The benefits and risks of the intraosseous (IO) route for vascular access in patients with out-of-hospital cardiac arrest (OHCA) remain controversial. This study compares the success rates of establishing the access route, epinephrine administration rates, and time-to-epinephrine between adult patients with OHCA with IO access and those with intravenous (IV) access established by paramedics in the prehospital setting. METHODS: This was a retrospective study conducted by the San-Min station of Taoyuan Fire Department. Data for IV access were collected between January 1, 2020, and December 31, 2020. Data for IO access were collected between January 1, 2021, and March 10, 2021. Inclusion criteria were adult patients with OHCA who received on-scene resuscitation attempts and in whom either IV or IO route access was established by paramedics. Exclusion criteria were missing data, return of spontaneous circulation before establishing vascular access, cardiac arrest en route to hospital, patients not resuscitated, and OHCA unidentified by the dispatcher. Exposure was defined as IV route vs. IO route (EZ-IO®). The outcome measurements were per-patient based success rates of route establishment (successes/attempts), administration rates of epinephrine (epinephrine administered per case/enrolled OHCAs), and odds ratios of IV versus IO on epinephrine administration. We used nonparametric Mann-Whitney rank sum tests for the analysis in continuous variables and Fisher's exact tests for the analysis of categorical variables and the outcomes. Firth logistic regression method was used for sparse data. Factors associated with epinephrine administration other than vascular access were also analyzed. Time-to-epinephrine (defined as time from paramedic arrival to epinephrine injection) was reviewed and calculated by two independent observers and the Kaplan-Meier method was used to compare the two access routes. RESULTS: A total of 112 adult patients were enrolled in the analysis, including 71

men and 41 women, with an average age of 67 years. There were 90 IV access cases and 22 IO access cases. The groups were compared for median success rates of route establishment (33% vs. 100%, P < 0.001) and administration rates of epinephrine (52% vs. 100%, P < 0.001). The adjusted odds ratio of IO versus IV was 32.445, 95% confidence interval (CI) of 1.844-570.861. Time-to-epinephrine was significantly shorter in the cumulative time-event analysis by the Kaplan-Meier method (P < 0.001). CONCLUSION: The IO route was significantly associated with higher success rates of route establishment, epinephrine administration, and shorter time-to-epinephrine in the prehospital resuscitation of adult patients with OHCA.

6. Acad Emerg Med. 2023 Mar 4. doi: 10.1111/acem.14716. Online ahead of print.
Survival by Time-to-Administration of Amiodarone, Lidocaine, or Placebo in Shock-Refractory Out-of-Hospital Cardiac Arrest.
Lupton JR(1), Neth MR(1), Sahni R(1), Jui J(1), Wittwer L(1), Newgard CD(1), Daya MR(1).
ABSTRACT
BACKGROUND: Amiodarone and lidocaine have not been shown to have a clear survival benefit compared to placebo for out-of-hospital cardiac arrest (OHCA). However, randomized trials may have been impacted by delayed administration of the study drugs. We sought to evaluate how timing from Emergency Medical Services (EMS) arrival on-scene to drug administration affects the efficacy of amiodarone and lidocaine compared to placebo. METHOD: This is a secondary analysis of the 10-site, 55 EMS agency double-blind randomized controlled Amiodarone, Lidocaine, or Placebo in OHCA Study. We included patients with initial shockable rhythms who received the study drugs of amiodarone, lidocaine, or placebo before achieving return of spontaneous circulation. We performed logistic regression analyses evaluating survival to hospital discharge and secondary outcomes of survival to admission and functional survival (modified Rankin Scale ≤3). We evaluated the samples stratified by early (<8 minutes) and late administration groups (≥8 minutes). We compared outcomes for amiodarone and lidocaine compared to placebo and adjust for potential confounders. RESULTS: There were 2802 patients meeting inclusion criteria, with 879 (31.4%) in the early (<8 min) and 1923 (68.6%) in the late (≥8 min) groups. In the early group, patients receiving amiodarone, compared to placebo, had significantly higher survival to admission (62.0% vs. 48.5%, p=0.001; adjusted OR [95% CI] 1.76 [1.24-2.50]), survival to discharge (37.1% vs. 28.0%, p=0.021; 1.56 [1.07-2.29]), and functional survival (31.6% vs. 23.3%, p=0.029; 1.55 [1.04-2.32]). There were no significant differences with early lidocaine compared to early placebo (p-values>0.05). Patients in the late group who received amiodarone or lidocaine had no significant differences in outcomes at discharge compared to placebo (p-values >0.05). CONCLUSIONS: The early administration of amiodarone, particularly within 8 minutes, is associated with greater survival to admission, survival to discharge, and functional survival compared to placebo in patients with an initial shockable rhythm.

TRAUMA

1. J Nippon Med Sch. 2023 Feb 21. doi: 10.1272/jnms.JNMS.2023_90-206. Online ahead of print.
Development of a Machine Learning Model for Predicting Cardiac Arrest During Transport for Trauma Patients.
Kitano S(1)(2), Ogawa K(3), Igarashi Y(4), Nishimura K(3), Osawa S(3), Suzuki K(1), Fujimoto K(1), Harada S(1), Narikawa K(1), Tagami T(5), Ohwada H(3), Yokobori S(4), Ogawa S(1), Yokota H(1).
ABSTRACT
BACKGROUND: Trauma is a serious medical and economic problem worldwide, and patients with trauma injuries have a poor survival rate following cardiac arrest. This study aimed to create a

prediction model specific to prehospital trauma care and to achieve greater accuracy with techniques of machine learning. METHODS: This retrospective observational study investigated data of patients who had blunt trauma injuries due to traffic accident and fall trauma from January 1, 2018, to December 31, 2019, using the National Emergency Medical Services Information System, which stores emergency medical service activity records nationwide in the United States. Random forest was used to develop a machine learning model. RESULTS: Per the prediction model, the area under the curve of the predictive model was 0.95 and negative predictive value was 0.99. The feature importance of the predictive model was the highest for the AVPU scale (an acronym from "Alert, Verbal, Pain, Unresponsive"), followed by oxygen saturation (SpO2). Among patients who were progressing to cardiac arrest, the cutoff value was 89% for SpO2 in unalert patients. CONCLUSIONS: Patients whose conditions did not progress to cardiac arrest could be identified with high accuracy by machine learning model techniques.

VENTILATION

1. Am J Emerg Med. 2023 Feb 13;67:79-83. doi: 10.1016/j.ajem.2023.02.014. Online ahead of print.
Peri-Intubation Arrest in High Risk vs. Standard Risk Pediatric Trauma Patients Undergoing Endotracheal Intubation.
VanDeWall A(1), Harris-Kober S(2), Farooqi A(3), Kannikeswaran N(4).
ABSTRACT
BACKGROUND: While the anatomically difficult airway has been studied in pediatric trauma patients, physiologic risk factors are poorly understood. Our objective was to evaluate if previously published high risk physiologic criteria for difficult airway in medical patients is associated with adverse outcomes in pediatric trauma patients. METHODS: This was a retrospective chart review of patients ≤18 years with traumatic injuries who underwent endotracheal intubation (EI) in a pediatric emergency department (PED) between 2016 and 2021. High risk criteria evaluated included 1) hypotension, 2) concern for cardiac dysfunction, 3) persistent hypoxemia, 4) severe metabolic acidosis (pH < 7.1), 5) post-return of spontaneous circulation. Our primary outcome was peri-intubation cardiac arrest, defined as cardiac arrest within 10 minutes of EI. Secondary outcomes included in-hospital cardiac arrest and mortality and first pass EI success. RESULTS: One third (n = 32; 36.4%) of the 88 patients analyzed had at least one high risk criteria. When compared to the standard risk group, those in the high risk group had a higher incidence of peri-intubation arrest (28.1% vs. 0%, difference: 28.1%, 95% CI: 10.1-46.2), PED/in-hospital arrest (43.8% vs. 3.4%, difference: 38.4%, 95% CI: 17.8-59.0) and in-hospital mortality (33.4% vs. 3.6%, difference: 29.8%, 95% CI: 8.4-46.9). Having multiple high risk criteria progressively increased the odds of post-intubation PED/in-hospital cardiac arrest (1 risk factor: OR = 6.7, 95% CI: 1.5-30.2; 2 risk factors: OR = 12.5, 95% CI: 2.3-70.0; ≥ 3 risk factors: OR = 56.1, 95% CI: 6.0-523.8). CONCLUSIONS: The presence of high risk physiologic criteria is associated with increased incidence of peri-intubation, in-hospital arrest, and death in pediatric trauma patients. Children with multiple risk factors are at an incremental risk of cardiac arrest.

2. Int J Environ Res Public Health. 2023 Feb 5;20(4):2824. doi: 10.3390/ijerph20042824.
PEEP-ZEEP Compared with Bag Squeezing and Chest Compression in Mechanically Ventilated Cardiac Patients: Randomized Crossover Clinical Trial.
de Oliveira TF(1), Peringer VS(1), Forgiarini Junior LA(2), Eibel B(1).
ABSTRACT
Background and Objectives: Perform the bag squeezing and PEEP-ZEEP techniques associated with manual chest compression in mechanically ventilated cardiac patients in order to observe their effectiveness in the removal of pulmonary secretions and safety from a hemodynamic and ventilatory point of view. Methods: This is a randomized crossover clinical trial developed in a

hospital in southern Brazil. We included hemodynamically stable male and female patients aged over 18 years who used invasive mechanical ventilation for at least 48 h. The control group was established for the bag-squeezing technique and the intervention group for the PEEP-ZEEP maneuver, both associated with manual chest compression. Tracheal aspiration was performed 2 h before in order to match the groups in relation to the volume of secretion, and also immediately at the end of the techniques in order to measure the amount of secretion collected. Results: The sample had 36 individuals with a mean age of 70.3 years, 21% of the patients were male, and the majority (10.4%) were hospitalized for ischemic heart disease. DBP (p = 0.024), MAP (p = 0.004) and RR (p = 0.041) showed a significant difference in the post-moment in both groups. There was a significant difference in the reduction of peak pressure values (p = 0.011), in the moment after performing the techniques, and also in the Cdyn (p = 0.004) in the control group versus moment. Conclusions: Both maneuvers are safe in terms of hemodynamics and ventilatory mechanics, in addition to being capable of favoring airway clearance through secretion removal, and they can be used in routine physiotherapeutic care.

3. Resusc Plus. 2023 Feb 18;13:100365. doi: 10.1016/j.resplu.2023.100365. eCollection 2023 Mar.
The reality of advanced airway management during out of hospital cardiac arrest; why did paramedics deviate from their allocated airway management strategy during the AIRWAYS-2 randomised trial?
Kirby K(1)(2), Lazaroo M(3), Green J(4), Hall H(5), Pilbery R(6), Whitley GA(7), Voss S(1), Benger J(1).
ABSTRACT
BACKGROUND: AIRWAYS-2 was a large multi-centre cluster randomised controlled trial investigating the effect on functional outcome of a supraglottic airway device (i-gel) versus tracheal intubation (TI) as the initial advanced airway during out-of-hospital cardiac arrest. We aimed to understand why paramedics deviated from their allocated airway management algorithm during AIRWAYS-2. METHODS: This study employed a pragmatic sequential explanatory design utilising retrospective study data collected during the AIRWAYS-2 trial. Airway algorithm deviation data were analysed to categorise and quantify the reasons why paramedics did not follow their allocated strategy of airway management during AIRWAYS-2. Recorded free text entries provided additional context to the paramedic decision-making related to each category identified. RESULTS: In 680 (11.7%) of 5800 patients the study paramedic did not follow their allocated airway management algorithm. There was a higher percentage of deviations in the TI group (399/2707; 14.7%) compared to the i-gel group (281/3088; 9.1%). The predominant reason for a paramedic not following their allocated airway management strategy was airway obstruction, occurring more commonly in the i-gel group (109/281; 38.7%) versus (50/399; 12.5%) in the TI group. CONCLUSION: There was a higher proportion of deviations from the allocated airway management algorithm in the TI group (399; 14.7%) compared to the i-gel group (281; 9.1%). The most frequent reason for deviating from the allocated airway management algorithm in AIRWAYS-2 was obstruction of the patient's airway by fluid. This occurred in both groups of the AIRWAYS-2 trial, but was more frequent in the i-gel group.

CERERBRAL MONITORING

1. AJNR Am J Neuroradiol. 2023 Feb 16. doi: 10.3174/ajnr.A7779. Online ahead of print.
Parieto-Occipital Injury on Diffusion MRI Correlates with Poor Neurologic Outcome following Cardiac Arrest.
Calabrese E(1), Gandhi S(1)(2), Shih J(3), Otero M(3), Randazzo D(3), Hemphill C(3), Huie R(4), Talbott JF(1)(2), Amorim E(5)(2).
ABSTRACT
BACKGROUND AND PURPOSE: MR imaging of the brain provides unbiased neuroanatomic evaluation of brain injury and is useful for neurologic prognostication following cardiac arrest. Regional analysis

of diffusion imaging may provide additional prognostic value and help reveal the neuroanatomic underpinnings of coma recovery. The purpose of this study was to evaluate global, regional, and voxelwise differences in diffusion-weighted MR imaging signal in patients in a coma after cardiac arrest. MATERIALS AND METHODS: We retrospectively analyzed diffusion MR imaging data from 81 subjects who were comatose for >48 hours following cardiac arrest. Poor outcome was defined as the inability to follow simple commands at any point during hospitalization. ADC differences between groups were evaluated across the whole brain, locally by using voxelwise analysis and regionally by using ROI-based principal component analysis. RESULTS: Subjects with poor outcome had more severe brain injury as measured by lower average whole-brain ADC (740 [SD, 102] × 10-6 mm2/s versus 833 [SD, 23] × 10-6 mm2/s, P < .001) and larger average volumes of tissue with ADC below 650 × 10-6 mms/s (464 [SD, 469] mL versus 62 [SD, 51] mL, P < .001). Voxelwise analysis showed lower ADC in the bilateral parieto-occipital areas and perirolandic cortices for the poor outcome group. ROI-based principal component analysis showed an association between lower ADC in parieto-occipital regions and poor outcome. CONCLUSIONS: Brain injury affecting the parieto-occipital region measured with quantitative ADC analysis was associated with poor outcomes after cardiac arrest. These results suggest that injury to specific brain regions may influence coma recovery.

2. Neurocrit Care. 2023 Feb;38(1):129-137. doi: 10.1007/s12028-022-01570-8. Epub 2022 Jul 28.
The SLANT Score Predicts Poor Neurologic Outcome in Comatose Survivors of Cardiac Arrest: An External Validation Using a Retrospective Cohort.
Luck TG(1), Locke K(1), Sherman BC(1), Vibbert M(2), Hefton S(2), Shah SO(3).
ABSTRACT
BACKGROUND: Hypoxic brain injury is the leading cause of death in comatose patients following resuscitation from cardiac arrest. Neurological outcome can be difficult to prognosticate following resuscitation, and goals of care discussions are often informed by multiple prognostic tools. One tool that has shown promise is the SLANT score, which encompasses five metrics including initial nonshockable rhythm, leukocyte count after targeted temperature management, total adrenaline dose during resuscitation, lack of bystander cardiopulmonary resuscitation, and time to return of spontaneous circulation. This cohort study aimed to provide an external validation of this score by using a database of comatose cardiac arrest survivors from our institution. METHODS: We retrospectively queried our database of cardiac arrest survivors, selecting for patients with coma, sustained return of spontaneous circulation, and use of targeted temperature management to have a comparable sample to the index study. We calculated SLANT scores for each patient and separated them into risk levels, both according to the original study and according to a Youden index analysis. The primary outcome was poor neurologic outcome (defined by a cerebral performance category score of 3 or greater at discharge), and the secondary outcome was in-hospital mortality. Univariable and multivariable analyses, as well as a receiver operator characteristic curve, were used to assess the SLANT score for independent predictability and diagnostic accuracy for poor outcomes. RESULTS: We demonstrate significant association between a SLANT group with increased risk and poor neurologic outcome on univariable (p = 0.005) and multivariable analysis (odds ratio 1.162, 95% confidence interval 1.003-1.346, p = 0.046). A receiver operating characteristic analysis indicates that SLANT scoring is a fair prognostic test for poor neurologic outcome (area under the curve 0.708, 95% confidence interval 0.536-0.879, p = 0.024). Among this cohort, the most frequent SLANT elements were initial nonshockable rhythm (84.5%) and total adrenaline dose ≥ 5 mg (63.9%). There was no significant association between SLANT score and in-hospital mortality (p = 0.064). CONCLUSIONS: The SLANT score may independently predict poor neurologic outcome but not in-hospital mortality.

Including the SLANT score as part of a multimodal approach may improve our ability to accurately prognosticate comatose survivors of cardiac arrest.

3. Am J Crit Care. 2023 Mar 1;32(2):81-91. doi: 10.4037/ajcc2023991.
Lactate Level and Clearance as Predictors of Neurologic Outcome After Cardiopulmonary Resuscitation.
Brux H(1), Vom Dahl J(2), Haake H(3).
ABSTRACT
BACKGROUND: Cardiac arrest with subsequent cardiopulmonary resuscitation is common in emergency medicine and is often associated with an unfavorable neurologic outcome. Lactate level corresponds to the severity of tissue hypoxia and damage and thus could be useful in predicting neurologic outcome. OBJECTIVES: To investigate whether lactate and its clearance can serve as early prognostic biomarkers of neurologic outcome after cardiopulmonary resuscitation. METHODS: This study was a retrospective analysis of 249 patients of the Kliniken Maria Hilf hospital who survived at least 12 hours after cardiac arrest and cardiopulmonary resuscitation between 2012 and 2020. Multivariable logistic regressions were performed to correlate the neurologic outcome with lactate level, lactate clearance, and treatment-related patient data to identify factors that are predictors of neurologic outcome. RESULTS: A lactate level greater than 4.2 mmol/L at admission was significantly associated with an unfavorable neurologic outcome. Among patients with a lactate level greater than 4.2 mmol/L at admission, lactate clearance at 24 hours after admission that was greater than 80.9% was associated with a significant decrease in the probability of an unfavorable neurologic outcome. CONCLUSIONS: These results suggest that lactate and its clearance have an impact on neurologic outcome and can be used as prognostic biomarkers and in treatment decision-making in patients with cardiac arrest and successful resuscitation.

4. Eur Heart J Acute Cardiovasc Care. 2023 Mar 3:zuad019. doi: 10.1093/ehjacc/zuad019. Online ahead of print.
Neuroprognostication after cardiac arrest: What the cardiologist should know.
Kondziella D(1).
ABSTRACT
Two aspects are key to mastering prognostication of comatose cardiac arrest survivors: a detailed knowledge about the clinical trajectories of consciousness recovery (or lack thereof) and the ability to correctly interpret the results of multimodal investigations, which include clinical examination, EEG, neuroimaging, evoked potentials, and blood biomarkers. While the very good and the very poor ends of the clinical spectrum typically do not pose diagnostic challenges, the intermediate "grey zone" of post-cardiac arrest encephalopathy requires cautious interpretation of the available information and sufficiently long clinical observation. Late recovery of coma patients with initially ambiguous diagnostic results is increasingly reported, as are unresponsive patients with various forms of residual consciousness, including so-called cognitive motor dissociation, rendering prognostication of post-anoxic coma highly complex. The aim of this paper is to provide busy clinicians with a high-yield, concise overview of neuroprognostication after cardiac arrest, emphasizing notable developments in the field since 2020.

ULTRASOUND AND CPR

1. Eur Heart J Acute Cardiovasc Care. 2023 Feb 9;12(2):124-128. doi: 10.1093/ehjacc/zuac150.
Resuscitative transoesophageal echocardiography performed by emergency physicians in the emergency department: insights from a 1-year period.

Poppe M(1), Magnet IAM(1), Clodi C(1), Mueller M(1), Ettl F(1), Neumayer D(1), Losert H(1), Zeiner-Schatzl A(1), Testori C(1), Roeggla M(1), Schriefl C(1).

ABSTRACT

AIMS: Transoesophageal echocardiography (TOE) has increasingly been described as a possible complementary and point-of-care approach for patients with cardiac arrest (CA). It provides information about potentially reversible causes and prognosis and allows monitoring of resuscitation efforts without affecting ongoing chest compressions. The aim of this study was to assess the feasibility of TOE performed by emergency physicians (EPs) during CA in an emergency department (ED). METHODS AND RESULTS: This prospective study was performed at the Department of Emergency Medicine at the Medical University of Vienna from February 2020 to February 2021. All patients of ≥18 years old presenting with ongoing resuscitation efforts were screened. After exclusion of potential contraindications, a TOE examination was performed and documented by EPs according to a standardized four-view imaging protocol. The primary endpoint represents feasibility defined as successful probe insertion and acquisition of interpretable images. Of 99 patients with ongoing non-traumatic CA treated in the ED, a total of 62 patients were considered to be examined by TOE. The examination was feasible in 57 patients (92%) [females, 14 (25%), mean age 53 ± 13, and witnessed collapse 48 (84%)]. Within these, the examiners observed 51 major findings in 32 different patients (66%). In 21 patients (37%), these findings led to a direct change of therapy. In 18 patients (32%), the examiner found ventricular contractions without detectable pulse. No TOE-related complications were found. CONCLUSION: Our findings suggest that EPs may be able to acquire and interpret TOE images in the majority of patients during CA using a standardized four-view imaging protocol.

2. Turk J Emerg Med. 2023 Jan 2;23(1):24-29. doi: 10.4103/2452-2473.366482. eCollection 2023 Jan-Mar.

Role of initial cardiac activity assessed by point-of-care ultrasonography in predicting cardiac arrest outcomes: A prospective cohort study.

Thandar S(1), Sahu AK(2), Sinha TP(2), Bhoi S(2).

ABSTRACT

OBJECTIVES: This study was conducted to investigate the association between visible cardiac activity in point-of-care ultrasound (POCUS) and outcomes of cardiac arrest such as the return of spontaneous circulation (ROSC), survival to inpatient admission (SIA), and survival to hospital discharge (STHD). METHODS: This was a single-center, prospective cohort study conducted in the emergency department (ED). Adult (age >18 years) patients in cardiac arrest were included in the study. Exclusion criteria of the study were - traumatic arrest, out-of-hospital cardiac arrest resuscitated before ED admission, and patients presenting with initial shockable rhythm. Patients whose ultrasound images could not be obtained and whose resuscitation stopped following POCUS were also excluded from the study. POCUS examination was done after 2 min of initiation of cardiopulmonary resuscitation (CPR) and visible cardiac activity was defined as any visible movement of the myocardium, excluding movement of blood within cardiac chambers, or isolated valve movement. The duration of POCUS examinations was limited to 10 s. The association of initial cardiac activity in POCUS with the outcomes of cardiac arrest was investigated. RESULTS: Out of 140 patients screened, 84 patients were included in the study. Rates of ROSC, SIA, and STHD were found in 23 (27.4%), 9 (10.7%), and 2 (2.4%) patients, respectively. Only 15 out of 84 (17.9%) patients had cardiac activity on the initial POCUS examination. Cardiac activity was seen in 52.2% of patients with ROSC, which was significantly higher ($P < 0.001$) as compared with the no-ROSC group (4.9%). Unlike the above association, there was no difference in the incidence of initial cardiac activity in patient groups who got admitted (SIA) and discharged (STHD) versus those who died. In the multivariate

regression analysis, the duration of CPR and initial cardiac activity significantly predicted the rate of ROSC, with an adjusted odds ratio of 0.93 (95% confidence interval [CI]: 0.86-0.99, P = 0.04) and 24.8 (95% CI: 3.17-89.41, P = 0.002), respectively. None of the variables predicted SIA and STHD. The positive likelihood ratio of cardiac activity for predicting ROSC, SIA, and STHD were 10.6, 2.1, and 2.9, respectively. CONCLUSION: Integration of POCUS in cardiac arrest resuscitation was shown to be helpful in terms of prognostic significance of the presence of initial cardiac activity in terms of ROSC.

ORGANISATION AND TRAINING

1. Resusc Plus. 2023 Jan 31;13:100361. doi: 10.1016/j.resplu.2023.100361. eCollection 2023 Mar.
Dedicated chest compressor team: A quality improvement initiative to improve chest compression performance at in-hospital cardiac arrest events through quarterly training.
O'Leary A(1), Butler P(2), Fine JR(3).

ABSTRACT
BACKGROUND: High-quality cardiopulmonary resuscitation (CPR) is foundational to all resuscitative efforts. Spaced practice improves learners' skill retention. We evaluated the implementation of a quarterly CPR curriculum and skills training program for a dedicated chest compressor team to improve the quality of CPR performed during in-hospital cardiac arrest (IHCA) events and its impact on patient survival of event. METHODS: Baseline observations on CPR performance within the hospital were collected in October 2018. The CPR quarterly training program was implemented in November 2018. Training included use of high-fidelity simulation manikins and team members received real-time feedback scores related to compression rate, depth and recoil. High-quality CPR scores were set at ≥ 70%. Yearly IHCA event survival data was examined in relation to the implementation of training. RESULTS: Quarterly CPR training of the team led to retention of CPR skills (chest compression rate, depth, and recoil). The team's initial CPR training performance average score was 49.1%, increasing to 80.3%, with 95% (n = 37) of participants achieving a higher score after feedback during their initial training. A two-sample t-test was used for numerical data and chi-square was used for proportional data analysis. The survival of event prior to this training was 61.0% January-October 2018. Post -training, event survival rose to 73.5% (p-value 0.03) in 2019. CONCLUSION: Implementation of a team that attends quarterly CPR training with a high-fidelity simulation manikin is attainable. This training resulted in improved CPR quality and benefited IHCA event survival.

2. Prehosp Disaster Med. 2023 Feb 17:1-5. doi: 10.1017/S1049023X23000183. Online ahead of print.
Relationship of Public Interest in Cardiopulmonary Resuscitation with Cardiac Arrest Epidemiology and National Socioeconomic Indicators: Exploratory Infodemiology Study.
Birkun AA(1).

ABSTRACT
STUDY OBJECTIVE: Web-based big data analytics provides a great opportunity to measure public interest in cardiac arrest (CA) and cardiopulmonary resuscitation (CPR). This study aimed to examine associations of online interest in CPR and CA with epidemiological characteristics of out-of-hospital CA (OHCA) and national socioeconomic indicators in a set of European countries. METHODS: Country-level online search popularity data for CPR and CA topics measured in relative search volume (RSV) with Google Trends (GT), published OHCA epidemiological indicators, and World Bank's socioeconomic statistics of 28 European countries for the year 2017 were analyzed for correlation using Spearman's rank correlation coefficient (r S). RESULTS: Whereas OHCA incidence, bystander CPR rate, and hospital survival did not correlate with RSV for CPR or CA, the rate of return of spontaneous circulation (ROSC) demonstrated a positive correlation with RSV for CPR (r S = 0.388;

P = .042). Further, RSV for CPR positively correlated with countries' gross domestic product and health expenditure (r S = 0.939 and 0.566; P ≤.002) and negatively correlated with mortality caused by road traffic injury (r S = -0.412; P = .029). CONCLUSION: For the sample of European countries, public interest in CPR or CA showed no relationship with real bystander CPR rates and therefore could not be recommended as a proxy of community readiness to attempt resuscitation. The association of RSV for CPR with the rate of ROSC and countries' socioeconomic characteristics suggests it could be used for identifying geographies with poor performance of prehospital systems in terms of managing CA, in particular where effective epidemiological surveillance for CA may be unavailable.

3. Eur Heart J Acute Cardiovasc Care. 2023 Feb 9;12(2):87-95. doi: 10.1093/ehjacc/zuac165.
Smartphone-activated volunteer responders and bystander defibrillation for out-of-hospital cardiac arrest in private homes and public locations.
Andelius L(1)(2), Malta Hansen C(1)(3), Jonsson M(4), Gerds TA(5)(6), Rajan S(7), Torp-Pedersen C(8)(9), Claesson A(4), Lippert F(1), Tofte Gregers MC(1)(2), Berglund E(4), Gislason GH(5)(7), Køber L(3), Hollenberg J(4), Ringh M(4), Folke F(1)(2)(7).
ABSTRACT
AIMS: To investigate the association between the arrival of smartphone-activated volunteer responders before the Emergency Medical Services (EMS) and bystander defibrillation in out-of-hospital cardiac arrest (OHCA) at home and public locations. METHODS AND RESULTS: This is a retrospective study (1 September 2017-14 May 2019) from the Stockholm Region of Sweden and the Capital Region of Denmark. We included 1271 OHCAs, of which 1029 (81.0%) occurred in private homes and 242 (19.0%) in public locations. The main outcome was bystander defibrillation. At least one volunteer responder arrived before EMS in 381 (37.0%) of OHCAs at home and 84 (34.7%) in public. More patients received bystander defibrillation when a volunteer responder arrived before EMS at home (15.5 vs. 2.2%, P < 0.001) and in public locations (32.1 vs. 19.6%, P = 0.030). Similar results were found among the 361 patients with an initial shockable heart rhythm (52.7 vs. 11.5%, P < 0.001 at home and 60.0 vs. 37.8%, P = 0.025 in public). The standardized probability of receiving bystander defibrillation increased with longer EMS response times in private homes. The 30-day survival was not significantly higher when volunteer responders arrived before EMS (9.2 vs. 7.7% in private homes, P = 0.41; and 40.5 vs. 35.4% in public locations, P = 0.44). CONCLUSION: Bystander defibrillation was significantly more common in private homes and public locations when a volunteer responder arrived before the EMS. The standardized probability of bystander defibrillation increased with longer EMS response times in private homes. Our findings support the activation of volunteer responders and suggest that volunteer responders could increase bystander defibrillation, particularly in private homes.

4. Prehosp Emerg Care. 2023;27(2):196-204. doi: 10.1080/10903127.2022.2058131. Epub 2022 Apr 12.
Association between Mode of Transport and Patient Outcomes in the Emergency Department following Out-of-Hospital Cardiac Arrest: A Single-Center Retrospective Study.
Sanguanwit P(1), Sutthisuwan K(1), Phattharapornjaroen P(1), Phontabtim M(1), Mankong Y(2).
ABSTRACT
BACKGROUND: Out-of-hospital cardiac arrest (OHCA) remains a health problem worldwide, carrying a high mortality rate. Comparison of emergency department (ED) return of spontaneous circulation (ROSC) after OHCA in relation to emergency medical services (EMS) and non-EMS modes of transportation to the hospital was conducted to assess the impact points of the EMS system in Thailand. METHODS: This retrospective observational study enrolled all OHCA patients who

visited the ED of Ramathibodi Hospital, a tertiary university hospital in Bangkok, between January 1, 2008, and May 31, 2020. Patients were differentiated into EMS and non-EMS groups according to mode of transportation to the ED. Patients' characteristics and comorbidities, witnessed arrests, bystander chest compression, initial rhythm, and resuscitation treatment were documented. ED-sustained ROSC, ED survival, 30-day survival, and 30-day survival with good cerebral performance category (CPC) scores were monitored and recorded. Multivariate logistic analyses were performed to assess factors influencing clinical outcomes. RESULTS: A total of 339 patients were enrolled, 117 (34.51%) of whom were in the EMS transport group. There were no differences between the EMS and non-EMS groups in ED-sustained ROSC (adjusted odds ratio [aOR], 0.99; 95% confidence interval [CI], 0.58-1.70; P = 0.98), or ED survival (aOR, 0.99; 95% CI, 0.57-1.71; P = 0.97). There were also no differences in 30-day survival or 30-day survival with good CPC score between the two groups. CONCLUSIONS: In our cohort data of OHCA, ED-sustained ROSC and ED survival outcomes were not superior in the EMS transportation group. Evidence to show that EMS transportation affected 30-day survival and 30-day good CPC score was also lacking. Thus, public promotion of Thailand's EMS system is advocated with a simultaneous improvement of EMS response to enhance OHCA outcomes.

5. Eur Heart J Acute Cardiovasc Care. 2023 Feb 9;12(2):96-105. doi: 10.1093/ehjacc/zuac153.
Management of comatose survivors of out-of-hospital cardiac arrest in Europe: current treatment practice and adherence to guidelines. A joint survey by the Association for Acute CardioVascular Care (ACVC) of the ESC, the European Resuscitation Council (ERC), the European Society for Emergency Medicine (EUSEM), and the European Society of Intensive Care Medicine (ESICM).
Jorge-Perez P(1), Nikolaou N(2), Donadello K(3), Khoury A(4)(5), Behringer W(6), Hassager C(7), Boettiger B(8)(9)(10), Sionis A(11)(12), Nolan J(13)(14), Combes A(15)(16), Quinn T(17), Price S(18)(19), Grand J(20).
ABSTRACT
AIMS: International guidelines give recommendations for the management of comatose out-of-hospital cardiac arrest (OHCA) survivors. We aimed to investigate adherence to guidelines and disparities in the treatment of OHCA in hospitals in Europe. METHODS AND RESULTS: A web-based, multi-institutional, multinational survey in Europe was conducted using an electronic platform with a predefined questionnaire developed by experts in post-resuscitation care. The survey was disseminated to all members of the societies via email, social media, websites, and newsletters in June 2021. Of 252 answers received, 237 responses from different units were included and 166 (70%) were from cardiac arrest centres. First-line vasopressor used was noradrenaline in 195 (83%) and the first-line inotrope was dobutamine in 148 (64%) of the responses. Echocardiography is available 24/7 in 204 (87%) institutions. Targeted temperature management was used in 160 (75%) institutions for adult comatose survivors of OHCA with an initial shockable rhythm. Invasive or external cooling methods with feedback were used in 72 cardiac arrest centres (44%) and 17 (24%) non-cardiac arrest centres (P < 0.0003). A target temperature between 32 and 34°C was preferred by 46 centres (21%); a target between 34 and 36°C by 103 centres (52%); and <37.5°C by 35 (16%). Multimodal neuroprognostication was poorly implemented and a follow-up at 3 months after discharge was done in 71 (30%) institutions. CONCLUSION: Post-resuscitation care is not well established and varies among centres in European hospitals. Cardiac arrest centres have a higher coherence with guidelines compared with respondents from non-cardiac arrest centres. The overall inconsistency in approaches and deviation from recommendations could be a focus for improvement.

6. J Am Coll Cardiol. 2023 Feb 21;81(7):681-683. doi: 10.1016/j.jacc.2022.11.048.

Volunteer Response for Out-of-Hospital Cardiac Arrest: Strength in Numbers?
Cheskes S(1).
NO ABSTRACT AVAILABLE

7. J Am Coll Cardiol. 2023 Feb 21;81(7):668-680. doi: 10.1016/j.jacc.2022.11.047.
Association Between Number of Volunteer Responders and Interventions Before Ambulance Arrival for Cardiac Arrest.
Gregers MCT(1), Andelius L(2), Kjoelbye JS(3), Juul Grabmayr A(3), Jakobsen LK(3), Bo Christensen N(3), Kragh AR(3), Hansen CM(4), Lyngby RM(2), Væggemose U(5), Torp-Pedersen C(6), Ersbøll AK(7), Folke F(8).
ABSTRACT
BACKGROUND: Volunteer responder (VR) programs for activation of laypersons in out-of-hospital cardiac arrest (OHCA) have been deployed worldwide, but the optimal number of VRs to dispatch is unknown. OBJECTIVES: The purpose of this study was to investigate the association between the number of VRs arriving before Emergency Medical Services (EMS) and the proportion of bystander cardiopulmonary resuscitation (CPR) and defibrillation. METHODS: We included OHCAs not witnessed by EMS with VR activation from the Capital Region (September 2, 2017, to May 14, 2019) and the Central Region of Denmark (November 5, 2018, to December 31, 2019). We created 4 groups according to the number of VRs arriving before EMS: 0, 1, 2, and 3 or more. Using a logistic regression model adjusted for EMS response time, we examined associations between the number of VRs arriving before EMS and bystander CPR and defibrillation. RESULTS: We included 906 OHCAs. The adjusted ORs for bystander CPR were 2.40 (95% CI: 1.42-4.05), 3.18 (95% CI: 1.39-7.26), and 2.70 (95% CI: 1.32-5.52) when 1, 2, or 3 or more VRs arrived before EMS (reference), respectively. The adjusted OR for bystander defibrillation increased when 1 (1.97 [95% CI: 1.12-3.52]), 2 (2.88 [95% CI: 1.48-5.58]), or 3 or more (3.85 [95% CI: 2.11-7.01]) VRs arrived before EMS (reference). The adjusted OR of bystander defibrillation increased to 1.95 (95% CI: 1.18-3.22) when ≥3 VRs arrived first compared with 1 VR arriving first (reference). CONCLUSIONS: We found an association of increased bystander CPR and defibrillation when 1 or more VRs arrived before the EMS with a trend toward increased bystander defibrillation with increasing number of VRs arriving first.

8. Resuscitation. 2023 Feb 13;185:109721. doi: 10.1016/j.resuscitation.2023.109721. Online ahead of print.
Termination of resuscitation in out-of-hospital cardiac arrest in women and men: An ESCAPE-NET project.
Smits RLA(1), Sødergren STF(2), van Schuppen H(3), Folke F(4), Ringh M(5), Jonsson M(5), Motazedi E(1), van Valkengoed IGM(1), Tan HL(6).
ABSTRACT
AIM: Women have less favorable resuscitation characteristics than men. We investigated whether the Advanced Life Support Termination of Resuscitation rule (ALS-TOR) performs equally in women and men. Additionally, we studied whether adding or removing criteria from the ALS-TOR improved classification into survivors and non-survivors. METHODS: We analyzed 6,931 female and 14,548 male out-of-hospital cardiac arrest (OHCA) patients from Dutch and Swedish registries, and validated in 10,772 female and 21,808 male Danish OHCA patients. Performance measures were calculated for ALS-TOR in relation to 30-day survival. Recursive partitioning analysis was performed with the ALS-TOR criteria, as well as age, comorbidities, and additional resuscitation characteristics (e.g. initial rhythm, OHCA location). Finally, we explored if we could reduce the number of ALS-TOR criteria without loss of prognostic value. RESULTS: The ALS-TOR had a specificity and positive predictive value (PPV) of ≥99% in both women and men (e.g. PPV 99.9 in men). Classification by recursive

partitioning analysis showed a high sensitivity but a PPV below 99%, thereby exceeding the acceptable miss rate of 1%. A combination of no return of spontaneous circulation (ROSC) before transport to the hospital and unwitnessed OHCA resulted in nearly equal specificity and PPV, higher sensitivity, and a lower transport rate to the hospital than the ALS-TOR. CONCLUSION: For both women and men, the ALS-TOR has high specificity and low miss rate for predicting 30-day OHCA survival. We could not improve the classification with additional characteristics. Employing a simplified version may decrease the number of futile transports to the hospital.

9. CJEM. 2023 Feb 13:1-11. doi: 10.1007/s43678-023-00464-8. Online ahead of print.
Caring for the invisible and forgotten: a qualitative document analysis and experience-based co-design project to improve the care of families experiencing out-of-hospital cardiac arrest.
Loch T(1), Drennan IR(2)(3), Buick JE(4), Mercier D(5), Brindley PG(5)(6), MacKenzie M(5), Kroll T(7), Frazer K(7), Douma MJ(8)(9); Family Centred Cardiac Arrest Care Project.
ABSTRACT
OBJECTIVES: The objectives of this project were to collect and analyze clinical governance documents related to family-centred care and cardiac arrest care in Canadian EMS organizations; and to improve the family-centredness of out-of-hospital cardiac arrest care through experience-based co-design. METHODS: We conducted qualitative document analysis of Canadian EMS clinical governance documents related to family-centred and cardiac arrest care, combining elements of content and thematic analysis methods. We then used experience-based co-design to develop a family-centred out-of-hospital cardiac arrest care policy and procedure template. RESULTS: Thirty-five Canadian EMS organizations responded to our requests, representing service area coverage for 80% of the Canadian population. Twenty documents were obtained for review and six overarching themes were identified: addressing family in event of in-home death, importance of family, family member escort, provider discretion and family presence discouraged. Informed by our qualitative analysis we then co-designed a policy and procedure template was created that prioritizes patient care while promotes family-centredness. CONCLUSIONS: There were few directives to support family-centred care by Canadian EMS organizations. A family-centred out-of-hospital cardiac arrest care policy and procedure template was developed using experience-based co-design to assist EMS organizations improve the family-centredness of out-of-hospital cardiac arrest care.

10. Resuscitation. 2023 Feb 11;185:109731. doi: 10.1016/j.resuscitation.2023.109731. Online ahead of print.
Treatment and outcome variation in out-of-hospital cardiac arrest among four urban hospitals in Detroit.
Mathew S(1), Harrison N(2), Ajimal S(1), Silvagi R(1), Reece R(1), Klausner H(3), Levy P(1), Dunne R(1), O'Neil B(4).
ABSTRACT
AIMS: To determine whether out-of-hospital cardiac arrest (OHCA) post-resuscitation management and outcomes differ between four Detroit hospitals. INTRODUCTION: Significant variation exists in treatment/outcomes from OHCA. Disparities between hospitals serving a similar population is not well known. METHODS: Retrospective OHCA data was collected from the Detroit-Cardiac Arrest Registry (DCAR) between January 2014 to December 2019. Four hospitals were compared on two treatments (angiography, do not resuscitate (DNR)) and two outcomes (cerebral performance category (CPC) ≤ 2, in-hospital death). Models for death and CPC were tested with and without coronary angiography and DNR status. RESULTS: 999 patients at hospitals A - D differed ($p < 0.05$) before multivariable adjustment by age, race, witnessed arrest, dispatch-emergency department (ED) time, TTM, coronary angiography, DNR order, and in-hospital death. Rates of death and CPC ≤ 2

were worse in Hospital A (82.8%, 10%, respectively) compared to others (69.1%, 14.1%). After multivariable adjustment, Hospital A performed angiography less compared to B (OR = 0.17) and was more likely to initiate new DNR status than B (OR = 2.9), C (OR = 16.1), or D (OR = 3.6). CPC ≤ 2 were worse in Hospital A compared to B (OR = 0.27) and D (OR = 0.35). After sensitivity analysis, CPC ≤ 2 odds did not differ for A versus B (OR = 0.58, adjusted for angiography) or D (OR = 0.65, adjusted for DNR). Odds of death, despite angiography and DNR differences, were worse in Hospital A compared to B (OR = 1.87) and D (OR = 1.81). CONCLUSION: Differing rates of DNR and coronary angiography was associated with observed disparities in favorable neurologic outcome, but not death, between four Detroit hospitals.

11. Resuscitation. 2023 Mar;184:109724. doi: 10.1016/j.resuscitation.2023.109724. Epub 2023 Feb 11.

Corrigendum to "The "four-finger ruler" as a novel, simple and easy technique for hands placement during CPR training" [Resuscitation 182 (2022) 109683].

Nakagawa NK(1), Salles IC(2), Costa MM(2), Pinho JL(2), Böttiger BW(3).

NO ABSTRACT AVAILABLE

12. Resuscitation. 2023 Feb 21;185:109746. doi: 10.1016/j.resuscitation.2023.109746. Online ahead of print.

Factors associated with the arrival of smartphone-activated first responders before the emergency medical services in Out-of-Hospital cardiac arrest dispatch.

Gamberini L(1), Del Giudice D(2), Saltalamacchia S(1), Taylor B(3), Sala I(4), Allegri D(5), Pastori A(6), Coniglio C(7), Gordini G(1), Semeraro F(1); Collaborators.

ABSTRACT

BACKGROUND: First responder programs were developed to speed up access to cardiopulmonary resuscitation and defibrillation for out-of-hospital cardiac arrest (OHCA) victims. Little is known about the factors influencing the efficiency of the first responders arriving before the EMS and, therefore, effectively contributing to the chain of survival. OBJECTIVES: The primary objective of this retrospective observational study was to identify the factors associated with first responders' arrival before EMS in the context of a regional first responder program arranged to deliver automated external defibrillators on suspected OHCA scenes. METHODS: Eight hundred ninety-six dispatches where FRs intervened were collected from 2018 to 2022. A robust Poisson regression was performed to estimate the role of the time of day, the immediate availability of a defibrillator, the type of first responder, distances between the responder, the event and the dispatched vehicle, and the nearest available defibrillator on the probability of responder arriving before EMS. Moreover, a geospatial logistic regression model was built. RESULTS: Responders arrived before EMS in 13.4% of dispatches and delivered a shock in 0.9%. The immediate availability of a defibrillator for the responder (OR = 3.24) and special categories such as taxi drivers and police (OR = 1.74) were factors significantly associated with the responder arriving before EMS. Moreover, a geospatial effect suggested that first responder programs may have a greater impact in rural areas. CONCLUSIONS: When dispatched to OHCA scenes, responders already carrying defibrillators could more probably reach the scene before EMS. Special first responder categories are more competitive and should be further investigated.

13. Yonago Acta Med. 2023 Feb 10;66(1):120-128. doi: 10.33160/yam.2023.02.014. eCollection 2023 Feb.

Factors Related to Young People's Willingness to Perform Basic Life Support.

Hasegawa Y(1)(2), Hanaki K(2).

ABSTRACT
BACKGROUND: Survival rates increase when basic life support (BLS) is provided by bystanders to patients with acute diseases, such as out-of-hospital cardiac arrest; however, its implementation rate is not high. In this study, we investigated "interest on BLS," "knowledge on BLS," and "experience on BLS" as factors related to the willingness to implement BLS among junior high school, high school, and college students who have multiple opportunities to learn it. METHODS: This is an observational study using a questionnaire survey. The participants were 112 junior high school students, 114 high school students, and 109 university students (non-medical), totaling 294 (87.8% response rate). The questionnaire listed three items on the strength of willingness to perform BLS, three items on attributes of the participant, four items on the score of interest on BLS, one item on the score of knowledge on BLS, and two items on the score of experience on BLS. RESULTS: Among junior high school students, the factors that were significantly associated with the willingness to perform BLS were "Presence of someone who died" and "Interest on BLS" score. Among high school and college students, the factors that were significantly associated with the willingness to perform BLS were "Interest on BLS" and "Knowledge on BLS" scores. CONCLUSION: For junior high school students, creating an environment in which they can visualize the actual situation may increase their interest, whereas for high school and university students, in addition to such an environment, conducting seminars of short duration may help them to consolidate their knowledge and increase their willingness to implement BLS.

14. Yonago Acta Med. 2023 Feb 4;66(1):67-77. doi: 10.33160/yam.2023.02.008. eCollection 2023 Feb.

Bystanders' Willingness to Perform Basic Life Support and Its Relationship with Facilitative and Obstructive Factors: A Nationwide Survey in Japan.

Hasegawa Y(1)(2), Hanaki K(2).

ABSTRACT
BACKGROUND: The administration of basic life support (BLS) by bystanders is essential to improve the survival rates of patients who have experienced out-of-hospital cardiac arrest (OHCA). Although providing BLS to individuals who experience OHCA greatly improves their chances of survival, the actual implementation rate is low. Therefore, we investigated the association between bystanders' willingness to perform BLS and facilitative/obstructive factors with the objective of identifying educational methods that would improve the likelihood of bystanders performing BLS should they encounter a patient with OHCA. METHODS: The study participants included 502 male and 498 female Japanese residents (total, 1000 participants) with no experience in performing BLS and 42 male and 59 female Japanese residents (total 101 participants) with experience in performing BLS. The participants were aged 15-65 years. Both groups graded the strength of their willingness to perform BLS in the future on a 4-point scale, as well as their level of agreement with factors facilitating or obstructing their willingness to perform BLS. These factors were established based on the theory of helping behavior, which defines psychological states when helping others in social psychology.We then analyzed the associations between willingness to perform BLS in the future and their level of agreement with factors facilitating or obstructing their willingness to perform BLS. RESULTS: The willingness to perform BLS decreased in accordance with the increase in the level of intervention required for patients who experienced OHCA, and was significantly associated with four facilitating factors: sufficient ability and experience to perform BLS, personal advantage, high personal norms, and psychological closeness to the patient. CONCLUSION: Our results suggested that workshops and other educational activities focused on these facilitative factors may be helpful in increasing the rate at which bystanders perform BLS.

15. Circ Genom Precis Med. 2023 Feb;16(1):e003913. doi: 10.1161/CIRCGEN.122.003913. Epub 2023 Jan 30.

Family History of Sudden Cardiac Death in the Young and Inherited Arrhythmia Syndromes: Awareness and Attitudes of General Practitioners and Private Practice Cardiologists.

Piciacchia F(1), Auricchio A(1)(2), Behr ER(3)(4)(5), Wilde AAM(3)(6), Conte G(1)(2).

NO ABSTRACT AVAILABLE

16. Resuscitation. 2023 Mar 1:109757. doi: 10.1016/j.resuscitation.2023.109757. Online ahead of print.

Three-year trends in out-of-hospital cardiac arrest across the world: second report from the International Liaison Committee on Resuscitation (ILCOR).

Nishiyama C(1), Kiguchi T(2), Okubo M(3), Alihodžić H(4), Al-Araji R(5), Baldi E(6), Beganton F(7), Booth S(8), Bray J(9), Christensen E(10), Cresta R(11), Finn J(12), Grasner JT(13), Jouven X(14), Kern KB(15), Maconochie I(16), Masterson S(17), McNally B(18), Nolan JP(19), Eng Hock Ong M(20), Perkins GD(21), Ho Park J(22), Ristau P(13), Savastano S(23), Shahidah N(24), Do Shin S(22), Soar J(25), Tjelmeland I(26), Quinn MO(27), Wnent J(13), Wyckoff MH(28), Iwami T(29); ILCOR Research and Registries Working Group.

ABSTRACT

BACKGROUND: The International Liaison Committee on Resuscitation (ILCOR) Research and Registries Working Group previously reported data on systems of care and outcomes of out-of-hospital cardiac arrest (OHCA) in 2015 from 16 national and regional registries. To describe the temporal trends with updated data on OHCA, we report the characteristics of OHCA from 2015 through 2017. METHODS: We invited national and regional population-based OHCA registries for voluntary participation and included emergency medical services (EMS)-treated OHCA. We collected descriptive summary data of core elements of the latest Utstein style recommendation during 2016 and 2017 at each registry. For registries that participated in the previous 2015 report, we also extracted the 2015 data. RESULTS: Eleven national registries in North America, Europe, Asia, and Oceania, and 4 regional registries in Europe were included in this report. Across registries, the estimated annual incidence of EMS-treated OHCA was 30.0-97.1 individuals per 100,000 population in 2015, 36.4-97.3 in 2016, and 40.8-100.2 in 2017. The provision of bystander cardiopulmonary resuscitation (CPR) varied from 37.2% to 79.0% in 2015, from 2.9% to 78.4% in 2016, and from 4.1% to 80.3% in 2017. Survival to hospital discharge or 30-day survival for EMS-treated OHCA ranged from 5.2% to 15.7% in 2015, from 6.2% to 15.8% in 2016, and from 4.6% to 16.4% in 2017. CONCLUSION: We observed an upward temporal trend in provision of bystander CPR in most registries. Although some registries showed favourable temporal trends in survival, less than half of registries in our study demonstrated such a trend.

17. Cardiovasc Diagn Ther. 2023 Feb 28;13(1):1-10. doi: 10.21037/cdt-22-371. Epub 2023 Feb 14.

Ethnic and sex-based differences in outcomes after out-of-hospital cardiac arrest: a glimpse of the largest municipal healthcare system in the United States.

Nagraj S(1), Varrias D(1), Kharawala A(1), Mathai SV(1), Seo J(1), Narvel H(1), Li W(1), Kokkinidis DG(2), Barakakis PA(3), Tzoumas A(4), Liaqat W(5), Peppas S(6), Palaiodimos L(1), Thachil R(1).

ABSTRACT

BACKGROUND: Ethnic and sex-based disparity in outcomes after out-of-hospital cardiac arrest (OHCA) may exist and could be due to social factors and inequality in care. We aimed to study whether ethnic and sex-based differences in out-of-hospital cardiac arrest outcomes occurred in a safety net hospital within the largest municipal healthcare system in the United States. METHODS: We conducted a retrospective cohort study of patients successfully resuscitated from an OHCA and

brought to New York City Health + Hospitals/Jacobi, from January 2019 to September 2021. Out-of-hospital cardiac arrest characteristics, do not resuscitate and withdrawal of life-sustaining therapy orders, and disposition data were collected and analyzed using regression models. RESULTS: Out of 648 patients screened, 154 were included (48.1% women). On multivariable analysis, sex [odds ratio (OR): 0.84; 95% CI: 0.30-2.4; P=0.74] and ethnic background (OR: 0.80; 95% CI: 0.58-1.12; P=0.196) did not predict discharge survival. No significant sex difference in do not resuscitate (P=0.76) or withdrawal of life-sustaining therapy (P=0.39) orders was found. Younger age (OR: 0.96; P=0.04) and initial shockable rhythm (OR: 7.26; P=0.01) independently predicted survival, both at discharge and at one year. CONCLUSIONS: Among patients resuscitated after an out-of-hospital cardiac arrest, neither sex nor ethnic background predicted discharge survival and no sex differences in end-of-life preferences were found. These findings are distinct from those of previously published reports. Given the unique population studied, distinct from those of registry-based studies, socioeconomic factors likely served as bigger drivers of out-of-hospital cardiac arrest outcomes rather than ethnic background or sex.

18. Prehosp Emerg Care. 2023 Mar 1:1-13. doi: 10.1080/10903127.2023.2183533. Online ahead of print.

Barriers to the Initiation of Telecommunicator-CPR During 9-1-1 Out-of-Hospital Cardiac Arrest Calls: A Qualitative Study.

Missel AL(1), Dowker SR(1)(2)(3), Chiola M(4), Platt J(1), Tsutsui J(4), Kasten K(5), Swor R(6), Neumar RW(3)(7), Hunt N(3)(7), Herbert L(3), Sams W(3), Nallamothu BK(2)(8)(7), Shields T(3), Coulter-Thompson EI(1)(8), Friedman CP(1).

ABSTRACT

INTRODUCTION: Fewer than 10% of individuals who suffer out-of-hospital cardiac arrest (OHCA) survive with good neurologic function. Bystander CPR more than doubles the chance of survival, and telecommunicator-CPR (T-CPR) during a 9-1-1 call substantially improves the frequency of bystander CPR. OBJECTIVE: We examined the barriers to initiation of T-CPR. METHODS: We analyzed the 9-1-1 call audio from 65 EMS-treated OHCAs from a single US 9-1-1 dispatch center. We initially conducted a thematic analysis aimed at identifying barriers to the initiation of T-CPR. We then conducted a conversation analysis that examined the interactions between telecommunicators and bystanders during the recognition phase (i.e., consciousness and normal breathing). RESULTS: We identified six process themes related to barriers, including incomplete or delayed recognition assessment, delayed repositioning, communication gaps, caller emotional distress, nonessential questions and assessments, and caller refusal, hesitation, or inability to act. We identified three suboptimal outcomes related to arrest recognition and delivery of chest compressions, which are missed OHCA identification, delayed OHCA identification and treatment, and compression instructions not provided following OHCA identification. A primary theme observed during missed OHCA calls was incomplete or delayed recognition assessment and included failure to recognize descriptors indicative of agonal breathing (e.g., "snoring", "slow") or to confirm that breathing was effective in an unconscious victim. CONCLUSIONS: We observed that modifiable barriers identified during 9-1-1 calls where OHCA was missed, or treatment was delayed, were often related to incomplete or delayed recognition assessment. Repositioning delays were a common barrier to the initiation of chest compressions.

POST-CARDIAC ARREST TREATMENTS

1. Scand Cardiovasc J. 2023 Dec;57(1):2176919. doi: 10.1080/14017431.2023.2176919.

Sudden cardiac death in long-term follow-up in patients treated with primary percutaneous coronary intervention.

Savic L(1)(2), Mrdovic I(1)(2), Asanin M(1)(2), Stankovic S(3), Krljanac G(1)(2), Lasica R(1)(2), Simic D(2).

ABSTRACT

Objective. Most studies analyzing predictors of sudden cardiac death (SCD) after acute myocardial infarction included only high-risk patients or index reperfusion had not been performed in all patients. The aim of our study was to analyze the incidence of SCD and determine the predictors of SCD occurrence during 6-year follow-up of unselected patients with ST-elevation myocardial infarction (STEMI), treated with primary percutaneous coronary intervention (pPCI). Method. we analysed 3114 STEMI patients included included in the University Clinical Center of Serbia STEMI Register. Patients presenting with cardiogenic schock were excluded. Echocardiographic examination was performed before hospital discharge. Results. During 6-year follow-up, lethal outcome was registered in 297 (9.5%) patients, of whom 95 (31.9%) had SCD. The highest incidence of SCD was recorded in the first year of follow-up, when SCD was registered in 25 patients, which is 26.3% of the total number of patients who had had SCD, i.e. 0.8% of the patients analyzed. The independent predictors for the occurrence of SCD during 6-year follow-up were EF < 45% (HR 3.07, 95% 1.87-5.02), post-procedural TIMI flow <3 (HR 2.59, 95%CI 1.37-5.14), reduced baseline kidney function (HR 1.87, 95%CI 1.12-2.93) and Killip class >1 at admission (HR 1.69, 95%CI 1.23-2.97). Conclusion. There is a low incidence of SCD in unselected STEMI patients treated with primary PCI. Predictors of SCD occurence during long-term follow-up in analyzed patients are clinical variables that are easily recorded during index hospitalization and include: EF ≤45%, post-procedural flow TIMI < 3, Killip class >1, and reduced baseline kidney function.

2. Crit Care Explor. 2023 Feb 24;5(3):e0874. doi: 10.1097/CCE.0000000000000874. eCollection 2023 Mar.

Early Versus Delayed Coronary Angiography After Out-of-Hospital Cardiac Arrest Without ST-Segment Elevation-A Systematic Review and Meta-Analysis of Randomized Controlled Trials.

Al Lawati K(1)(2)(3), Forestell B(1), Binbraik Y(2)(4), Sharif S(1)(2)(5), Ainsworth C(2)(4), Mathew R(6), Amin F(2)(4), Al Fawaz M(2), Pinilla-Echeverri N(4), Belley-Côté E(2)(4)(5), Welsford M(1), Rochwerg B(2)(5).

ABSTRACT

The optimal timing of coronary angiography remains unclear following out-of-hospital cardiac arrest (OHCA) without ST elevation on electrocardiogram. The objective of this systematic review and meta-analysis was to evaluate the efficacy and safety of early angiography versus delayed angiography following OHCA without ST elevation. DATA SOURCES: The databases MEDLINE, PubMed EMBASE, and CINHAL, as well as unpublished sources from inception to March 9, 2022. STUDY SELECTION: A systematic search was performed for randomized controlled trials of adult patients after OHCA without ST elevation who were randomized to early as compared to delayed angiography. DATA EXTRACTION: Reviewers screened and abstracted data independently and in duplicate. The certainty of evidence was assessed for each outcome using the Grading Recommendations Assessment, Development and Evaluation approach. The protocol was preregistered (CRD 42021292228). DATA SYNTHESIS: Six trials were included (n = 1,590 patients). Early angiography probably has no effect on mortality (relative risk [RR] 1.04; 95% CI 0.94-1.15; moderate certainty) and may have no effect on survival with good neurologic outcome (RR 0.97; 95% CI 0.87-1.07; low certainty) or ICU length of stay (LOS) (mean difference 0.41 days fewer; 95% CI -1.3 to 0.5 d; low certainty). Early angiography has an uncertain effect on adverse events. CONCLUSIONS: In OHCA patients without ST elevation, early angiography probably has no effect on mortality and may have no effect on survival with good neurologic outcome and ICU LOS. Early angiography has an uncertain effect on adverse events.

3. Arch Cardiovasc Dis. 2023 Feb 13:S1875-2136(23)00051-7. doi: 10.1016/j.acvd.2023.01.007. Online ahead of print.
Prognosis of out-of-hospital cardiac arrest due to acute myocardial infarction with or without ST-segment elevation in patients treated with percutaneous coronary intervention.
Pham V(1), Varenne O(2), Cariou A(3), Picard F(4).
NO ABSTRACT AVAILABLE

4. Resuscitation. 2023 Feb 25:109753. doi: 10.1016/j.resuscitation.2023.109753. Online ahead of print.
The association of the post-resuscitation on-scene interval and patient outcomes after out-of-hospital cardiac arrest.
Khan L(1), Hutton J(2), Yap J(1), Dodek P(3), Scheuermeyer F(4), Asamoah-Boaheng M(5), Heidet M(6), Wall N(7), Fordyce CB(8), van Diepen S(9), Christenson J(4), Grunau B(10).
ABSTRACT
BACKGROUND: After resuscitation from out-of-hospital cardiac arrest (OHCA) by Emergency Medical Services (EMS), the amount of time that should be dedicated to pre-transport stabilization is unclear. We examined whether the time spent on-scene after return of spontaneous circulation (ROSC) was associated with patient outcomes. METHODS: We examined consecutive adult EMS-treated OHCAs from the British Columbia Cardiac Arrest registry (January 1/2019-June 1/2021) that had on-scene ROSC (sustained to scene departure). The primary outcome was favourable neurological outcome (Cerebral Performance Category ≤ 2) at hospital discharge; secondary outcomes were re-arrest during transport and hospital-discharge survival. Using adjusted logistic regression models, we estimated the association between the post-resuscitation on-scene interval (divided into quartiles) and outcomes. RESULTS: Of 1653 cases, 611 (37%) survived to hospital discharge, and 523 (32%) had favourable neurological outcomes. The median post-resuscitation on-scene interval was 18.8 minutes (IQR:13.0-25.5). Compared to the first post-resuscitation on-scene interval quartile, neither the second (adjusted odds ratio [AOR] 1.19; 95% CI 0.72-1.98), third (AOR 1.10; 95% CI 0.67-1.81), nor fourth (AOR 1.54; 95% CI 0.93-2.56) quartiles were associated with favourable neurological outcomes; however, the fourth quartile was associated with a greater odds of hospital-discharge survival (AOR 1.73; 95% CI 1.05-2.85), and both the third (AOR 0.40; 95% CI 0.22-0.72) and fourth (AOR 0.44;95% CI 0.24-0.81) quartiles were associated with a lower odds of intra-transport re-arrest. CONCLUSION: Among resuscitated OHCAs, increased post-resuscitation on-scene time was not associated with improved neurological outcomes, but was associated with improved survival to hospital discharge and decreased intra-transport re-arrest.

5. Integr Med Res. 2023 Mar;12(1):100925. doi: 10.1016/j.imr.2023.100925. Epub 2023 Feb 5.
Efficacy of acupuncture for cardiopulmonary cerebral resuscitation: A systematic review and meta-analysis.
Liu Y(1), Ren M(1), Kuang Z(2), Luo X(3), Li H(2), Zhang Y(2), Wen W(2), Cai Y(2)(4), Ni X(2)(4), Chen Y(1)(3)(5)(6)(7).
ABSTRACT
BACKGROUND: Cerebral resuscitation is one of the main therapeutic aims in the treatment of cardiac arrest (CA) patients who experience a return of spontaneous circulation (ROSC). However, the therapeutic effects of current treatments are not ideal. The purpose of this study was to evaluate the efficacy of neurological function of acupuncture combined with conventional cardiopulmonary cerebral resuscitation the (CPCR) for patients after ROSC. METHODS: Seven electronic databases and other related websites were searched to identify studies on acupuncture combined with conventional CPCR for patients after ROSC. R software was used to conduct a meta-analysis, and the outcomes that could not be pooled were analyzed using a descriptive analysis. RESULTS: Seven RCTs involving 411 participants who had experienced ROSC were eligible for inclusion. The main acupoints were Neiguan (PC6), Shuigou (DU26), Baihui (DU20), Yongquan (KI1),

and Sanyinjiao (SP6). Compared to conventional CPCR, acupuncture combined with conventional CPCR led to significantly higher Glasgow Coma Scale (GCS) scores on day 3 (mean difference (MD)=0.89, 95% CI: 0.43, 1.35, I2 = 0%), day 5 (MD = 1.21, 95% CI: 0.27, 2.15; I2 = 0%), and day 7 (MD = 1.92, 95% CI: 1.35, 2.50; I2 = 0%). CONCLUSION: Acupuncture-assisted conventional CPCR may have a potential role in improving neurological function in CA patients after ROSC, but the certainty of evidence is very low and more high-quality studies are required.

6. Resuscitation. 2023 Mar;184:109701. doi: 10.1016/j.resuscitation.2023.109701. Epub 2023 Jan 23.
Post-resuscitation care following cardiac arrest in intensive care units: A French national survey.
de Longeaux K(1), Bailly P(2).
NO ABSTRACT AVAILABLE

TARGETED TEMPERATURE MANAGEMENT

1. Clin Exp Emerg Med. 2023 Feb 16. doi: 10.15441/ceem.23.012. Online ahead of print.
Targeted Temperature Management with Hypothermia for Comatose Patients After Cardiac Arrest.
Callaway CW(1).
ABSTRACT
Targeted temperature management with hypothermia (32ºC-34ºC) (TTM-hypothermia) is a treatment strategy for adult patients who are comatose after cardiac arrest. Robust preclinical data support the beneficial effects of hypothermia beginning within 4 hours of reperfusion and maintained during the several days of post-reperfusion brain dysregulation. TTM-hypothermia increased survival and functional recovery after adult cardiac arrest in several trials and in realworld implementation studies. TTM-hypothermia also benefits neonates with hypoxic-ischemic brain injury. However, larger and methodologically more rigorous adult trials do not detect benefit. Reasons for inconsistency of adult trials include the difficulty delivering differential treatment between randomized groups within 4 hours and the use of shorter durations of treatment. Furthermore, adult trials enrolled populations that vary in illness severity and brain injury, with individual trials enriched for higher or lower illness severity. There are interactions between illness severity and treatment effect. Current data indicate that TTM-hypothermia implemented quickly for adult patients after cardiac arrest, may benefit select patients at risk of severe brain injury but not benefit other patients. More data are needed on how to identify treatment-responsive patients and on how to titrate the timing and duration of TTM-hypothermia.

2. Neurocrit Care. 2023 Feb;38(1):16-25. doi: 10.1007/s12028-022-01564-6. Epub 2022 Jul 28.
Cardiac Arrest Treatment Center Differences in Sedation and Analgesia Dosing During Targeted Temperature Management.
Ceric A(1), May TL(2), Lybeck A(3), Cronberg T(4), Seder DB(2), Riker RR(2), Hassager C(5), Kjaergaard J(5), Haxhija Z(6), Friberg H(7), Dankiewicz J(8), Nielsen N(6).
ABSTRACT
BACKGROUND: Sedation and analgesia are recommended during targeted temperature management (TTM) after cardiac arrest, but there are few data to provide guidance on dosing to bedside clinicians. We evaluated differences in patient-level sedation and analgesia dosing in an international multicenter TTM trial to better characterize current practice and clinically important outcomes. METHODS: A total 950 patients in the international TTM trial were randomly assigned to a TTM of 33 °C or 36 °C after resuscitation from cardiac arrest in 36 intensive care units. We recorded cumulative doses of sedative and analgesic drugs at 12, 24, and 48 h and normalized to midazolam and fentanyl equivalents. We compared number of medications used, dosing, and

titration among centers by using multivariable models, including common severity of illness factors. We also compared dosing with time to awakening, incidence of clinical seizures, and survival. RESULTS: A total of 614 patients at 18 centers were analyzed. Propofol (70%) and fentanyl (51%) were most frequently used. The average dosages of midazolam and fentanyl equivalents were 0.13 (0.07, 0.22) mg/kg/h and 1.16 (0.49, 1.81) μg/kg/h, respectively. There were significant differences in number of medications ($p < 0.001$), average dosages ($p < 0.001$), and titration at all time points between centers ($p < 0.001$), and the outcomes of patients in these centers were associated with all parameters described in the multivariate analysis, except for a difference in the titration of sedatives between 12 and 24 h ($p = 0.40$). There were associations between higher dosing at 48 h ($p = 0.003$, odds ratio [OR] 1.75) and increased titration of analgesics between 24 and 48 h ($p = 0.005$, OR 4.89) with awakening after 5 days, increased titration of sedatives between 24 and 48 h with awakening after 5 days ($p < 0.001$, OR > 100), and increased titration of sedatives between 24 and 48 h with a higher incidence of clinical seizures in the multivariate analysis ($p = 0.04$, OR 240). There were also significant associations between decreased titration of analgesics and survival at 6 months in the multivariate analysis ($p = 0.048$). CONCLUSIONS: There is significant variation in choice of drug, dosing, and titration when providing sedation and analgesics between centers. Sedation and analgesia dosing and titration were associated with delayed awakening, incidence of clinical seizures, and survival, but the causal relation of these findings cannot be proven.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

1. PLoS One. 2023 Feb 14;18(2):e0264098. doi: 10.1371/journal.pone.0264098. eCollection 2023.
Optimal deployment of automated external defibrillators in a long and narrow environment.
Lin CH(1), Chu KC(2), Lee JT(3), Kao CY(4).

ABSTRACT

AIM OF THE STUDY: Public access to automated external defibrillators (AEDs) plays a key role in increasing survival outcomes for patients with out-of-hospital cardiac arrest. Based on the concept of maximizing "rescue benefit" of AEDs, we aimed to propose a systematic methodology for optimizing the deployment of AEDs, and develop such strategies for long and narrow spaces. METHODS: We classified the effective coverage of an AED in hot, warm, and cold zones. The AEDs were categorized, according to their accessibility, as fixed, summonable, or patrolling types. The overall rescue benefit of the AEDs were evaluated by the weighted size of their collective hot zones. The optimal strategies for the deployment of AEDs were derived mathematically and numerically verified by computer programs. RESULTS: To maximize the overall rescue benefit of the AEDs, the AEDs should avoid overlapping with each other's coverage as much as possible. Specific rules for optimally deploying one, two, or multiple AEDs, and various types of AEDs are summarized and presented. CONCLUSION: A methodology for assessing the rescue benefit of deployed AEDs was proposed, and deployment strategies for maximizing the rescue benefit of AEDs along a long, narrow, corridor-like, finite space were derived. The strategies are simple and readily implementable. Our methodology can be easily generalized to search for optimal deployment of AEDs in planar areas or three-dimensional spaces.

2. Neurocrit Care. 2023 Feb 14. doi: 10.1007/s12028-023-01681-w. Online ahead of print.
Automated Seizure Detection in Patients with Cardiac Arrest: A Retrospective Review of Ceribell™ Rapid-EEG Recordings.
Villamar MF(1)(2), Ayub N(3), Koenig SJ(4).

ABSTRACT

BACKGROUND: In patients with cardiac arrest who remain comatose after return of spontaneous circulation, seizures and other abnormalities on electroencephalogram (EEG) are common. Thus, guidelines recommend urgent initiation of EEG for the evaluation of seizures in this population. Point-of-care EEG systems, such as Ceribell™ Rapid Response EEG (Rapid-EEG), allow for prompt initiation of EEG monitoring, albeit through a reduced-channel montage. Rapid-EEG incorporates an automated seizure detection software (Clarity™) to measure seizure burden in real time and alert clinicians at the bedside when a high seizure burden, consistent with possible status epilepticus, is identified. External validation of Clarity is still needed. Our goal was to evaluate the real-world performance of Clarity for the detection of seizures and status epilepticus in a sample of patients with cardiac arrest. METHODS: This study was a retrospective review of Rapid-EEG recordings from all the patients who were admitted to the medical intensive care unit at Kent Hospital (Warwick, RI) between 6/1/2021 and 3/18/2022 for management after cardiac arrest and who underwent Rapid-EEG monitoring as part of their routine clinical care (n = 21). Board-certified epileptologists identified events that met criteria for seizures or status epilepticus, as per the 2021 American Clinical Neurophysiology Society's Standardized Critical Care EEG Terminology, and evaluated any seizure burden detections generated by Clarity. RESULTS: In this study, 4 of 21 patients with cardiac arrest (19.0%) who underwent Rapid-EEG monitoring had multiple electrographic seizures, and 2 of those patients (9.5%) had electrographic status epilepticus within the first 24 h of the study. None of these ictal abnormalities were detected by the Clarity seizure detection system. Clarity showed 0% seizure burden throughout the entirety of all four Rapid-EEG recordings, including the EEG pages that showed definite seizures or status epilepticus. CONCLUSIONS: The presence of frequent electrographic seizures and/or status epilepticus can go undetected by Clarity. Timely and careful review of all raw Rapid-EEG recordings by a qualified human EEG reader is necessary to guide clinical care, regardless of Clarity seizure burden measurements.

3. Resusc Plus. 2023 Feb 7;13:100363. doi: 10.1016/j.resplu.2023.100363. eCollection 2023 Mar.
Impact of defibrillation with automated external defibrillator by bystander before defibrillation by emergency medical system personnel on neurological outcome of out-of-hospital cardiac arrest with non-cardiac etiology.
Komori A(1)(2)(3), Iriyama H(1)(2)(3), Abe T(1)(3).
ABSTRACT
AIM OF THE STUDY: Although defibrillation using automated external defibrillator (AED) by bystander prior to emergency medical system (EMS) arrival was associated with favorable outcomes in out-of-hospital cardiac arrest (OHCA) of cardiac cause, whether it improves outcomes of OHCA due to non-cardiac cause is not clear. We aimed to investigate the impact of defibrillation with AED by bystander before defibrillation by EMS personnel on the outcomes of OHCA of presumed non-cardiac cause. METHODS: This was a retrospective cohort study using the All-Japan Utstein registry (reference period: 2013 to 2017). We included adult patients with OHCA of presumed non-cardiac cause, who had initial shockable rhythm, and who received witnessed arrest bystander cardiopulmonary resuscitation (CPR). Exposure variable was defibrillation with AED by bystander in comparison with initial defibrillation by EMS. Logistic regression analyses were conducted to assess the association between bystander AED shock and favorable neurological outcome (Cerebral Performance Category scale 1 or 2) at one month.RESULTS: Among the 1,053 patients included for analysis, 57 (5.4%) received bystander AED shock. There was no statistically significant difference in the rate of favorable neurological outcome at one month between groups [9 (15.8%) vs 109 (10.9%), p = 0.26]. Logistic regression analysis adjusted for characteristics, intervention, and time course of CPR showed no association between bystander AED shock and favorable neurological outcome [OR (95% CI): 1.63 (0.70-3.77), p = 0.25]. CONCLUSION: In this study, defibrillation with AED by bystander

before defibrillation by EMS personnel was not associated with the favorable outcomes of OHCA of presumed non-cardiac cause.

4. Resuscitation. 2023 Feb 22:109745. doi: 10.1016/j.resuscitation.2023.109745. Online ahead of print.

Myoclonus in comatose patients with electrographic status epilepticus after cardiac arrest: Corresponding EEG patterns, effects of treatment and outcomes.

Nutma S(1), Ruijter BJ(2), Beishuizen A(3), Tromp SC(4), Scholten E(5), Horn J(6), van den Bergh WM(7), van Kranen-Mastenbroek VH(8), Thomeer EC(9), Moudrous W(9), Aries M(8), van Putten MJ(10), Hofmeijer J(11).

ABSTRACT

OBJECTIVE: To clarify the significance of any form of myoclonus in comatose patients after cardiac arrest with rhythmic and periodic EEG patterns (RPPs) by analyzing associations between myoclonus and EEG pattern, response to anti-seizure medication and neurological outcome. DESIGN: Post hoc analysis of the prospective randomized Treatment of ELectroencephalographic STatus Epilepticus After Cardiopulmonary Resuscitation (TELSTAR) trial. SETTING: Eleven ICUs in the Netherlands and Belgium. PATIENTS: One hundred and fifty-seven adult comatose post-cardiac arrest patients with RPPs on continuous EEG monitoring. INTERVENTIONS: Anti-seizure medication vs no anti-seizure medication in addition to standard care. MEASUREMENTS AND MAIN RESULTS: Of 157 patients, 98 (63%) had myoclonus at inclusion. Myoclonus was not associated with one specific RPP type. However, myoclonus was associated with a smaller probability of a continuous EEG background pattern (48% in patients with vs 75% without myoclonus, odds ratio (OR) 0.31; 95% confidence interval (CI) 0.16-0.64) and earlier onset of RPPs (24% vs 9% within 24 hours after cardiac arrest, OR 3.86;95% CI 1.64-9.11). Myoclonus was associated with poor outcome at three months, but not invariably so (poor neurological outcome in 96% vs 82%, p = 0.004). Anti-seizure medication did not improve outcome, regardless of myoclonus presence (6% good outcome in the intervention group vs 2% in the control group, OR 0.33; 95% CI 0.03-3.32). CONCLUSIONS: Myoclonus in comatose patients after cardiac arrest with RPPs is associated with poor outcome and discontinuous or suppressed EEG. However, presence of myoclonus does not interact with the effects of anti-seizure medication and cannot predict a poor outcome without false positives.

5. Sensors (Basel). 2023 Feb 17;23(4):2270. doi: 10.3390/s23042270.

A Low-Power Wireless System for Predicting Early Signs of Sudden Cardiac Arrest Incorporating an Optimized CNN Model Implemented on NVIDIA Jetson.

Kota VD(1), Sharma H(2), Albert MV(2), Mahbub I(3), Mehta G(1), Namuduri K(1).

ABSTRACT

The survival rate for sudden cardiac arrest (SCA) is low, and patients with long-term risks of SCA are not adequately alerted. Understanding SCA's characteristics will be key to developing preventive strategies. Many lives could be saved if SCA's early onset could be detected or predicted. Monitoring heart signals continuously is essential for diagnosing sporadic cardiac dysfunction. An electro-cardiogram (ECG) can be used to continuously monitor heart function without having to go to the hospital. A zeolite-based dry electrode can provide safe on-skin ECG acquisition while the subject is out-of-hospital and facilitate long-term monitoring. To the ECG signal, a low-power 1 µW read-out circuit was designed and implemented in our prior work. However, having long-term ECG monitoring outside the hospital, i.e., high battery life, and low power consumption while transmission and reception of ECG signal are crucial. This paper proposes a prototype with a 10-bit resolution ADC and nRF24L01 transceivers placed 5 m apart. The system uses the 2.4 GHz worldwide ISM frequency band with GFSK modulation to wirelessly transmit digitized ECG bits at 250 kbps data rate to a

physician's computer (or similar) for continuous monitoring of ECG signals; the power consumption is only 11.2 mW and 4.62 mW during transmission and reception, respectively, with a low bit error rate of ≤0.1%. Additionally, a subject-wise cross-validated, three-fold, optimized convolutional neural network (CNN) model using the Physionet-SCA dataset was implemented on NVIDIA Jetson to identify the irregular heartbeats yielding an accuracy of 89% with a run time of 5.31 s. Normal beat classification has an F1 score of 0.94 and a ROC score of 0.886. Thus, this paper integrates the ECG acquisition and processing unit with low-power wireless transmission and CNN model to detect irregular heartbeats.

6. Resuscitation. 2023 Feb 25;185:109754. doi: 10.1016/j.resuscitation.2023.109754. Online ahead of print.

Automated external defibrillator electrode size and termination of ventricular fibrillation in out-of-hospital cardiac arrest.

Yin RT(1), Taylor TG(2), de Graaf C(3), Ekkel MM(3), Chapman FW(2), Koster RW(3).

ABSTRACT

Smaller electrodes allow more options for design of automated external defibrillator (AED) user interfaces. However, previous studies employing monophasic-waveform defibrillators found that smaller electrode sizes have lower defibrillation shock success rates. We hypothesize that, for impedance-compensated, biphasic truncated exponential (BTE) shocks, smaller electrodes increase transthoracic impedance (TTI) but do not adversely affect defibrillation success rates. METHODS AND RESULTS: In this prospective before-and-after clinical study, Amsterdam police and firefighters used AEDs with BTE waveforms: an AED with larger electrodes in 2016-2017 (113 cm2), and an AED with smaller electrodes in 2017-2020 (65 cm2). We analyzed 157 and 178 patient cases with an initial shockable rhythm where the larger and smaller electrodes were used, respectively. A single 200-J shock terminated ventricular fibrillation (VF) in 86% of patients treated with large electrodes and 89% of patients treated with smaller electrodes. Small electrodes had a non-inferior first shock defibrillation success rate compared to large electrodes, with a difference of 3% (95% CI: -3% -9%) with the lower confidence limit remaining above the defined non-inferiority threshold. TTI was significantly higher for the smaller electrodes (median: 100 Ω) compared to the larger electrodes (median: 88 Ω) ($p < 0.001$). CONCLUSIONS: For AEDs with impedance-compensating BTE waveforms, TTI was higher for smaller electrodes than the large electrode electrodes. Overall defibrillation shock success for AEDs with smaller electrodes was non-inferior to the AEDs with larger electrodes.

7. Resuscitation. 2023 Feb 24:109755. doi: 10.1016/j.resuscitation.2023.109755. Online ahead of print.

The Ability of Machine Learning Algorithms to Predict Defibrillation Success during Cardiac Arrest: A Systematic Review.

Sem M(1), Mastrangelo E(2), Lightfoot D(3), Aves T(4), Lin S(5), Mohindra R(6).

ABSTRACT

OBJECTIVE: To evaluate the existing knowledge on the effectiveness of machine learning (ML) algorithms inpredicting defibrillation success during in- and out-of-hospital cardiac arrest. METHODS: MEDLINE, Embase, CINAHL and Scopus were searched from inception to August 30, 2022. Studies were included that utilized ML algorithms for prediction of successful defibrillation, observed as return of spontaneous circulation (ROSC), survival to hospital or discharge, or neurological status at discharge. Studies were excluded if involving a trauma, an unknown underlying rhythm, an implanted cardiac defibrillator or if focused on the prediction or onset of cardiac arrest. Risk of bias was assessed using the PROBAST tool. RESULTS: There were 2399 studies identified, of which 107 full text articles were reviewed and 15 observational studies (n=5680) were included for final analysis.

29 ECG waveform features were fed into 15 different ML combinations. The best performing ML model had an accuracy of 98.6 (98.5 - 98.7)%, with 4 second ECG intervals. An algorithm incorporating end-tidal CO2 reported an accuracy of 83.3% (no CI reported). Meta-analysis was not performed due to heterogeneity in study design, ROSC definitions, and characteristics. CONCLUSION: Machine learning algorithms, specifically Neural Networks, have been shown to have potential to predict defibrillation success for cardiac arrest with high sensitivity and specificity.Due to heterogeneity, inconsistent reporting, and high risk of bias, it is difficult to conclude which, if any, algorithm is optimal. Further clinical studies with standardized reporting of patient characteristics, outcomes, and appropriate algorithm validation are still required to elucidate this.

PEDIATRICS AND CHILDREN

1. Front Pediatr. 2023 Feb 1;10:1075983. doi: 10.3389/fped.2022.1075983. eCollection 2022.
Association between the types of bystander cardiopulmonary resuscitation and the survival with good neurologic outcome of preschool pediatric out-of-hospital cardiac arrest cases in Japan: A propensity score matching analysis using an extended nationwide database.
Murasaka K(1), Yamashita A(2), Owada H(3), Wato Y(1), Inaba H(1)(3)(4).
ABSTRACT
BACKGROUND: Pediatric out-of-hospital cardiac arrests (OHCAs) are frequently associated with a respiratory etiology. Despite the high proportion of preschool children with OHCAs, very few studies on this special population exist. This study characterizes the epidemiologic features of preschool pediatric OHCAs and analyzes the advantage of conventional (ventilations with chest compressions) bystander cardiopulmonary resuscitation (CPR) over compression-only bystander CPR (BCPR) on the one-month post-event neurological status of the patient. METHODS: Japanese nationwide databases for all ambulance transport events and OHCAs occurring during a 4-year period between 2016 and 2019 were combined, totalling 3,608 patient events. Children ≤6-years-old were included; physician- and EMS-witnessed events, no prehospital resuscitation effort events, and neonatal patient events were excluded. Neurologically favorable 1-month survival rates were compared among groups using univariate and multivariate analyses before and after propensity score matching. RESULTS: From the combined database, 2,882 pediatric OHCAs meeting selection criteria were categorized as no BCPR (984), compression-only BCPR (1,428), and conventional BCPR (470). The proportion of bystander-witnessed cases was low (22.3%). Most OHCA witnesses were family members (88.5%), and most OHCAs occurred at home (88.0%). The neurologically favorable 1-month survival rates were: no BCPR 2.4%, compression only, 3.2%, and conventional 6.6% ($P < 0.01$). Multivariate logistic regression analysis before and after matching showed that conventional BCPR was associated with higher neurologically favorable 1-month survival than compression-only BCPR. Subgroup analyses after matching demonstrated that conventional BCPR was associated with better outcomes in nonmedical (adjusted odds ratio; 95% confidence interval, 2.83; 1.09-7.32) and unwitnessed OHCA cases (3.42; 1.09-10.8). CONCLUSIONS: Conventional CPR is rarely performed by bystanders in preschool pediatric OHCA. However, conventional BCPR results in neurologically favorable outcomes in nonmedical and unwitnessed cases.

2. Children (Basel). 2023 Jan 18;10(2):180. doi: 10.3390/children10020180.
Evaluation of Serum Biomarkers and Electroencephalogram to Determine Survival Outcomes in Pediatric Post-Cardiac-Arrest Patients.
El-Seify M(1), Shata MO(2), Salaheldin S(3), Bawady S(4), Rezk AR(5).
ABSTRACT

Cardiac arrest causes primary and secondary brain injuries. We evaluated the association between neuron-specific enolase (NSE), serum S-100B (S100B), electroencephalogram (EEG) patterns, and post-cardiac arrest outcomes in pediatric patients. A prospective observational study was conducted in the pediatric intensive care unit and included 41 post-cardiac arrest patients who underwent EEG and serum sampling for NSE and S100B. The participants were aged 1 month to 18 years who experienced cardiac arrest and underwent CPR after a sustained return of spontaneous circulation for ≥48 h. Approximately 19.5% (n = 8) of patients survived until ICU discharge. Convulsions and sepsis were significantly associated with higher mortality (relative risk: 1.33 [95% CI = 1.09-1.6] and 1.99 [95% CI = 0.8-4.7], respectively). Serum NSE and S100B levels were not statistically associated with the outcome (p = 0.278 and 0.693, respectively). NSE levels were positively correlated with the duration of CPR. EEG patterns were significantly associated with the outcome (p = 0.01). Non-epileptogenic EEG activity was associated with the highest survival rate. Post-cardiac arrest syndrome is a serious condition with a high mortality rate. Management of sepsis and convulsions affects prognosis. We believe that NSE and S100B may have no benefit in survival evaluation. EEG can be considered for post-cardiac arrest patients.

3. Resuscitation. 2023 Feb 16;185:109740. doi: 10.1016/j.resuscitation.2023.109740. Online ahead of print.

A pilot study to predict cardiac arrest in the pediatric intensive care unit.

Kenet AL(1), Pemmaraju R(2), Ghate S(2), Raghunath S(2), Zhang Y(2), Yuan M(2), Wei TY(2), Desman JM(2), Greenstein JL(2), Taylor CO(3), Ruchti T(4), Fackler J(5), Bergmann J(5).

ABSTRACT

BACKGROUND: Cardiac arrest is a leading cause of mortality prior to discharge for children admitted to the pediatric intensive care unit. To address this problem, we used machine learning to predict cardiac arrest up to three hours in advance. METHODS: Our data consists of 240 Hz ECG waveform data, 0.5 Hz physiological time series data, medications, and demographics from 1,145 patients in the pediatric intensive care unit at the Johns Hopkins Hospital, 15 of whom experienced a cardiac arrest. The data were divided into training, validating, and testing sets, and features were generated every five minutes. 23 heart rate variability (HRV) metrics were determined from ECG waveforms. 96 summary statistics were calculated for 12 vital signs, such as respiratory rate and blood pressure. Medications were classified into 42 therapeutic drug classes. Binary features were generated to indicate the administration of these different drugs. Next, six machine learning models were evaluated: logistic regression, support vector machine, random forest, XGBoost, LightGBM, and a soft voting ensemble. RESULTS: XGBoost performed the best, with 0.971 auROC, 0.797 auPRC, 99.5% sensitivity, and 69.6% specificity on an independent test set. CONCLUSION: We have created high-performing models that identify signatures of in-hospital cardiac arrest (IHCA) that may not be evident to clinicians. These signatures include a combination of heart rate variability metrics, vital signs data, and therapeutic drug classes. These machine learning models can predict IHCA up to three hours prior to onset with high performance, allowing clinicians to intervene earlier, improving patient outcomes.

4. Evid Based Nurs. 2023 Mar 3:ebnurs-2022-103617. doi: 10.1136/ebnurs-2022-103617. Online ahead of print.

Preventing cardiac arrest in high-risk children by implementing low-cost technology independent quality improvement safety bundle.

Singh Y(1)(2).

NO ABSTRACT AVAILABLE

EXTRACORPOREAL LIFE SUPPORT

1. Int J Artif Organs. 2023 Feb 18:3913988231155508. doi: 10.1177/03913988231155508. Online ahead of print.

Extracorporeal life support in pediatric burn care: A systematic review.

Maybauer MO(1)(2)(3), Maybauer DM(1)(2), Capoccia M(4).

ABSTRACT

A systematic review of the role of extracorporeal life support (ECLS) in pediatric patients with burn and smoke inhalation injury was undertaken. A systematic search of the literature according to a specific combination of keywords to ascertain the effectiveness of this treatment strategy was conducted. A total of 14 articles out of 266 were considered suitable for the analysis in pediatric patients. The PICOS approach and PRISMA flow chart were followed for the purpose of this review. Despite the limited number of studies on the subject, ECMO in burn and smoke inhalation injury provides an additional level of support in pediatric patients leading to positive outcomes. V-V ECMO demonstrated the best overall survival of all configurations, with similar outcomes to non-burned patients. Prolonged mechanical ventilation prior to ECMO decreases survival and increases mortality by 12% with each additional day off ECMO. Good outcomes have been described for scald burns, dressing changes, and pre-ECMO cardiac arrest.

2. Int J Emerg Med. 2023 Feb 17;16(1):8. doi: 10.1186/s12245-023-00485-1.

Impact of bystander cardiopulmonary resuscitation on neurological outcomes in patients undergoing veno-arterial extracorporeal membrane oxygenation.

Shimai R(1), Ouchi S(1), Miyazaki T(2), Hirabayashi K(1), Abe H(1), Yabe K(1), Kakihara M(1), Maki M(1), Isogai H(1), Wada T(3), Ozaki D(1), Yasuda Y(1), Odagiri F(1), Takamura K(1), Yaginuma K(1), Yokoyama K(1), Tokano T(1), Minamino T(4).

ABSTRACT

BACKGROUND: Veno-arterial extracorporeal membrane oxygenation (V-A ECMO) requires a large amount of economic and human resources. The presence of bystander cardiopulmonary resuscitation (CPR) was focused on selecting appropriate V-A ECMO candidates. RESULT: This study retrospectively enrolled 39 patients with V-A ECMO due to out-of-hospital cardiac arrest (CA) between January 2010 and March 2019. The introduction criteria of V-A ECMO included the following: (1) < 75 years old, (2) CA on arrival, (3) < 40 min from CA to hospital arrival, (4) shockable rhythm, and (5) good activity of daily living (ADL). The prescribed introduction criteria were not met by 14 patients, but they were introduced to V-A ECMO at the discretion of their attending physicians and were also included in the analysis. Neurological prognosis at discharge was defined using The Glasgow-Pittsburgh Cerebral Performance and Overall Performance Categories of Brain Function (CPC). Patients were divided into good or poor neurological prognosis (CPC ≤ 2 or ≥ 3) groups (8 vs. 31 patients). The good prognosis group had a significantly larger number of patients who received bystander CPR ($p = 0.04$). The mean CPC at discharge was compared based on the combination with the presence of bystander CPR and all five original criteria. Patients who received bystander CPR and met all original five criteria showed significantly better CPC than patients who did not receive bystander CPR and did not meet some of the original five criteria ($p = 0.046$). CONCLUSION: Considering the presence of bystander CPR help in selecting the appropriate candidate of V-A ECMO among out-of-hospital CA cases.

3. Curr Probl Cardiol. 2023 Feb 22:101658. doi: 10.1016/j.cpcardiol.2023.101658. Online ahead of print.

Predictors of Mortality in Patients with Refractory Cardiac Arrest Supported with VA-ECMO: A Systematic Review and a Meta-Analysis.

Hashem A(1), Mohamed MS(2), Alabdullah K(3), Elkhapery A(2), Khalouf A(2), Saadi S(4), Nayfeh T(5), Rai D(4), Alali O(2), Kinzelman-Vesely EA(5), Parikh V(4), Feitell SC(4).

ABSTRACT
BACKGROUND: Cardiac arrest (C.A.) is associated with high mortality rate, ranging between 75-93%. Given its significance, venoarterial extracorporeal membrane oxygenation (VA-ECMO) has been used for end-organs perfusion and to maintain adequate oxygenation as a life-saving option in refractory cardiac arrest. The predictors for the success of VA-ECMO in this setting have not been established yet. In this meta-analysis, we aim to identify the variables associated with increased mortality in patients with C.A. supported with VA-ECMO. METHODS: We conducted a systematic review and meta-analysis to evaluate mortality-predicting factors in patients with C.A. supported with VA-ECMO that were published between January 2000 to July 2022. To identify relevant articles, the MEDLINE (Pubmed, Ovid) and Cochrane Databases were queried with various combinations of our prespecified keywords, including VA-ECMO, CA, and mortality predictors. We performed a meta-analysis using a random-effects model to calculate the odds ratio (OR). RESULTS: We retrieved a total of 4,476 records, out of which we included 10 observational studies in our study. A total of 931 patients were included in our study with the age range of 47-68 years, predominantly males (63.9%). The overall mortality was 69.4%. The predictors for mortality were age >65 (OR 4.61, 95% CI 1.63-13.03, p<0.01), history of chronic kidney disease (CKD) (OR 2.42, 95% CI 1.37-4.28, p<0.01), cardiopulmonary resuscitation (CPR) duration prior to ECMO > 40 min (OR 6.62 [95%CI 1.39, 9.02], p<0.01), having an initial non-shockable rhythm (OR 2.62 [95%CI 1.85, 3.70], p<0.01) and Sequential Organ Failure Assessment (SOFA) score >14 (OR 12.29, 95%CI 2.71-55.74, p<0.01). Regarding blood work, an increase in lactate by 5 mmol/L increased the odds of mortality by 121% (2 studies; OR 2.21 [95%CI 1.26, 3.86], p<0.01; I2= 0%) while the increase in lactate by 1 mmol/L increases odd of mortality by 15% (2 studies, OR 1.15 [95%CI 1.02, 1.31], p=0.03, I=0%), and an increase in creatinine by 1 mg/dL increased the odds of mortality by 225% (1 study; OR 3.25 [95% CI 1.22, 8.7], p=0.02). Albumin was protective as for each 1 g/dL increase, the odds of mortality decreased by 68% (1 study; OR 0.32 [95% CI 0.14, 0.74], p<0.01). CONCLUSION: Refractory CA requiring VA-ECMO has a high mortality. Predictors of mortality include age >65, history of CKD, CPR duration prior to ECMO > 40 min, initial rhythm being non-shockable and SOFA score >14.

4. Eur Heart J Acute Cardiovasc Care. 2023 Feb 21:zuad012. doi: 10.1093/ehjacc/zuad012. Online ahead of print.

Coronary disease in refractory cardiac arrest undergoing resuscitation with extracorporeal membrane oxygenation (E-CPR).

Franco D(1)(2), Goslar T(1)(3), Radsel P(1)(3), De Luca N(2), Mancusi C(2), Barbato E(4), Noc M(1)(3).

ABSTRACT
BACKGROUND: Because reestablishment of spontaneous circulation (ROSC) in patients with cardiac arrest is frequently not achieved by conventional cardiopulmonary resuscitation (C-CPR), selected patients may undergo resuscitation with extracorporeal membrane oxygenation (E-CPR). We compared angiographic features and percutaneous coronary intervention (PCI) between patients undergoing E-CPR and those with ROSC after C-CPR. METHODS: Forty-nine consecutive E-CPR patients undergoing immediate coronary angiography admitted between August 2013 and August 2022 were matched to 49 patients with ROSC after C-CPR. RESULTS: Multivessel disease (69.4% vs 34.7%; p = 0.001), ≥ 50% unprotected left main (ULM) stenosis (18.4% vs 4.1%; p = 0.025) and ≥1 chronic total occlusion (CTO) (28.6% vs 10.2%; p = 0.021) were more often documented in E-CPR group. There was no significant differences in the incidence, features and distribution of acute culprit lesion which was present in >90%. SYNTAX (27.6 vs 13.4; p = 0.002) and GENSINI (86.2 vs 46.0; p = 0.001) scores were increased in E-CPR group. Optimal cut-off predicting E-CPR was 19.75 for SYNTAX (sensitivity 74%, specificity 87%) and 60.50 (sensitivity 69%, specificity 75%) for GENSINI score. More lesions were treated (1.3 vs 1.1 lesions/patient; p = 0.002) and stents implanted (2.0 vs 1.3/patient; p < 0.001) in E-CPR group. Final TIMI 3 flow was comparable (88.6% vs 95.7%; p = 0.196) but residual SYNTAX (13.6 vs 3.1; p < 0.001) and GENSINI (36.7 vs 10.9; p < 0.001) scores remained increased in E-CPR group. CONCLUSION: E-CPR patients have more multivessel disease, ULM stenosis

and CTO but similar incidence, features and distribution of acute culprit lesion. Despite more complex PCI, revascularization is less complete.

5. Chin Med J (Engl). 2023 Feb 21. doi: 10.1097/CM9.0000000000002587. Online ahead of print.
Clinical practice of emergency department-initiated extracorporeal cardiopulmonary resuscitation for cardiac arrest in adults.
Xu G(1), Wang J(2), Zhou W(3), Jin H(1)(2), Chai Y(2), Fan H(1)(4), Hou S(1)(4), Liu Z(1)(4), Liu Y(1)(4).
NO ABSTRACT AVAILABLE

EXPERIMENTAL RESEARCH

1. Braz J Med Biol Res. 2023 Feb 10;56:e12408. doi: 10.1590/1414-431X2023e12408. eCollection 2023.
Changes of antioxidant enzymes in the kidney after cardiac arrest in the rat model.
Lee JH(1), Islam MS(2), Yoo YJ(2), Kim SE(3), Kim RH(2), Jang YJ(2), Lee SH(2), Hwang HP(4), Shin HY(5), Hwang JH(5), Kim K(6), Park BY(2), Ahn D(2), Lee Y(1), Kim T(1), Kim IS(2), Yoon JC(1), Tae HJ(2).
ABSTRACT
Globally, cardiac arrest (CA) is a leading cause of death and disability. Asphyxial CA (ACA)-induced kidney damage is a crucial factor in reducing the survival rate. The purpose of this study was to investigate the role of antioxidant enzymes in histopathological renal damage in an ACA rat model at different time points. A total of 88 rats were divided into five groups and exposed to ACA except for the sham group. To evaluate glomerular function and oxidative stress, serum levels of blood urea nitrogen (BUN) and creatinine (Crtn) and malondialdehyde (MDA) levels in renal tissues were measured. To determine histopathological damage, hematoxylin and eosin staining, periodic acid-Schiff staining, and Masson's trichrome staining were performed. Expression levels of antioxidant enzymes including superoxide dismutase-1 (SOD-1), superoxide dismutase-2 (SOD-2), catalase (CAT), and glutathione peroxidase (GPx) were measured by immunohistochemistry (IHC). Survival rate of the experimental rats was reduced to 80% at 6 h, 55% at 12 h, 42.9% at 1 day, and 33% at 2 days after return of spontaneous circulation. Levels of BUN, Crtn, and MDA started to increase significantly in the early period of CA induction. Renal histopathological damage increased markedly from 6 h until two days post-CA. Additionally, expression levels of antioxidant enzymes were significantly decreased at 6 h, 12 h, 1 day, and 2 days after CA. CA-induced oxidative stress and decreased levels of antioxidant enzymes (SOD-1, SOD-2, CAT, GPx) from 6 h to two days could be possible mediators of severe renal tissue damage and increased mortality rate.

2. J Intensive Med. 2022 Feb 24;2(2):118-126. doi: 10.1016/j.jointm.2022.01.003. eCollection 2022 Apr.
Carbon monoxide-releasing molecule-2 protects intestinal mucosal barrier function by reducing epithelial tight-junction damage in rats undergoing cardiopulmonary resuscitation.
Niu Q(1)(2), Liu F(3), Zhang J(1), Yang X(1), Wang X(1).
ABSTRACT
BACKGROUND: Ischemia-reperfusion injury (IRI) to the small intestine is associated with the development of systemic inflammation and multiple organ failure after cardiopulmonary resuscitation (CPR). It has been reported that exogenous carbon monoxide (CO) reduces IRI. This study aimed to assess the effects of carbon monoxide-releasing molecule-2 (CORM-2) on intestinal mucosal barrier function in rats undergoing CPR. METHODS: We established a rat model of

asphyxiation-induced cardiac arrest (CA) and resuscitation to study intestinal IRI, and measured the serum levels of intestinal fatty acid-binding protein. Morphological changes were investigated using light and electron microscopes. The expression levels of claudin 3 (CLDN3), occludin (OCLN), zonula occludens 1 (ZO-1), tumor necrosis factor-alpha (TNF-α), interleukin-10 (IL-10), and nuclear factor kappa B (NF-κB) p65 were detected by western blotting. RESULTS: Compared with the sham-operated group, histological changes and transmission electron microscopy revealed severe intestinal mucosal injury in the CPR and inactive CORM-2 (iCORM-2) groups. In contrast, CORM-2 alleviated intestinal IRI. CORM-2, unlike iCORM-2, markedly decreased the Chiu's scores (2.38 ± 0.38 vs. 4.59 ± 0.34; $P < 0.05$) and serum intestinal fatty acid-binding protein level (306.10 ± 19.22 vs. 585.64 ± 119.84 pg/mL; $P < 0.05$) compared with the CPR group. In addition, CORM-2 upregulated the expression levels of tight junction proteins (CLDN3, OCLN, and ZO-1) ($P < 0.05$) and downregulated those of IL-10, TNF-α, and NF-κB p65 ($P < 0.05$) in the ileum tissue of rats that received CPR. CONCLUSIONS: CORM-2 prevented intestinal mucosal damage as a result of IRI during CPR. The underlying protective mechanism was associated with inhibition of ischemia-reperfusion-induced changes in intestinal epithelial permeability and inflammation in intestinal tissue.

3. Resuscitation. 2023 Feb 16:109735. doi: 10.1016/j.resuscitation.2023.109735. Online ahead of print.

Preclinical evaluation of triiodothyronine nanoparticles as a novel therapeutic intervention for resuscitation from cardiac arrest.

Weil BR(1), Allen SE(2), Barbaccia T(2), Wong K(2), Beaver AM(2), Slabinski EA(2), Mellott JG(2), Taylor Dickinson PC(2), Mousa SA(3).

ABSTRACT

BACKGROUND: Given emerging evidence of rapid non-genomic cytoprotective effects of triiodothyronine (T3), we evaluated the resuscitative efficacy of two nanoparticle formulations of T3 (T3np) designed to prolong cell membrane receptor-mediated signaling. METHODS: Swine (n = 40) were randomized to intravenous vehicle (empty np), EPI (0.015 mg/kg), T3np (0.125 mg/kg), or T3np loaded with phosphocreatine (T3np + PCr; 0.125 mg/kg) during CPR following 7-min cardiac arrest (n = 10/group). Hemodynamics and biomarkers of heart (cardiac troponin I; cTnI) and brain (neuron-specific enolase; NSE) injury were assessed for up to 4-hours post-ROSC, at which time the heart and brain were collected for post-mortem analysis. RESULTS: Compared with vehicle (4/10), the rate of ROSC was higher in swine receiving T3np (10/10; $p < 0.01$), T3np + PCr (8/10; $p = 0.08$) or EPI (10/10; $p < 0.01$) during CPR. Although time to ROSC and survival duration were comparable between groups, EPI was associated with a ∼2-fold higher post-ROSC concentration of cTnI vs T3np and T3np + PCr and the early post-ROSC rise in NSE and neuronal injury were attenuated in T3np-treated vs EPI-treated animals. Analysis of hippocampal ultrastructure revealed deterioration of mitochondrial integrity, reduced active zone length, and increased axonal vacuolization in EPI-treated animals vs controls. However, the frequency of these abnormalities was diminished in

animals resuscitated with T3np. CONCLUSIONS: T3np achieved a ROSC rate and post-ROSC survival that was superior to vehicle and comparable to EPI. The attenuation of selected biomarkers of cardiac and neurologic injury at individual early post-ROSC timepoints in T3np-treated vs EPI-treated animals suggests that T3np administration during CPR may lead to more favorable outcomes in cardiac arrest.

4. Children (Basel). 2023 Feb 1;10(2):283. doi: 10.3390/children10020283.
Four Different Finger Positions and Their Effects on Hemodynamic Changes during Chest Compression in Asphyxiated Neonatal Piglets.
Bruckner M(1)(2)(3), Neset M(1)(2), O'Reilly M(1)(2), Lee TF(1)(2), Cheung PY(1)(2), Schmölzer GM(1)(2).
ABSTRACT
Background: The Neonatal Life Support Consensus on Science With Treatment Recommendations states that chest compressions (CC) be performed preferably with the 2-thumb encircling technique. The aim of this study was to compare the hemodynamic effects of four different finger positions during CC in a piglet model of neonatal asphyxia. Methods: Seven asphyxiated post-transitional piglets were randomized to CC with 2-thumb-, 2-finger-, knocking-fingers-, and over-the-head 2-thumb-techniques for one minute at each technique. CC superimposed with sustained inflations were performed manually. Results: Seven newborn piglets (age 0-4 days, weight 2.0-2.1 kg) were included in the study. The mean (SD) slope rise of carotid blood flow was significantly higher with the 2-thumb-technique and over-the-head 2-thumb-technique (118 (45) mL/min/s and 121 (46) mL/min/s, respectively) compared to the 2-finger-technique and knocking-finger-technique (75 (48) mL/min/s and 71 (67) mL/min/s, respectively) ($p < 0.001$). The mean (SD) dp/dtmin (as an expression of left ventricular function) was significantly lower with the 2-thumb-technique, with -1052 (369) mmHg/s, compared to -568 (229) mmHg/s and -578(180) mmHg/s (both $p = 0.012$) with the 2-finger-technique and knocking-finger-technique, respectively. Conclusion: The 2-thumb-technique and the over-the-head 2-thumb-technique resulted in improved slope rises of carotid blood flow and dp/dtmin during chest compression.

5. Sci Rep. 2023 Feb 28;13(1):3419. doi: 10.1038/s41598-023-30120-1.
Bio-physiological susceptibility of the brain, heart, and lungs to systemic ischemia reperfusion and hyperoxia-induced injury in post-cardiac arrest rats.
Aoki T(1), Wong V(1), Endo Y(1), Hayashida K(1), Takegawa R(1), Okuma Y(1)(2), Shoaib M(1)(3), Miyara SJ(1), Yin T(1), Becker LB(1)(3), Shinozaki K(4)(5).
ABSTRACT
Cardiac arrest (CA) patients suffer from systemic ischemia-reperfusion (IR) injury leading to multiple organ failure; however, few studies have focused on tissue-specific pathophysiological responses to IR-induced oxidative stress. Herein, we investigated biological and physiological parameters of the brain and heart, and we particularly focused on the lung dysfunction that has not been well studied to date. We aimed to understand tissue-specific susceptibility to oxidative stress and tested how oxygen concentrations in the post-resuscitation setting would affect outcomes. Rats were resuscitated from 10 min of asphyxia CA. Mechanical ventilation was initiated at the beginning of cardiopulmonary resuscitation. We examined animals with or without CA, and those were further divided into the animals exposed to 100% oxygen (CA_Hypero) or those with 30% oxygen (CA_Normo) for 2 h after resuscitation. Biological and physiological parameters of the brain, heart, and lungs were assessed. The brain and lung functions were decreased after CA and resuscitation indicated by worse modified neurological score as compared to baseline (222 ± 33 vs. 500 ± 0, $P < 0.05$), and decreased PaO2 (20 min after resuscitation: 113 ± 9 vs. baseline: 128 ± 9 mmHg,

P < 0.05) and increased airway pressure (2 h: 10.3 ± 0.3 vs. baseline: 8.1 ± 0.2 mmHg, P < 0.001), whereas the heart function measured by echocardiography did not show significant differences compared before and after CA (ejection fraction, 24 h: 77.9 ± 3.3% vs. baseline: 82.2 ± 1.9%, P = 0.2886; fractional shortening, 24 h: 42.9 ± 3.1% vs. baseline: 45.7 ± 1.9%, P = 0.4658). Likewise, increases of superoxide production in the brain and lungs were remarkable, while those in the heart were moderate. mRNA gene expression analysis revealed that CA_Hypero group had increases in Il1b as compared to CA Normo group significantly in the brain (P < 0.01) and lungs (P < 0.001) but not the heart (P = 0.4848). Similarly, hyperoxia-induced increases in other inflammatory and apoptotic mRNA gene expression were observed in the brain, whereas no differences were found in the heart. Upon systemic IR injury initiated by asphyxia CA, hyperoxia-induced injury exacerbated inflammation/apoptosis signals in the brain and lungs but might not affect the heart. Hyperoxia following asphyxia CA is more damaging to the brain and lungs but not the heart.

6. Shock. 2023 Mar 1. doi: 10.1097/SHK.0000000000002107. Online ahead of print.
Effects of mesenchymal stem cells on post-resuscitation renal and intestinal injuries in a porcine cardiac arrest model.
Chen C(1), Ma S, Liao L, Xiao Y, Dai H.
ABSTRACT
OBJECTIVES: Systemic ischemia-reperfusion triggered by cardiac arrest (CA) and resuscitation often causes post-resuscitation multiple organ injuries. Mesenchymal stem cells (MSCs) have been proven to be a promising treatment for regional renal and intestinal ischemia reperfusion injuries. This study aimed to investigate the effects of MSCs on renal and intestinal injuries following cardiopulmonary resuscitation (CPR) in a porcine CA model. METHODS: Twenty-two male pigs were randomly assigned to the sham (n = 6), CA/CPR (n = 8), and CA/CPR + MSC (n = 8) groups. MSCs were differentiated from human embryonic stem cells, and then intravenously administered at a dose of 2.5 × 106/kg at 1.5 and 3 d prior to the CA/CPR procedure. The experimental model was established by 8 min of untreated CA, followed by 8 min of CPR. Renal and intestinal injuries were evaluated based on the serum levels of creatinine (Cr), blood urea nitrogen (BUN), intestinal fatty acid-binding protein (IFABP), and diamine oxidase (DAO) at 1, 2, 4, and 24 h after resuscitation. At the end of the experiment, pathological damage was determined by cell apoptosis and ferroptosis in the renal and intestinal tissues. RESULTS: During CPR, five pigs in the CA/CPR group and seven pigs in the CA/CPR + MSC group were successfully resuscitated. After resuscitation, the serum levels of Cr, BUN, IFABP, and DAO were significantly increased in the CA/CPR and CA/CPR + MSC groups compared with those in the sham group. However, MSCs administration significantly decreased the levels of renal and intestinal injury biomarkers compared to those in the CA/CPR group. Cell apoptosis and ferroptosis, which were indicated by the levels of apoptotic cells, iron deposition, lipid peroxidation, antioxidants, and ferroptosis-related proteins, were observed in renal and intestinal tissues after resuscitation in the CA/CPR and CA/CPR + MSC groups. Nevertheless, both were significantly milder in the CA/CPR + MSC group than in the CA/CPR group. CONCLUSIONS: MSCs administration was effective in alleviating post-resuscitation renal and intestinal injuries possibly through inhibition of cell apoptosis and ferroptosis in a porcine CA model.

CASE REPORTS

1. Prehosp Emerg Care. 2023;27(2):275-277. doi: 10.1080/10903127.2022.2082609. Epub 2022 Jun 6.
The Role of Ultrasound Examination in the Differential Diagnosis of Cardiac Arrest in Prehospital Care: A Case Report.

Soták M(1)(2), Tyll T(1), Pochop M(1).

ABSTRACT

The survival rate of patients with out-of-hospital cardiac arrest has improved in recent years; however, it remains low. One approach to improving outcomes in these cases is to implement point-of-care ultrasound as an integral part of advanced cardiac life support management. Due to its growing popularity among emergency physicians, several protocols for this examination have been developed; however, there are little data on its use in the prehospital setting. We present a case report on the role of ultrasound examination in cardiac arrest for both diagnostic and therapeutic management.

2. Cureus. 2023 Jan 9;15(1):e33565. doi: 10.7759/cureus.33565. eCollection 2023 Jan.

Cardiac Arrest as the First Presentation of Gitelman Syndrome.

Geletu A(1), Gardner-Gray J(2), Roche M(3), Ngassa M(1).

ABSTRACT

Gitelman syndrome is a salt-wasting tubulopathy characterized by profound hypokalemia, hypomagnesemia, metabolic alkalosis, and hypocalciuria. Cardiac arrest is a relatively rare manifestation of Gitelman syndrome. Here we present a case of Gitelman syndrome in a patient with recurrent cardiac arrest. A 43-year-old female was admitted for out-of-hospital cardiac arrest secondary to ventricular fibrillation. Initial workup revealed severe hypokalemia, hypomagnesemia, metabolic alkalosis, and prolonged QTc. The workup revealed a picture of salt-wasting tubulopathy with hypokalemia, hypomagnesemia, and hypocalciuria. Potassium was repleted aggressively, and the patient received potassium-sparing agents resulting in the stabilization of potassium levels. Before discharge, an implantable cardioverter defibrillator (ICD) was placed for secondary prevention of cardiac arrest. The patient remained symptom-free, and electrolytes remained stable. This case highlights the diagnostic challenges of Gitelman syndrome and the importance of accurate diagnosis in improving patient outcomes.

3. Am J Emerg Med. 2023 Feb 9:S0735-6757(23)00073-6. doi: 10.1016/j.ajem.2023.01.055. Online ahead of print.

Bolus intravenous potassium chloride for recurrent ventricular fibrillation.

Romain J(1), Marie CL(2), Daniel J(2), Stéphane T(2).

ABSTRACT

We report the feasibility and recommend the potential efficacy of a bolus intravenous potassium chloride during out-of-hospital cardiac arrest with recurrent ventricular fibrillation following an acute coronary syndrome in a man in his 40's.

4. Children (Basel). 2023 Feb 15;10(2):378. doi: 10.3390/children10020378.

Extracorporeal Cardiopulmonary Resuscitation-A Chance for Survival after Sudden Cardiac Arrest.

Damps M(1), Buczyński M(2), Wiktor Ł(3).

ABSTRACT

Extracorporeal membrane oxygenation (ECMO) is an increasingly popular method for the treatment of patients with life-threatening conditions. The case we have described is characterized by the effectiveness of therapy despite resuscitation lasting more than one hour. A 3.5-year-old girl with a negative medical history was admitted to the Department of Cardiology due to ectopic atrial tachycardia. It was decided to perform electrical cardioversion under intravenous anaesthesia. During the induction of anaesthesia, cardiac arrest with pulseless electrical activity (PEA) occurred. Despite resuscitation, a permanent hemodynamically effective heart rhythm was not achieved. Due to prolonged resuscitation (over one hour) and persistent PEA, it was decided to use veno-arterial

extracorporeal membrane oxygenation. After three days of intensive ECMO therapy, hemodynamic stabilization was achieved. The time of implementing ECMO therapy and assessment of the initial clinical status of the patient should be emphasized.

5. Eur Heart J Case Rep. 2023 Feb 6;7(2):ytad059. doi: 10.1093/ehjcr/ytad059. eCollection 2023 Feb.
Loperamide-induced cardiogenic syncope: a case report of a life-threatening presentation of an over-the-counter drug.
Hegde V(1), Dalia T(2), Tayeb T(2), Cotter E(3), Vidic A(2).
ABSTRACT
BACKGROUND: Loperamide at supratherapeutic doses can cause cardiac toxicity, presenting as cardiogenic shock, prolonged QT, malignant arrhythmias, or in severe cases sudden cardiac death. Surreptitious loperamide use is difficult to diagnose. We present an interesting case of loperamide use presenting with polymorphic ventricular tachycardia, cardiogenic shock. CASE SUMMARY: A 25-year-old female presented with multiple syncopal episodes for 12 months with an electrocardiogram showing a Brugada-like pattern for which she underwent implantable cardioverter-defibrillator placement. One day following the procedure, she developed cardiogenic shock and was transferred to our tertiary care centre. Extensive workup was unrevealing. She responded well to supportive management, recovering from shock and was transferred to the floor. Unfortunately, she again developed cardiogenic shock, ultimately leading to cardiac arrest. Given the unclear cause for her cardiovascular symptoms, futher medication history was obtained. It was revealed that she was taking 100-150 tablets of loperamide per day. The decision was made to treat with intralipid emulsion therapy empirically given the strong suspicion for loperamide toxicity. The patient recovered well with supportive care. Loperamide levels returned elevated at 190 ng/mL. Repeated studies showed improvement of the conduction block, resolution of arrhythmias, and recovery of right and left ventricular function. DISCUSSION: Acute loperamide toxicity can present as biventricular failure, with difficult-to-control arrhythmias. It requires a high index of suspicion. Treatment for loperamide toxicity is mainly supportive, lipid emulsion therapy can be considered in severe or refractory cases.

6. Ann Transl Med. 2023 Jan 31;11(2):136. doi: 10.21037/atm-22-6468.
ECPR successfully used in 5.5-hour cardiac arrest caused by peripartum cardiomyopathy: a case report and minireview.
Lin F(#)(1), Cao Y(#)(2), Xian M(1), He Y(1), Xia Q(3), Deng L(1)(4).
ABSTRACT
BACKGROUND: Cardiac arrest (CA) caused by peripartum cardiomyopathy (PPCM) is a catastrophic disease that can lead to a high mortality rate in young women. Cardiopulmonary resuscitation (CPR) is the initial first aid measure to be taken and unfortunately, does not always lead to the restoration of spontaneous circulation (ROSC). We shared a rare successful case of extracorporeal cardiopulmonary oxygenation-assisted resuscitation (ECPR) in a patient with CA for up to 5.5 hours due to PPCM. CASE DESCRIPTION: A previously healthy 31-year-old woman at 34 weeks of gestation was admitted to the emergency department with fever and arrhythmia. Two days later, the patient had postpartum CA. She underwent CPR for up to 5 hours before receiving V-A extracorporeal membrane oxygenation (ECMO) support and eventually regained spontaneous circulation after half an hour. Based on the clinical manifestations, the patient was diagnosed with PPCM and received treatment. The patient was successfully removed from ECMO after 9 days. The patient experienced ECMO-related complications, including thrombocytopenia and intracranial hemorrhage (ICH). Although treatment was difficult, the patient was discharged after 2 months without any neurological complications. We followed up for 1 year and the patient was able to work normally as

a teacher. In our mini-review, we found that the success rate of ECPR in perinatal CA was high, and ECPR is worthy of promotion and application. CONCLUSIONS: As an advanced life support method, ECPR can save patients undergoing postpartum CA. However, effective CPR and avoidance of ICH are necessary for the recovery of brain function.

7. ESC Heart Fail. 2023 Feb 25. doi: 10.1002/ehf2.14319. Online ahead of print.
Cardiac arrest caused by coronary occlusion during transcatheter aortic valve implantation: a unique cause.
Gao X(1), Chen F(1), Jiang X(2), Chen N(3), Liu J(1), Luan Y(4), Yang G(5), Yin D(1), Guo R(1).
ABSTRACT
Coronary artery occlusion (CAO) is a rare but life-threatening complication of transcatheter aortic valve implantation (TAVI). The mechanism of CAO is the displacement of the native calcified valve leaflet over the coronary ostium. Here, we report on a woman who experienced sudden cardiac arrest and abrupt CAO during TAVI, which was caused by two different original obstructions, a rupture of aortic plaque or a partial tear of the aortic intima blocking the upper 2/3 of the left main trunk (LMT) ostium, and the transcatheter heart valve (THV) blocking the lower 1/3 of the LMT ostium. She was eventually successfully treated with the chimney stenting technique. Aortography other than coronary angiography was used to ascertain CAO. In patients presenting with abrupt cardiac arrest or cardiogenic shock with LMT occlusion, there must be prompt identification, and the causes of CAO may be various and rare. The identification of CAO relies not only on CAG but also on aortography, especially if the locations and origins of obstructions are special. Supportive therapy with an attempt at percutaneous revascularization is necessary. Pre-procedural assessment is crucial prior to TAVI interventions. In cases with high risk of CAO, upfront coronary artery protection can be provided.

8. Am J Med Genet A. 2023 Feb 20. doi: 10.1002/ajmg.a.63151. Online ahead of print.
Co-occurrence of Proteus syndrome and ventricular tachycardia cardiac arrest in a teenager.
Ferguson R(1), Scurr I(2), Ours CA(3), Johnston JJ(3), Pike K(4), Spentzou G(1).
ABSTRACT
Proteus syndrome is an extremely rare overgrowth condition caused by a somatic variant of the AKT1 gene. It can involve multiple organ systems though rarely is there symptomatic cardiac involvement. Fatty infiltration of the myocardium has been described but has not been reported to cause functional or conduction abnormalities. We present an individual with Proteus syndrome who suffered a sudden cardiac arrest.

9. Acta Med Okayama. 2023 Feb;77(1):117-120. doi: 10.18926/AMO/64372.
Organ Donation after Extracorporeal Cardiopulmonary Resuscitation and Brain Death.
Obara T(1), Yumoto T(1), Aoshima K(1), Tsukahara K(1), Naito H(1), Nakao A(1).
ABSTRACT
A 38-year-old primipara Japanese woman suffered cardiac arrest due to a pulmonary thromboembolism 1 day after undergoing a cesarean section. Extracorporeal cardiopulmonary resuscitation was initiated and extracorporeal membrane oxygenation support was needed for 24 h. Despite intensive care, the patient was diagnosed with brain death on day 6. With the family's consent, comprehensive end-of-life care including organ donation was discussed based on our hospital's policy. The family decided to donate her organs. Specific training and education are required for emergency physicians to optimize the process of incorporating organ donation into end-of-life care while respecting the patient's and family's wishes.

10. Cureus. 2023 Jan 26;15(1):e34232. doi: 10.7759/cureus.34232. eCollection 2023 Jan.
Reintroduction of 5-Fluorouracil Post-cardiac Arrest Secondary to Chemotherapy-Induced Cardiotoxicity.
Wu K(1), Bhattacharya P(2).
ABSTRACT
5-fluorouracil (5-FU) has been known to have cardiotoxic side effects, including coronary vasospasm, myocardial infarctions, heart failure, arrhythmias, and cardiac arrest. These cases have been reported in patients with either known coronary disease or known risk factors. In cases of acute cardiotoxicity, cessation of fluoropyrimidines is recommended, and reintroduction of the medication is generally avoided. We present a case of a young patient with no known risk factors for coronary disease, who presented with an acute cardiac arrest suspected secondary to vasospasm from the administration of 5-FU for the treatment of rectal cancer and was successfully maintained on treatment with 5-FU post-arrest after transitioning from an infusion to bolus administration.

11. Pediatr Int. 2023 Feb 27:e15518. doi: 10.1111/ped.15518. Online ahead of print.
Resuscitation of a full-term infant born with pulseless electrical activity.
Hanaki M(1), Hitaka D(1), Miyazono Y(1)(2), Takada H(1)(2).
NO ABSTRACT AVAILABLE

12. Cureus. 2023 Jan 23;15(1):e34107. doi: 10.7759/cureus.34107. eCollection 2023 Jan.
Vasovagal Syncope and Pulseless Electrical Activity Cardiac Arrest in Patients With Immunoglobulin Light Chain Cardiac Amyloidosis: A Case Series.
Sperry BW(1), Harhash AA(2), Cossor F(3), Raza S(4).
ABSTRACT
Immunoglobulin light chain (AL) amyloidosis may lead to amyloid fibril deposition into peripheral and autonomic nerves, resulting in resting and orthostatic hypotension. While most patients die from progressive heart failure, the most commonly proposed cardiac rhythm associated with sudden death is pulseless electrical activity (PEA). Herein, we describe four patients with severe AL cardiac amyloidosis who had witnessed cardiac arrest with pulseless electrical activity as a result of vasovagal syncope. Healthcare providers should be aware of severe autonomic dysfunction in cardiac amyloidosis and the potential for an abnormal vasovagal response leading to syncope or death.

13. Front Cardiovasc Med. 2023 Feb 13;10:1074544. doi: 10.3389/fcvm.2023.1074544. eCollection 2023.
ECMELLA as a bridge to heart transplantation in refractory ventricular fibrillation: A case report.
Giraud R(1)(2)(3), Assouline B(1)(2)(3), Burri H(2)(4), Shah D(2)(4), Meyer P(2)(4), Degrauwe S(2)(4), Kirsch M(5), Bendjelid K(1)(2)(3).
ABSTRACT
BACKGROUND: Extracorporeal membrane oxygenation (ECMO) is an effective cardiorespiratory support technique in refractory cardiac arrest (CA). In patients under veno-arterial ECMO, the use of an Impella device, a microaxial pump inserted percutaneously, is a valuable strategy through a left ventricular unloading approach. ECMELLA, a combination of ECMO with Impella, seems to be a promising method to support end-organ perfusion while unloading the left ventricle. CASE SUMMARY: The present case report describes the clinical course of a patient with ischemic and dilated cardiomyopathy who presented with refractory ventricular fibrillation (VF) leading to CA in the late postmyocardial infarction (MI) period, and who was successfully treated with ECMO and IMPELLA as a bridge to heart transplantation. DISCUSSION: In the case of CA on VF refractory to

conventional resuscitation maneuvers, early extracorporeal cardiopulmonary resuscitation (ECPR) associated with an Impella seems to be the best strategy. It provides organ perfusion, left ventricular unloading, and ability for neurological evaluation and VF catheter ablation before allowing heart transplantation. It is the treatment of choice in cases of end-stage ischaemic cardiomyopathy and recurrent malignant arrhythmias.

14. Ann Neurol. 2023 Feb 26. doi: 10.1002/ana.26619. Online ahead of print.
Cardiac Arrest and Neurologic Recovery: Insights from the Case of Mr. Damar Hamlin.
Geocadin RG(1), Agarwal S(2), Goss AL(3), Callaway CW(4), Richie M(5).
ABSTRACT
The association between brain injury after cardiac arrest and poor survival outcomes has led to longstanding pessimism. However, the publicly-witnessed cardiac arrest, resuscitation and acute management of Mr. Damar Hamlin and his favorable neurologic recovery provides some optimism. Mr. Hamlin's case highlights the neurologic advances of the last two decades and presents the opportunity to improve outcomes for all cardiac arrest patients in key areas: 1) Effectively implementing the American Heart Association 'Chain of Survival' to prevent initial brain injury and promote neuroprotection; 2) Revisiting the process of neurologic prognostication and re-defining the brain recovery during the early periods, and 3) Incorporating neurorehabilitation into existing cardiac rehabilitation models to support holistic recovery.

15. Herzschrittmacherther Elektrophysiol. 2023 Mar;34(1):71-74. doi: 10.1007/s00399-023-00926-7. Epub 2023 Feb 14.
[Survived 80 seconds of asystole without damage!: Consequences for better Holter diagnostics].
[Article in German; Abstract available in German from the publisher]
Müller C(1), Mönch-Tegeder S(2), Arendt C(2).
ABSTRACT
A 67-year old women suffered multiple syncope episodes during a vacation trip. The emergency 12-lead electrocardiogram revealed a sinusrhythm, AV block I° and left bundle branch block. After admission to the base hospital, a Holter ECG system was implemented. The next morning, the woman collapsed unnoticed. By chance, she was found and stabilized by nurses. The Holter report showed a total AV block over 80 seconds without ventricular replacement rhythm. The patient recovered without neurological damage and got a pacemacer system (DDDR). To the best of our knowledge, this is the longest documented total AV block survived without clinical damage. Conclusion: 1. The emergency 12-lead electrocardiogram (Index ECG) has prognostic power. 2. It is absolutely necessary to integrate alert functions in Holter ECG systems to enable external help in case of threatening arrhythmias.