This week's PubMed 4th – 10th September 2022: articles of interest n = 43

CPR AND COVID-19

1. Int J Emerg Med. 2022 Sep 9;15(1):46. doi: 10.1186/s12245-022-00444-2.
Characteristics and outcomes of out-of-hospital cardiac arrest patients before and during the COVID-19 pandemic in Thailand.
Phattharapornjaroen P(1), Nimnuan W(1), Sanguanwit P(2), Atiksawedparit P(3), Phontabtim M(1), Mankong Y(3).
ABSTRACT
BACKGROUND: Out-of-hospital cardiac arrest (OHCA) remains one of the leading causes of death worldwide, and bystander CPR with public-access defibrillation improves OHCA survival outcomes. The COVID-19 pandemic has posed many challenges for emergency medical services (EMS), including the suggestion of compression-only resuscitation and recommendations for complete personal protective equipment, which have created operational difficulties and prolonged response time. However, the risk factors affecting OHCA outcomes during the pandemic are poorly defined. This study aimed to assess the characteristics and outcomes of OHCA patients before and during the COVID-19 pandemic in Thailand. METHODS: This single-center, retrospective cohort study used data from electronic medical records and EMS paper records. All OHCA patients who visited Ramathibodi Hospital's emergency department before COVID-19 (March 2018 to December 2019) and during COVID-19 (March 2020-December 2021) were identified, and the number of emergency department returns of spontaneous circulation (ED-ROSC) and characteristics in OHCA patients before and during the COVID-19 pandemic in Thailand were collected. RESULTS: A total of 136 patients were included (78 men [59.1%]; mean [SD] age, 67.9 [18] years); 60 of these were during the COVID-19 period (beginning March 2020), and 76 were before the COVID-19 period. The overall baseline characteristics that differed significantly between the two groups were bystander witness and mode of chest compression (p-values < 0.001 and < 0.001, respectively). The ED ROSC during the COVID-19 period was significantly lower than before the COVID-19 period (26.67% vs. 46.05%, adjusted OR 0.21, p-value < 0.001). There were significant differences in survival to admission between the COVID-19 period and before (25.00% and 40.79%, adjusted OR 0.26, p-value 0.005). However, 30-day survivals were not significantly different (3.3% during the COVID-19 period and 10.53% before the COVID-19 period). CONCLUSIONS: During the COVID-19 pandemic in Thailand, ED ROSC and survival to admission in out-of-hospital cardiac arrest patients were significantly reduced. Additionally, the witness responses and mode of chest compression were very different between the two groups.

2. J Clin Med. 2022 Sep 1;11(17):5177. doi: 10.3390/jcm11175177.
Management of Out-of-Hospital Cardiac Arrest during COVID-19: A Tale of Two Cities.
Lim SL(1)(2)(3), Kumar L(4), Saffari SE(5), Shahidah N(6), Al-Araji R(7), Ng QX(8), Ho AFW(3)(6), Arulanandam S(8), Leong BS(9), Liu N(3)(5), Siddiqui FJ(3), McNally B(4), Ong MEH(3)(6).
ABSTRACT
Variations in the impact of the COVID-19 pandemic on out-of-hospital cardiac arrest (OHCA) have been reported. We aimed to, using population-based registries, compare community response, Emergency Medical Services (EMS) interventions and outcomes of adult, EMS-treated, non-traumatic OHCA in Singapore and metropolitan Atlanta, before and during the pandemic. Associations of OHCA characteristics, pre-hospital interventions and pandemic with survival to hospital discharge were analyzed using logistic regression. There were 2084 cases during the pandemic (17 weeks from the first confirmed COVID-19 case) and 1900 in the pre-pandemic period

(corresponding weeks in 2019). Compared to Atlanta, OHCAs in Singapore were older, received more bystander interventions (cardiopulmonary resuscitation (CPR): 65.0% vs. 41.4%; automated external defibrillator application: 28.6% vs. 10.1%), yet had lower survival (5.6% vs. 8.1%). Compared to the pre-pandemic period, OHCAs in Singapore and Atlanta occurred more at home (adjusted odds ratio (aOR) 2.05 and 2.03, respectively) and were transported less to hospitals (aOR 0.59 and 0.36, respectively) during the pandemic. Singapore reported more witnessed OHCAs (aOR 1.96) yet less bystander CPR (aOR 0.81) during pandemic, but not Atlanta (p < 0.05). The impact of COVID-19 on OHCA outcomes did not differ between cities. Changes in OHCA characteristics and management during the pandemic, and differences between Singapore and Atlanta were likely the result of systemic and sociocultural factors.

3. Int J Environ Res Public Health. 2022 Sep 2;19(17):10968. doi: 10.3390/ijerph191710968.
Readiness of Bystander Cardiopulmonary Resuscitation (BCPR) during the COVID-19 Pandemic: A Review.
Fazel MF(1)(2), Mohamad MHN(2), Sahar MA(1), Juliana N(1), Abu IF(2), Das S(3).
ABSTRACT
Early cardiopulmonary resuscitation (CPR) is a strong link in the of survival for sudden cardiac arrest. Hence, bystander CPR (BPCR) plays an important role in curbing mortality and morbidity from out-of-hospital sudden cardiac arrest. However, the recent global Coronavirus disease 2019 (COVID-19) pandemic has impacted both public training and confidence in performing out-of-hospital CPR. This paper reviews detailed information from databases including Google Scholar, Scopus, PubMed and Web of Science on the readiness of BCPR during the pandemic. We also discussed the challenges bystanders encountered during the COVID-19 pandemic and the precautions to follow. Finally, we also highlighted the limitations which would benefit future endeavours in establishing well-planned and sustainable CPR training programs for the public. Therefore, regardless of the existing COVID-19 pandemic, BCPR must be emphasised to curb out-of-hospital cardiac arrest (OHCA) mortality.

4. J Comput Appl Math. 2022 Aug 28;419:114772. doi: 10.1016/j.cam.2022.114772. Online ahead of print.
Analysis of COVID-19 in Japan with extended SEIR model and ensemble Kalman filter.
Sun Q(1)(2), Miyoshi T(1)(3)(4), Richard S(1)(2).
ABSTRACT
We introduce an extended SEIR infectious disease model with data assimilation for the study of the spread of COVID-19. In this framework, undetected asymptomatic and pre-symptomatic cases are taken into account, and the impact of their uncertain proportion is fully investigated. The standard SEIR model does not consider these populations, while their role in the propagation of the disease is acknowledged. An ensemble Kalman filter is implemented to assimilate reliable observations of three compartments in the model. The system tracks the evolution of the effective reproduction number and estimates the unobservable subpopulations. The analysis is carried out for three main prefectures of Japan and for the entire country of Japan. For these four communities, our estimated effective reproduction numbers are more stable than the corresponding ones estimated by a different method (Toyokeizai). We also perform sensitivity tests for different values of some uncertain medical parameters, like the relative infectivity of symptomatic/asymptomatic cases. The regional analysis results suggest the decreasing efficiency of the states of emergency.

CPR/MECHANICAL CHEST COMPRESSION

1. Resuscitation. 2022 Sep 7:S0300-9572(22)00655-4. doi: 10.1016/j.resuscitation.2022.08.020. Online ahead of print.

Quality of chest compressions during prehospital resuscitation phase from scene arrival to ambulance transport in out-of-hospital cardiac arrest.

Gyung Won Lee S(1), Jeong Hong K(2), Han Kim T(3), Choi S(4), Do Shin S(5), Jun Song K(6), Sun Ro Y(7), Jeong J(8), Joo Park Y(9), Ho Park J(10).

ABSTRACT

AIM: Prehospital cardiopulmonary resuscitation is performed from scene arrival to hospital arrival. The diverse prehospital resuscitation phases can affect the quality of chest compressions. This study aimed to evaluate the dynamic changes in chest compression quality during prehospital resuscitation. METHODS: Adult out-of-hospital cardiac arrest patients treated without prehospital return of spontaneous circulation were included in Seoul between July 2020 and September 2021. The chest compressions quality was assessed using a real-time chest compression feedback device. The prehospital phase was divided by key events during the prehospital resuscitation timeline (phase 1: first 2 min after initiation of chest compression, phase 2: from the end of phase 1 to 1 min prior to ambulance departure; phase 3: from 1 min before to 1 min after ambulance departure; phase 4: from the end of phase 3 to hospital arrival). The main outcome was no-flow fraction. The no-flow fraction between prehospital phases was compared using repeated-measure analysis of variance. RESULTS: In total, 788 patients were included. Mean no-flow fraction was the highest in phase 3 (phase 1: 11.3%±13.8, phase 2: 19.3%±12.3, phase 3: 33.0%±34.9, phase 4: 18.7%±23.7, $p<0.001$). The mean number of total no-flow events per minute was also the highest in Phase 3. The minute-by-minute analysis showed that the no-flow fraction rapidly increased before ambulance departure and decreased during ambulance transport. CONCLUSION: Dynamic changes in chest compression quality were observed during prehospital resuscitation phase. The no-flow fraction was the highest from 1 min before to 1 min after ambulance departure.

2. Resuscitation. 2022 Sep 6:S0300-9572(22)00657-8. doi: 10.1016/j.resuscitation.2022.09.001. Online ahead of print.

Manual chest compression pause duration for ventilations during prehospital advanced life support - an observational study to explore optimal ventilation pause duration for mechanical chest compression devices.

van Schuppen H(1), Doeleman LC(2), Hollmann MW(2), Koster RW(3).

ABSTRACT

AIM: Mechanical chest compression devices in the 30:2 mode generally provide a pause of three seconds to give two insufflations without evidence supporting this pause duration. We aimed to explore the optimal pause duration by measuring the time needed for two insufflations, during advanced life support with manual compressions. METHODS: Prospectively collected data in the AmsteRdam REsuscitation STudies (ARREST) registry were analysed, including thoracic impedance signal and waveform capnography from manual defibrillators of the Amsterdam ambulance service. Compression pauses were analysed for number of insufflations, time interval from start of the compression pause to the end of the second insufflation, chest compression pause duration and ventilation subintervals. RESULTS: During 132 out-of-hospital cardiac arrests, 1619 manual chest compression pauses to ventilate were identified. In 1364 (84%) pauses, two insufflations were given. In 28% of these pauses, giving two insufflations took more than three seconds. The second insufflation is completed within 3.8 seconds in 90% and within 5 seconds in 97.5% of these pauses. An increasing likelihood of achieving two insufflations is seen with increasing compression pause

duration up to five seconds. CONCLUSION: The optimal chest compression pause duration for mechanical chest compression devices in the 30:2 mode to provide two insufflations, appears to be five seconds, warranting further studies in the context of mechanical chest compression. A 5-second pause will allow providers to give two insufflations with a very high success rate. In addition, a 5-second pause can also be used for other interventions like rhythm checks and endotracheal intubation.

3. Eur J Emerg Med. 2022 Oct 1;29(5):386-387. doi: 10.1097/MEJ.0000000000000916. Epub 2022 Feb 21.
Backboard use during cardiopulmonary resuscitation and chest compression quality.
Cuvelier Z(1), Houthoofdt R(2), Serraes B(3)(4)(5), Haentjens C(6), Mpotos N(7)(8), Blot S(5)(9)(10).
NO ABSTRACT AVAILABLE

REGISTRIES, REVIEWS AND EDITORIALS

1. J Anaesthesiol Clin Pharmacol. 2022 Jul;38(Suppl 1):S8-S12. doi: 10.4103/joacp.joacp_421_21. Epub 2022 Jun 30.
Prone cardiopulmonary resuscitation: Relevance in current times.
Bhatia N(1), Yaddanapudi S(1), Aditya AS(1).
ABSTRACT
The most common and recommended position for performing cardiopulmonary resuscitation (CPR) is the supine position. However, clinicians may encounter situations when patients suffer cardiac arrest in prone position. Prone CPR has been described previously in a number of settings, most commonly intraoperative. In the current COVID-19 era, with more patients being nursed in prone position, an increase in the incidence of cardiac arrests requiring prone CPR is expected. Hence most of the resuscitation guidelines have made prone CPR a vital component of their recommendations. To date, most of our health-care workers have limited knowledge about prone resuscitation and the literature surrounding it. Nonetheless, with the current evidence at hand, it seems to be a reliable method of providing resuscitation and all health-care workers should be well versed with it. Thus, the goal of this narrative review is to try and fill the gaps in our knowledge about prone CPR. Literature search was done on PubMed, Medline, EMBASE using keywords 'CPR', 'Resuscitation', 'Prone Position', 'Prone', 'Prone CPR'.

2. Resusc Plus. 2022 Aug 24;11:100294. doi: 10.1016/j.resplu.2022.100294. eCollection 2022 Sep.
Characteristics, survival and neurological outcome in out-of-hospital cardiac arrest: A nationwide study of 56,203 cases with emphasis on cardiovascular comorbidities.
Rawshani A(1)(2)(3), Hessulf F(1)(4), Völz S(1)(2), Dworeck C(1)(2), Odenstedt J(1)(2), Råmunddal T(1)(2), Hirlekar G(1)(2), Petursson P(1)(2), Angerås O(1)(2), Ioanes D(1), Myredal A(1)(2).
ABSTRACT
BACKGROUND: We studied clinical characteristics, survival and neurological outcomes in patients with pre-existing cardiovascular (CV) conditions who experienced an out-of-hospital cardiac arrest (OHCA). METHODS: We studied all cases of OHCA in the Swedish Registry for Cardiopulmonary Resuscitation (2010-2020). Patients were grouped according to the following pre-existing CV conditions prior: hypertension (HT), heart failure (HF) with HT, HF with ischemic heart disease (IHD), HF without HT or IHD, IHD, myocardial infarction (MI) and diabetes mellitus (DM), with groups being mutually exclusive. We studied 30-day survival and neurological outcomes using logistic and Cox regression. RESULTS: A total of 56,203 patients were included. The lowest rates of shockable rhythm occurred in cases with HT (19%), HF and HT (18%) and DM (18%). Median time to OHCA from

diagnosis of HT was 2.0 years in cases aged 0-40 years at diagnosis of HT, 4.4 years in those aged 41-60 at diagnosis, 5.0 years in those aged 61-70 years, 5.6 years in those aged 71-80 years and 6.0 years in those aged 81 years or older. The lowest survival was noted for patients with HF and HT. Age and sex adjusted OR for CPC score 1 did not differ in any group. CONCLUSION: The combination of HT and HF has the lowest survival of all cardiovascular comorbidities. Early onset of hypertension is a predictor for early cardiac arrest.

3. Mayo Clin Proc. 2022 Sep;97(9):1608-1618. doi: 10.1016/j.mayocp.2022.06.011.
Women Are Less Likely to Survive AMI Presenting With Out-of-Hospital Cardiac Arrest: A Nationwide Study.
Dafaalla M(1), Rashid M(1), Van Spall HGC(2), Mehta L(3), Parwani P(4), Sharma G(5), Palmer RB(6), Moledina S(1), Volgman AS(7), Mamas MA(8).
ABSTRACT
OBJECTIVE: To assess the impact of patient's sex on outcomes and management of acute myocardial infarction (AMI) patients presenting with out-of-hospital cardiac arrest (OHCA). PATIENTS AND METHODS: We conducted a population-based retrospective cohort study in AMI patients admitted with OHCA between 2010 and 2017 from the Myocardial Ischaemia National Audit Project (MINAP) registry. We used multivariable logistic regression models to evaluate the role of sex as a predictor of clinical outcomes and treatment strategy. RESULTS: Of 16,278 patients, women constituted almost one-quarter of the population (n=3710 [22.7%]). Women were older (median age 69 [IQR, 57-79] years vs 63 [IQR, 54-72] years, P<.001), experienced longer call-to-hospital-arrival time (median, 1.2 hours vs 1.1 hours; P=.008), were less likely to present with shockable rhythm (86.8% vs 91.5%, P<.001), and less likely to receive dual antiplatelet therapy (73.8% vs 78.6%, P<.001), beta blockers (64.7% vs 72.3%, P<.001), angiotensin-converting enzyme inhibitors (49.0% vs 55.3%, P<.001), coronary angiography (73.7% vs 83.3%, P<.001), and percutaneous coronary intervention (37.5% vs. 40.7%, p 0.004). After adjusting for patient characteristics and management, women had significantly higher odds of in-hospital death compared with men (odds ratio [OR], 1.3; 95% CI, 1.1 to 1.5) and lower odds of receiving coronary angiography (OR, 0.67; 95% CI, 0.59 to 0.75) and coronary artery bypass graft (OR, 0.28; 95% CI, 0.19 to 0.40). CONCLUSION: Women were less likely to survive following OHCA secondary to AMI. Hospital protocols that minimize physician bias and improve women-physician communication are needed to close this gap.

IN-HOSPITAL CARDIAC ARREST

1. Chest. 2022 Sep;162(3):499-500. doi: 10.1016/j.chest.2022.04.012.
Cardiac Arrest in the ICU: Measuring Performance to Drive Improvements in Care.
Tomassini S(1), Couper K(2).
NO ABSTRACT AVAILABLE

2. Adv Simul (Lond). 2022 Sep 9;7(1):29. doi: 10.1186/s41077-022-00225-0.
Inhospital cardiac arrest - the crucial first 5 min: a simulation study.
Stærk M(1)(2)(3), Lauridsen KG(4)(5)(6), Støtt CT(7), Riis DN(4), Løfgren B(1)(4)(8), Krogh K(9)(10).
ABSTRACT
BACKGROUND: Early recognition and call for help, fast initiation of chest compressions, and early defibrillation are key elements to improve survival after cardiac arrest but are often not achieved. We aimed to investigate what occurs during the initial treatment of unannounced in situ simulated inhospital cardiac arrests and reasons for successful or inadequate initial resuscitation efforts. METHODS: We conducted unannounced full-scale in situ simulated inhospital cardiac arrest followed by a debriefing. Simulations and debriefings were video recorded for subsequent analysis. We

analyzed quantitative data on actions performed and time measurements to key actions from simulations and qualitative data from transcribed debriefings. RESULTS: We conducted 36 simulations. Time to diagnosis of cardiac arrest was 37 (27; 55) s. Time to first chest compression from diagnosis of cardiac arrest was 37 (18; 74) s, time to calling the cardiac arrest team was 144 (71; 180) s, and time to first shock was 221 (181; 301) s. We observed participants perform several actions after diagnosing the cardiac arrest and before initiating chest compressions. Domains emerging from the debriefings were teaming and resources. Teaming included the themes communication, role allocation, leadership, and shared knowledge, which all included facilitators and barriers. Resources included the themes knowledge, technical issues, and organizational resources, of which all included barriers, and knowledge also included facilitators. CONCLUSION: Using unannounced in situ simulated cardiac arrests, we found that key elements such as chest compressions, calling the cardiac arrest team, and defibrillation were delayed. Perceived barriers to resuscitation performance were leadership and teaming, whereas experience, clear leadership, and recent training were perceived as important facilitators for treatment progress.

INJURIES AND CPR

1. Circ J. 2022 Sep 2. doi: 10.1253/circj.CJ-22-0193. Online ahead of print.

The Association Between the Duration of Chest Compression and Thoracic Injuries in Patients With Non-Traumatic Out-of-Hospital Cardiac Arrest.

Katasako A(1), Kawakami S(1), Koga H(2), Kitahara K(1), Komiya K(1), Mizokami K(1), Yamada T(3), Miura N(4), Inoue S(1).

ABSTRACT

BACKGROUND: Current guidelines emphasize the indispensability of high-quality chest compression for improving survival in patients who experience out-of-hospital cardiac arrest (OHCA). However, chest compression can cause thoracic injuries that may contribute to poor prognosis; therefore, the purpose of this study is to identify the predictors of thoracic injuries and evaluate the association between thoracic injuries and prognosis. Methods and Results: Between June 2017 to July 2019, Utstein-style data on 384 consecutive adult patients who experienced non-traumatic OHCA and who were transferred to our hospital (Aso Iizuka Hospital) were collected. Each patient underwent a full-body computed tomography scan. Two-hundred and thirty-four patients (76%) had thoracic injuries (Group-T). The duration of chest compression was significantly longer in Group-T than in patients without thoracic injuries (Group-N; 43 vs. 32 min, respectively, P<0.001). Multivariate analysis revealed that older age and longer chest compression duration were predictors of thoracic injuries (odds ratios 1.03 and 1.07, respectively, P≤0.005). Among patients who achieved return of spontaneous circulation, Kaplan-Meier curves showed a significantly higher cumulative survival rate in Group-N than in Group-T at the 30-day follow up (log-rank test P=0.009). CONCLUSIONS: Older age and longer chest compression duration were independent predictors of thoracic injuries due to chest compression in patients who experienced non-traumatic OHCA. Moreover, the presence of thoracic injuries was associated with worse short-term prognosis.

CAUSE OF THE ARREST

1. BMC Emerg Med. 2022 Sep 7;22(1):157. doi: 10.1186/s12873-022-00701-w.

Correction: Long-term prognosis and clinical course of choking-induced cardiac arrest in patients without the return of spontaneous circulation at hospital arrival: a population-based community study from the Shizuoka Kokuho Database.

Miyoshi T(1)(2), Endo H(2), Yamamoto H(3)(4), Shimada K(2), Kumamaru H(1)(5), Ichihara N(1)(5), Miyachi Y(1), Miyata H(1)(2)(5).
NO ABSTRACT AVAILABLE

END-TIDAL CO_2

No articles identified.

ORGAN DONATION

1. J Thorac Dis. 2022 Aug;14(8):2802-2811. doi: 10.21037/jtd-22-226.
Lung recruitment after cardiac arrest during procurement of atelectatic donor lungs is a protective measure in lung transplantation.
Niman E(1), Miyoshi K(1), Shiotani T(1), Toji T(2), Igawa T(3), Otani S(1), Okazaki M(1), Sugimoto S(1), Yamane M(1), Toyooka S(1).
ABSTRACT
BACKGROUND: Brain-dead donors are susceptible to pulmonary atelectasis (AT). In procurement surgery, lung recruitment under circulatory conditions and cold-flushing for atelectatic donor lungs often provoke graft injury due to the acute blood inflow. We hypothesized that lung recruitment without blood circulation can mitigate graft injury. This study aimed to examine the benefits of lung recruitment subsequent to cardiac arrest using a porcine lung-transplant model. METHODS: Thirteen donor pigs were categorized into the non-atelectatic (No-AT) group (n=3) representing a healthy control group; AT-BCR group (n=5), in which AT was reverted by conventional blood-circulated recruitment (BCR); and AT-no-BCR group (n=5), in which AT was reverted by no-BCR following circulatory arrest. In the atelectatic donor models, the left main bronchus was ligated for 24 hours prior to lung procurement. Left lung transplantation (LTx) was subsequently performed in the thirteen recipient pigs. After 6 hours evaluation, the recipients were euthanized and the lung grafts were excised. RESULTS: The post-transplant PaO2/FiO2 ratio was significantly higher in the AT-no-BCR group than in the AT-BCR group (P=0.015). Wet/dry ratio, histological findings of graft injury and tissue interleukin-8 expression in the AT-no-BCR group were similar to those of the No-AT group. CONCLUSIONS: Lung recruitment without circulation after circulatory arrest could be more protective for atelectatic donor lung than the conventional procedure.

FEEDBACK

No articles identified.

DRUGS

No articles identified.

TRAUMA

1. BMC Emerg Med. 2022 Sep 10;22(1):158. doi: 10.1186/s12873-022-00714-5.
Survival after traumatic cardiac arrest is possible-a comparison of German patient-registries.

Seewald S(1)(2), Wnent J(3)(4)(5), Gräsner JT(3)(4), Tjelmeland I(3)(6)(7), Fischer M(8), Bohn A(9)(10), Bouillon B(11), Maurer H(12), Lefering R(13).

ABSTRACT

BACKGROUND: Out-of-hospital cardiac arrest (OHCA) due to trauma is rare, and survival in this group is infrequent. Over the last decades, several new procedures have been implemented to increase survival, and a "Special circumstances chapter" was included in the European Resuscitation Council (ERC) guidelines in 2015. This article analysed outcomes after traumatic cardiac arrest in Germany using data from the German Resuscitation Registry (GRR) and the TraumaRegister DGU® (TR-DGU) of the German Trauma Society. METHODS: In this study, data from patients with OHCA between 01.01.2014 and 31.12.2019 secondary to major trauma and where cardiopulmonary resuscitation (CPR) was started were eligible for inclusion. Endpoints were return of spontaneous circulation (ROSC), hospital admission with ROSC and survival to hospital discharge. RESULTS: 1.049 patients were eligible for inclusion. ROSC was achieved in 28.7% of the patients, 240 patients (22.9%) were admitted to hospital with ROSC and 147 (14.0%) with ongoing CPR. 643 (67.8%) patients were declared dead on scene. Of all patients resuscitated after traumatic OHCA, 27.3% (259) died in hospital. The overall mortality was 95.0% and 5.0% survived to hospital discharge (47). In a multivariate logistic regression analysis; age, sex, injury severity score (ISS), head injury, found in cardiac arrest, shock on admission, blood transfusion, CPR in emergency room (ER), emergency surgery and initial electrocardiogram (ECG), were independent predictors of mortality. CONCLUSION: Traumatic cardiac arrest was an infrequent event with low overall survival. The mortality has remained unchanged over the last decades in Germany. Additional efforts are necessary to identify reversible cardiac arrest causes and provide targeted trauma resuscitation on scene.

VENTILATION

1. Prehosp Emerg Care. 2022 Sep-Oct;26(5):716-727. doi: 10.1080/10903127.2021.1940400. Epub 2021 Jul 20.

Prehospital Airway Management: A Systematic Review.

Carney N, Totten AM, Cheney T, Jungbauer R, Neth MR, Weeks C, Davis-O'Reilly C, Fu R, Yu Y, Chou R, Daya M.

ABSTRACT

Objective: To assess comparative benefits and harms across three airway management approaches (bag valve mask [BVM], supraglottic airway [SGA], and endotracheal intubation [ETI]) used by prehospital emergency medical services (EMS) to treat patients with trauma, cardiac arrest, or medical emergencies, and how they differ based on techniques and devices, EMS personnel and patient characteristics. Data sources: We searched electronic citation databases (Ovid® MEDLINE®, CINAHL®, the Cochrane Central Register of Controlled Trials, the Cochrane Database of Systematic Reviews, and Scopus®) from 1990 to September 2020. Review methods: We followed Agency for Healthcare Research and Quality Effective Health Care Program Methods guidance. Outcomes included mortality, neurological function, return of spontaneous circulation (ROSC), and successful advanced airway insertion. Meta-analyses using profile-likelihood random effects models were conducted, with analyses stratified by study design, emergency type, and age. Results: We included 99 studies involving 630,397 patients. We found few differences in primary outcomes across airway management approaches. For survival, there was no difference for BVM versus ETI or SGA in adult and pediatric patients with cardiac arrest or trauma. For neurological function, there was no difference for BVM versus ETI and SGA versus ETI in pediatric patients with cardiac arrest. There was no difference in BVM versus ETI in adults with cardiac arrest, but improved neurological function with BVM or ETI versus SGA. There was no difference in ROSC for patients with cardiac arrest for

BVM versus ETI or SGA in adults and pediatrics, or SGA versus ETI in pediatrics. There was higher frequency of ROSC in adults with SGA versus ETI. For successful advanced airway insertion, there was higher first-pass success with SGA versus ETI for all patients except adult medical patients (no difference), and no difference in overall success using SGA versus ETI in adults. Conclusions: The currently available evidence does not indicate benefits of more invasive airway approaches based on survival, neurological function, ROSC, or successful airway insertion. Strength of evidence was low or moderate; most included studies were observational. This supports the need for high-quality randomized controlled trials to advance clinical practice and EMS education and policy, and improve patient-centered outcomes.

CERERBRAL MONITORING

1. Int J Emerg Med. 2022 Sep 5;15(1):43. doi: 10.1186/s12245-022-00447-z.

Predictors of neurological outcome after out-of-hospital cardiac arrest: sex-based analysis: do males derive greater benefit from hypothermia management than females?

Awad EM(1)(2), Humphries KH(3)(4)(5), Grunau BE(3)(6)(7), Norris CM(8), Christenson JM(3)(6)(7).

ABSTRACT

BACKGROUND: Previous studies of the effect of sex on after out-of-hospital cardiac arrest (OHCA) outcomes focused on survival to hospital discharge and 1-month survival. Studies on the effect of sex on neurological function after OHCA are still limited. The objective of this study was to identify the predictors of favorable neurological outcome and to examine the association between sex as a biological variable and favorable neurological outcome OHCA. METHODS: Retrospective analyses of clustered data from the Resuscitation Outcomes Consortium multi-center randomized controlled trial (2011-2015). We included adults with non-traumatic OHCA and EMS-attended OHCA. We used multilevel logistic regression to examine the association between sex and favorable neurological outcomes (modified Rankin Scale) and to identify the predictors of favorable neurological outcome. RESULTS: In total, 22,416 patients were included. Of those, 8109 (36.2%) were females. The multilevel analysis identified the following variables as significant predictors of favorable neurological outcome: younger age, shorter duration of EMS arrival to the scene, arrest in public location, witnessed arrest, bystander CPR, chest compression rate (CCR) of 100-120 compressions per minute, induction of hypothermia, and initial shockable rhythm. Two variables, insertion of an advanced airway and administration of epinephrine, were associated with poor neurological outcome. Our analysis showed that males have higher crude rates of survival with favorable neurological outcome (8.6 vs. 4.9%, $p < 0.001$). However, the adjusted rate was not significant. Further analyses showed that hypothermia had a significantly greater effect on males than females. CONCLUSIONS: Males had significantly higher crude rates of survival with favorable neurological outcome. However, the adjusted rate was not statistically significant. Males derived significantly greater benefit from hypothermia management than females, but this can possibly be explained by differences in arrest characteristics or in-hospital treatment. In-depth confirmatory studies on the hypothermia effect size by sex are required.

2. Resuscitation. 2022 Sep 6:S0300-9572(22)00654-2. doi: 10.1016/j.resuscitation.2022.08.019. Online ahead of print.

Changes in Health Status and Health Related Quality of Life from Six Months to Five Years in Out-of-Hospital Cardiac Arrest Survivors - a NORCAST sub study.

Wimmer H(1), Šaltytė Benth J(2), Lundqvist C(3), Øystein Andersen G(4), Henriksen J(5), Drægni T(6), Solberg P(4), Stær-Jensen H(7), Sunde K(8), Rostrup Nakstad E(9).

ABSTRACT

BACKGROUND: Brain injury in out-of-hospital cardiac arrest (OHCA) survivors affects health status and health-related quality of life (HRQoL). It is unknown how HRQoL evolves over time, and assessments at different time points may lead to different results. METHODS: In a NORCAST sub study, OHCA survivors eligible for health status (EQ-5D-3L) and HRQoL (SF-36) assessments were examinated six months and five years after OHCA. At five-year follow-up, survivors also retrospectively assessed their health status for each consecutive year following OHCA. The next of kin independently assessed health status and HRQoL of their respective OHCA survivors. RESULTS: Among 138 survivors alive after six months and 117 after five years, 80 (88% male) completed both follow-ups. Health status and HRQoL remained stable over time, except for increasing SF-36 mental summary score and decreasing physical functioning and physical component score. Anxiety and depression levels were generally low, although younger survivors stated more anxiety than older survivors. Retrospective assessment showed reduced health status for the first two years, which increased only from the third year. Explorative analyses revealed that younger age, longer time to return of spontaneous circulation (tROSC) and late awakening affected health status, particularly in the first two years post-arrest. CONCLUSIONS: OHCA survivors showed stable health status and HRQoL with only minor differences between six months and five years. Younger survivors with long tROSC, late awakening, and more anxiety and depression symptoms at six months, had reduced health status the first two years with significant improvements towards the fourth year.

3. Neuroimage Clin. 2022 Aug 26;36:103171. doi: 10.1016/j.nicl.2022.103171. Online ahead of print.
MRI markers of brain network integrity relate to neurological outcome in postanoxic coma.
Keijzer HM(1), Lange PAM(2), Meijer FJA(3), Tonino BAR(4), Blans MJ(5), Klijn CJM(2), Hoedemaekers CWE(6), Hofmeijer J(7), Helmich RC(2).

ABSTRACT
AIM: Current multimodal approaches leave approximately half of the comatose patients after cardiac arrest with an indeterminate prognosis. Here we investigated whether early MRI markers of brain network integrity can distinguish between comatose patients with a good versus poor neurological outcome six months later. METHODS: We performed a prospective cohort study in 48 patients after cardiac arrest submitted in a comatose state to the Intensive Care Unit of two Dutch hospitals. MRI was performed at three days after cardiac arrest, including resting state functional MRI and diffusion-tensor imaging (DTI). Resting state fMRI was used to quantify functional connectivity within ten resting-state networks, and DTI to assess mean diffusivity (MD) in these same networks. We contrasted two groups of patients, those with good (n = 29, cerebral performance category 1-2) versus poor (n = 19, cerebral performance category 3-5) outcome at six months. Mutual associations between functional connectivity, MD, and clinical outcome were studied. RESULTS: Patients with good outcome show higher within-network functional connectivity (fMRI) and higher MD (DTI) than patients with poor outcome across 8/10 networks, most prominent in the default mode network, salience network, and visual network. While the anatomical distribution of outcome-related changes was similar for functional connectivity and MD, the pattern of inter-individual differences was very different: functional connectivity showed larger inter-individual variability in good versus poor outcome, while the opposite was observed for MD. Exploratory analyses suggested that it is possible to define network-specific cut-off values that could help in outcome prediction: (1) high functional connectivity and high MD, associated with good outcome; (2) low functional connectivity and low MD, associated with poor outcome; (3) low functional connectivity and high MD, associated with uncertain outcome. DISCUSSION: Resting-state functional connectivity and mean diffusivity-three days after cardiac arrest are strongly associated with neurological recovery-six months later in a complementary fashion. The combination of fMRI and MD holds potential to improve prediction of outcome.

ULTRASOUND AND CPR

No articles identified.

ORGANISATION AND TRAINING

1. J Nurs Care Qual. 2022 Sep 8. doi: 10.1097/NCQ.0000000000000648. Online ahead of print.

The Five-4-Life Quality Improvement Program: Improving Frontline Nurses' Cardiopulmonary Resuscitation Leadership and Team Management Skills.

Bala-Kerr R(1), Sullivan B, Martin S.

ABSTRACT

BACKGROUND: Poor leadership and teamwork in cardiopulmonary resuscitation (CPR) are associated with poor patient outcomes. PROBLEM: Frontline nursing staff frequently identify patients in cardiac arrest but may not have the initial leadership and teamwork skills to organize their initial rescue response. APPROACH: The Five-4-Life Quality Improvement (QI) program was pilot tested in a pediatric unit within a 510-bed acute care hospital in 2 phases: first, an educational program focused on leadership, team dynamics, and CPR skills, followed by sustaining interventions in the unit. Video recordings of 12 mock codes (4 pre-, 4 post-, 4 follow-up) were analyzed by trained observers. OUTCOMES: Descriptive statistical tests indicated a significant improvement in leadership, teamwork, and task management scores pre- and post-program, and sustained after the program. CONCLUSION: Implementing the Five-4-Life QI program is feasible in improving leadership, teamwork, and task management of first responding frontline nurses.

2. Prehosp Emerg Care. 2022 Sep 9:1-16. doi: 10.1080/10903127.2022.2122643. Online ahead of print.

A Qualitative Analysis of the Experiences of EMS Clinicians in Recognizing and Treating Witnessed Cardiac Arrests.

Burnett SJ(1), Innes JC(1)(2), Varughese R(1)(2), Frazer E(2), Clemency BM(1)(2).

ABSTRACT

Background: Survival from out of hospital cardiac arrest (OHCA) increases when effective cardiopulmonary resuscitation (CPR) and defibrillation are performed early. Patients who suffer OHCA in front of emergency medical services (EMS) clinicians have greater likelihood of survival, but little is known about how EMS clinicians think about and experience those events. We sought to understand how EMS clinicians assessed patients who devolved to cardiac arrest in in their presence and uncover the perceived barriers and facilitators associated with recognizing and treating witnessed OHCAs.Methods: EMS clinicians who had attended an EMS-witnessed OHCA and consented to participate were interviewed within 72 hours of the index case. Transcripts of the interviews were coded through the consolidated framework for implementation research to understand enabling and constraining factors involved and the predictability and anticipation of OHCA and subsequent management of patient care. Utstein data points, interventions, and associated times were extracted from the medical records. Results: We interviewed 29 EMS clinicians who attended 27 EMS-witnessed OHCAs. Twenty-six (96.3%) of the EMS-witnessed OHCAs were preceded by prodromal symptoms and were classified as predictable. Of the predictable cases, clinicians anticipated 53.8% of them and attributed the prodromes of other cases to serious but not peri-arrest etiologies. Participants described various environmental, crew, and intrapersonal enabling and constraining factors associated with recognizing and treating EMS-witnessed OHCAs. Environmental elements included issues of safety and physical locations, crew elements included

familiarity with their partners and working with them in the past, and intrapersonal elements included abilities to collect information and stress associated with responding to and managing the calls. Conclusion: Recognition and treatment of EMS-witnessed OHCAs are influenced by numerous environmental, crew, and intrapersonal factors. Future training and education on OHCA should include diverse locations, situations, and crew make-up, along with non-traditional patient complaints to broaden experiences associated with cardiac arrest management.

3. MedEdPORTAL. 2022 Aug 23;18:11269. doi: 10.15766/mep_2374-8265.11269. eCollection 2022.
Rapid Cycle Deliberate Practice: Application to Adult Advanced Life Support.
Blanchard E(1), Booker D(2), Peterson DT(3), Carter T(4).

ABSTRACT
INTRODUCTION: This curriculum includes three in-person simulation cases for Advanced Cardiac Life Support (ACLS) training using the rapid cycle deliberate practice (RCDP) technique. RCDP is a model for simulation-based medical education (SBME) that provides frequent feedback and opportunities to practice techniques until learning is cemented. The intent of these cases was to improve teamwork and communication, role designation, defibrillator operation, leadership, and clinical treatment of cardiac emergencies. METHODS: Each case provided an ACLS scenario for an adult patient in the postanesthesia care unit setting. The curriculum required high-fidelity mannequins and instructors trained to provide SBME through RCDP. Learners worked in teams and were expected to perform appropriate steps per the ACLS algorithm, with facilitators pausing learners and providing expert feedback and opportunities for deliberate practice throughout. RESULTS: Eighty-four postgraduate year 2 anesthesiology residents participated in the simulation curriculum over eight course offerings. Facilitators noted improved communication and teamwork among participants, as well as more accurate and effective defibrillator use. Feedback from learners was positive and indicated that they believed the experience would improve their clinical performance. DISCUSSION: This curriculum provides instruction on using the RCDP variant of SBME to prepare health care providers to deliver effective care in situations necessitating ACLS. Because RCDP allows for repeated iterations of the same skill, knowledge can be cemented and muscle memory created. Given the positive feedback, we believe the curriculum can provide an effective framework for ACLS reinforcement through RCDP implementation across multiple types of learners and institutions.

4. PLoS One. 2022 Sep 6;17(9):e0273787. doi: 10.1371/journal.pone.0273787. eCollection 2022.
Visual assessment of interactions among resuscitation activity factors in out-of-hospital cardiopulmonary arrest using a machine learning model.
Kawai Y(1), Okuda H(1), Kinoshita A(1), Yamamoto K(1), Miyazaki K(1), Takano K(1), Asai H(1), Urisono Y(1), Fukushima H(1).

ABSTRACT
AIM: The evaluation of the effects of resuscitation activity factors on the outcome of out-of-hospital cardiopulmonary arrest (OHCA) requires consideration of the interactions among these factors. To improve OHCA success rates, this study assessed the prognostic interactions resulting from simultaneously modifying two prehospital factors using a trained machine learning model. METHODS: We enrolled 8274 OHCA patients resuscitated by emergency medical services (EMS) in Nara prefecture, Japan, with a unified activity protocol between January 2010 and December 2018; patients younger than 18 and those with noncardiogenic cardiopulmonary arrest were excluded. Next, a three-layer neural network model was constructed to predict the cerebral performance category score of 1 or 2 at one month based on 24 features of prehospital EMS activity. Using this model, we evaluated the prognostic impact of continuously and simultaneously varying the transport time and the defibrillation or drug-administration time in the test data based on

heatmaps. RESULTS: The average class sensitivity of the prognostic model was more than 0.86, with a full area under the receiver operating characteristics curve of 0.94 (95% confidence interval of 0.92-0.96). By adjusting the two time factors simultaneously, a nonlinear interaction was obtained between the two adjustments, instead of a linear prediction of the outcome. CONCLUSION: Modifications to the parameters using a machine-learning-based prognostic model indicated an interaction among the prognostic factors. These findings could be used to evaluate which factors should be prioritized to reduce time in the trained region of machine learning in order to improve EMS activities.

5. Australas Emerg Care. 2022 Sep 7:S2588-994X(22)00068-9. doi: 10.1016/j.auec.2022.08.007. Online ahead of print.

Paramedic interactions with significant others during and after resuscitation and death of a patient.

Risson H(1), Beovich B(2), Bowles KA(2).

ABSTRACT

BACKGROUND: Out-of-hospital cardiac arrest often occurs at home, requiring paramedics to interact with family members and bystanders during resuscitation and inform them should the patient die. This study explores how paramedics navigate interactions and the changing needs of the patient and the bereaved. METHODS: Phenomenological methodology inspired individual, semi-structured interviews. Data was then coded using reflexive thematic analysis. RESULTS: Ten individual interviews with working paramedics with an average of 7.2 years of experience were analysed and resulted in four overarching themes. These themes encompassed communication goals and factors affecting their implementation. Four themes emerged: maximising patient outcome, minimising psychological trauma for significant others, paramedic engagement and communicating across cultures. Communication goals shift from maximising patient outcome to minimising psychological trauma for significant others during the resuscitation. Implementation of those goals is affected by paramedic engagement and communicating across cultures. CONCLUSIONS: Paramedics used communication techniques based on personal and professional experiences, attempting to navigate limited resources, factors affecting paramedic engagement and a perceived lack of education and support in matters of grief and death.

6. Eur J Emerg Med. 2022 Oct 1;29(5):383-385. doi: 10.1097/MEJ.0000000000000950. Epub 2022 Jun 9.

Public interest in cardiac arrest and cardiopulmonary resuscitation: a Google Trends analysis of the global online search traffic.

Birkun A(1), Baldi E(2), Böttiger BW(3)(4).

NO ABSTRACT AVAILABLE

7. Resuscitation. 2022 Sep 7:S0300-9572(22)00656-6. doi: 10.1016/j.resuscitation.2022.08.021. Online ahead of print.

Family Presence During Adult Resuscitation From Cardiac Arrest: A Systematic Review.

Considine J(1), Eastwood K(2), Webster H(3), Smyth M(4), Nation K(5), Greif R(6), Dainty K(7), Finn J(8), Bray J(9).

ABSTRACT

AIM: ****** OBJECTIVE: To conduct a systematic review of the published evidence related to family presence during adult resuscitation from cardiac arrest. METHODS: This review, registered with PROSPERO (CRD42021242384) and reported according to PRISMA guidelines, included studies of adult cardiac arrest with family presence during resuscitation that reported one or more patient,

family or provider outcomes. Three databases (Medline, CINAHL and EMBASE) were searched from inception to 10/05/2022. Two investigators screened the studies, extracted data, and assessed risks of bias using the Mixed Method Appraisal Tool (MMAT). The synthesis approach was guided by Synthesis Without Meta-Analysis (SWiM) reporting guidelines and a narrative synthesis method. RESULTS: The search retrieved 9,459 citations of which 31 were included: 18 quantitative studies (including two RCTs), 12 qualitative studies, and one mixed methods study. The evidence was of very low or low certainty. There were four major findings. High-certainty evidence regarding the effect of family presence during resuscitation on patient outcomes is lacking. Family members had mixed outcomes in terms of depression, anxiety, post-traumatic stress disorder (PTSD) symptoms, and experience of witnessing resuscitation. Provider experience was variable and resuscitation setting, provider education, and provider experience were major influences on family presence during resuscitation. Finally, providers reported that a family support person and organisational guidelines were important for facilitating family presence during resuscitation. CONCLUSION: The effect of family presence during resuscitation varies between individuals. There was variability in the effect of family presence during resuscitation on patient outcomes, family and provider outcomes and perceptions.

8. Resusc Plus. 2022 Aug 31;11:100288. doi: 10.1016/j.resplu.2022.100288. eCollection 2022 Sep.
An international collaborative study to co-produce a patient-reported outcome measure of cardiac arrest survivorship and health-related quality of life (CASHQoL): A protocol for developing the long-form measure.
Haywood KL(1), Southern C(2), Tutton E(3), Swindell P(4), Ellard D(5)(6), Pearson NA(1), Parsons H(5), Couper K(5)(7), Daintyi KN(8)(9), Agarwal S(10), Perkins GD(5)(11); SURViVORS PROM Buddies Group.
ABSTRACT
BACKGROUND: Current measures of health-related quality of life are neither sufficiently sensitive or specific to capture the complex and heterogenous nature of the recovery and survivorship associated with cardiac arrest. To address this critical practice gap, we plan a mixed-methods study to co-produce and evaluate a new cardiac arrest-specific patient/survivor-reported outcome measure (PROM). METHODS: International guidelines have informed a two-stage, iterative, and interactive process.Stage one will establish what is important to measure following cardiac arrest. A meta-ethnography of published qualitative research and a qualitative exploration of the experiences of survivors and their key supporters will inform the development of a measurement framework. This will be supplemented by existing, extensive reviews describing concepts that have previously been measured in this population. Focus groups with survivors, key supporters, and healthcare professionals, followed by further interviews with survivors and key supporters, will inform the iterative refinement of the framework, candidate items, and PROM structure.Stage two will involve a psychometric evaluation following completion by a large cohort of survivors. Measurement theory will inform: the identification of items that best measure important outcomes; item reduction; and provide robust evidence of measurement and practical properties. DISCUSSION: An international, collaborative approach to PROM development will engage survivors, key supporters, researchers, and health professionals from study commencement. Successful co-production of the cardiac arrest survivorship and health-related quality of life (CASHQoL) measure will provide a robust, relevant, and internationally applicable measure, suitable for completion by adult survivors, and integration into research, registries, and routine care settings.

POST-CARDIAC ARREST TREATMENTS

1. Catheter Cardiovasc Interv. 2022 Sep;100(3):338-339. doi: 10.1002/ccd.30378.
When not to treat could be the best option.
Musumeci G(1), Civera S(1).
ABSTRACT
Treatment strategy of people who experienced an Out of Hospital Cardiac Arrest without a ST-segment elevation myocardial infarction is still a matter of debate. Recent randomized trials and a meta-analysis comparing early. Against delayed coronary angiography in these patients did not find any improvement in short-term survival with the immediate approach strategy. Further studies are ongoing, whose results will help clarify the correct management of these OHCA-non STEMI patients.

2. Catheter Cardiovasc Interv. 2022 Sep;100(3):317-318. doi: 10.1002/ccd.30371.
Variability in healthcare delivery: It is never a good thing.
Butman SM(1).
ABSTRACT
In medicine, wide variations in healthcare delivery or outcomes are a sign of missing information and beg for more information in a timely resolution. While differences in patient selection for intervention in out-of-hospital-cardiac-arrest in Wales and England might seem regional, there is little reason to assume this is not true across many other geographical areas.

3. J Clin Med. 2022 Aug 29;11(17):5071. doi: 10.3390/jcm11175071.
Complete Revascularization and One-Year Survival with Good Neurological Outcome in Patients Resuscitated from an Out-of-Hospital Cardiac Arrest.
Kajana V(1)(2), Baldi E(1), Gentile FR(1)(3), Compagnoni S(1)(3), Quilico F(1)(3), Vicini Scajola L(1)(3), Repetto A(1), Mandurino-Mirizzi A(1), Ferlini M(1), Marinoni B(1), Ferrario Ormezzano M(1), Primi R(1), Bendotti S(1), Currao A(1), Savastano S(1).
ABSTRACT
Background. The survival benefit of complete versus infarct-related artery (IRA)-only revascularization during the index hospitalization in patients resuscitated from an out-of-hospital cardiac arrest (OHCA) with multivessel disease is unknown. Methods. We considered all the OHCA patients prospectively enrolled in the Lombardia Cardiac Arrest Registry (Lombardia CARe) from 1 January 2015 to 1 May 2021 who underwent coronary angiography (CAG) at the Fondazione IRCCS Policlinico San Matteo (Pavia). Patients' prehospital, angiographical and survival data were reviewed. Results. Out of 239 patients, 119 had a multivessel coronary disease: 69% received IRA-only revascularization, and 31% received a complete revascularization: 8 during the first procedure and 29 in a staged-procedure after a median time of 5 days [IQR 2.5-10.3]. The complete revascularization group showed significantly higher one-year survival with good neurological outcome than the IRA-only group (83.3% vs. 30.4%, p < 0.001). After correcting for cardiac arrest duration, shockable presenting rhythm, peak of Troponin-I, creatinine on admission and the need for circulatory support, complete revascularization was independently associated with the probability of death and poor neurological outcome [HR 0.3 (95%CI 0.1-0.8), p = 0.02]. Conclusions. This observation study shows that complete myocardial revascularization during the index hospitalization improves one-year survival with good neurological outcome in patients resuscitated from an OHCA with multivessel coronary disease.

4. Front Sociol. 2022 Aug 19;7:804573. doi: 10.3389/fsoc.2022.804573. eCollection 2022.
A technical solution to a professional problem: The risk management functions of prognosticators in the context of prognostication post-cardiac arrest.
Field-Richards SE(1), Timmons S(2).
ABSTRACT

Cardiac arrest (CA) is a major cause of mortality and morbidity globally. Two-thirds of deaths among patients admitted to intensive care units following out-of-hospital CA are due to neurological injury, with most as a consequence of withdrawing life-sustaining treatment, following prognostication of unfavorable neurological outcome. Given the ramifications of prognosis for patient outcome, post-cardiac arrest (P-CA) guidelines stress the importance of minimizing the risk of falsely pessimistic predictions. Although prognosticator use is advocated to this end, 100% accurate prognosticators remain elusive, therefore prognostication P-CA remains pervaded by uncertainty and risk. Bioethical discourse notwithstanding, when located within a wider socio-cultural context, prognostication can be seen to present risk and uncertainty challenges of a professional nature. Such challenges do not, however, subvert the medical profession's moral and ethical prognostication obligation. We interpret prognosticator use as an attempt to manage professional risk presented by prognostication P-CA and demonstrate how through performing "risk work," prognosticators serve professional functions, mediating tension between the professional duty to prognosticate, and risk presented. We draw on sociological analyses of risk and uncertainty, and the professions to explicate these (hitherto less enunciated) professional risk management functions of prognosticators. Accordingly, the use of prognosticators is conceived of as a professional response - a technical/scientific solution to the problem of professional risk, inherent within the P-CA prognostication process.

5. J Am Heart Assoc. 2022 Sep 8:e025779. doi: 10.1161/JAHA.122.025779. Online ahead of print.
Sex-Based Differences in 30-Day Readmissions After Cardiac Arrest: Analysis of the Nationwide Readmissions Database.
Sobti NK(1)(2), Yeo I(1)(3), Cheung JW(1)(2), Feldman DN(1)(2), Amin NP(1)(2)(4), Paul TK(1)(4), Ascunce RR(1)(4), Mecklai A(1)(4), Marcus JL(1)(4), Subramanyam P(1), Wong SC(1)(2), Kim LK(1)(2).
ABSTRACT
Background There are limited data on the sex-based differences in the outcome of readmission after cardiac arrest. Methods and Results Using the Nationwide Readmissions Database, we analyzed patients hospitalized with cardiac arrest between 2010 and 2015. Based on International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes, we identified comorbidities, therapeutic interventions, and outcomes. Multivariable logistic regression was performed to assess the independent association between sex and outcomes. Of 835 894 patients, 44.4% (n=371 455) were women, of whom 80.7% presented with pulseless electrical activity (PEA)/asystole. Women primarily presented with PEA/asystole (80.7% versus 72.4%) and had a greater comorbidity burden than men, as assessed using the Elixhauser Comorbidity Score. Thirty-day readmission rates were higher in women than men in both PEA/asystole (20.8% versus 19.6%) and ventricular tachycardia/ventricular fibrillation arrests (19.4% versus 17.1%). Among ventricular tachycardia/ventricular fibrillation arrest survivors, women were more likely than men to be readmitted because of noncardiac causes, predominantly infectious, respiratory, and gastro-intestinal illnesses. Among PEA/asystole survivors, women were at higher risk for all-cause (adjusted odds ratio [aOR], 1.07; [95% CI, 1.03-1.11]), cardiac-cause (aOR, 1.15; [95% CI, 1.06-1.25]), and noncardiac-cause (aOR, 1.13; [95% CI, 1.04-1.22]) readmission. During the index hospitalization, women were less likely than men to receive therapeutic procedures, including coronary angiography and targeted therapeutic management. While the crude case fatality rate was higher in women, in both ventricular tachycardia/ventricular fibrillation (51.8% versus 47.4%) and PEA/asystole (69.3% versus 68.5%) arrests, sex was not independently associated with increased crude case fatality after adjusting for differences in baseline characteristics. Conclusions Women are at increased risk of readmission following cardiac arrest, independent of comorbidities and therapeutic interventions.

6. J Neurol. 2022 Sep 8. doi: 10.1007/s00415-022-11368-5. Online ahead of print.
Nonconvulsive status epilepticus following cardiac arrest: overlooked, untreated and misjudged.
De Stefano P(1)(2), Kaplan PW(3), Quintard H(4), Seeck M(5), Sutter R(6)(7)(8)(9).
ABSTRACT

AIMS: Seizures and status epilepticus (SE) are detected in almost a third of the comatose cardiac arrest survivors. As the literature is quite exhaustive regarding SE with motor symptoms in those patients, little is known about nonconvulsive SE (NCSE). Our aim was to compile the evidence from the literature of the frequency and outcome of NCSE in adult patients remaining in coma after resuscitation. METHODS: The medical search PubMed was screened for most relevant articles reporting the emergence and outcome of NCSE in comatose post-resuscitated adult patients. RESULTS: We identified 11 cohort studies (four prospective observational, seven retrospective) including 1092 patients with SE in 29-96% and NCSE reported in 1-20%. EEG evaluation started at a median of 9.5 h (range 7.5-14.8) after cardiac arrest, during sedation and targeted temperature management (TTM). Favorable outcome after NCSE occurred in 24.5%. We found no study reporting EEG to detect or exclude NCSE in patients remaining in coma prior to the initiation of TTM and without sedation withing the first hours after ROSC. DISCUSSION: Studies on NCSE after ROSC are scarce and unsystematic, reporting favorable outcome in every fourth patient experiencing NCSE after ROSC. This suggests that NCSE is often overlooked and outcome after NCSE is not always poor. The low data quality does not allow firm conclusions regarding the effects of NCSE on outcome calling for further investigation. In the meantime, clinicians should avoid equating NCSE after ROSC with poor prognosis.

TARGETED TEMPERATURE MANAGEMENT

1. Emerg Med Int. 2022 Aug 27;2022:2662956. doi: 10.1155/2022/2662956. eCollection 2022.
Influence of the Level of Emergency Medical Facility on the Short-Term Treatment Results of Cardiac Arrest: Out-of-Hospital Cardiac Arrest and Interhospital Transfer.
Chung JY(1), Choi Y(1)(2), Jeong J(1)(2), Lee SW(3), Han KS(3), Kim SJ(3), Kim WY(4), Kang H(5), Hong ES(6).

ABSTRACT

OBJECTIVE: This study aimed to elucidate whether direct transport of out-of-hospital cardiac arrest (OHCA) patients to higher-level emergency medical centres (EMCs) would result in better survival compared to resuscitation in smaller local emergency departments (EDs) and subsequent transfer. METHODS: This study was a retrospective population-based analysis of cases registered in the national database of 2019. This study investigated the immediate results of cardiopulmonary resuscitation for OHCA compared between EMCs and EDs and the results of therapeutic temperature management (TTM) compared between the patients directly transported from the field and those transferred from other hospitals. In-hospital mortality was compared using multivariate logistic regression. RESULTS: From the population dataset, 11,493 OHCA patients were extracted. (8,912 in the EMC group vs. 2,581 in the ED group). Multivariate logistic regression revealed that the odds for ED mortality were lower with treatment in EDs than with treatment in EMCs. (odds ratio 0.712 (95% confidence interval (CI): 0.638-0.796)). From the study dataset, 1,798 patients who received TTM were extracted. (1,164 in the direct visit group vs. 634 in the transferred group). Multivariate regression analysis showed that the odds ratio for overall mortality was 1.411 (95% CI: 0.809-2.446) in the transferred group. (p = 0.220). CONCLUSION: The immediate outcome of OHCA patients who were transported to EDs was not inferior to that of EMCs. Therefore, it would be acceptable to transport OHCA patients to the nearest emergency facilities rather than to the specialized centres in distant areas.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

1. J Am Heart Assoc. 2022 Sep 6;11(17):e025897. doi: 10.1161/JAHA.121.025897. Epub 2022 Aug 29.

ECG T-Wave Morphologic Variations Predict Ventricular Arrhythmic Risk in Low- and Moderate-Risk Populations.

Ramírez J(1)(2)(3), Kiviniemi A(4), van Duijvenboden S(1)(5), Tinker A(1)(6), Lambiase PD(5)(7), Junttila J(4), Perkiömäki JS(4), Huikuri HV(4), Orini M(5)(7), Munroe PB(1)(6).

ABSTRACT

Background Early identification of individuals at risk of sudden cardiac death (SCD) remains a major challenge. The ECG is a simple, common test, with potential for large-scale application. We developed and tested the predictive value of a novel index quantifying T-wave morphologic variations with respect to a normal reference (TMV), which only requires one beat and a single-lead ECG. Methods and Results We obtained reference T-wave morphologies from 23 962 participants in the UK Biobank study. With Cox models, we determined the association between TMV and life-threatening ventricular arrhythmia in an independent data set from UK Biobank study without a history of cardiovascular events (N=51 794; median follow-up of 122 months) and SCD in patients with coronary artery disease from ARTEMIS (N=1872; median follow-up of 60 months). In UK Biobank study, 220 (0.4%) individuals developed life-threatening ventricular arrhythmias. TMV was significantly associated with life-threatening ventricular arrhythmias (hazard ratio [HR] of 1.13 per SD increase [95% CI, 1.03-1.24]; P=0.009). In ARTEMIS, 34 (1.8%) individuals reached the primary end point. Patients with TMV ≥5 had an HR for SCD of 2.86 (95% CI, 1.40-5.84; P=0.004) with respect to those with TMV <5, independently from QRS duration, corrected QT interval, and left ventricular ejection fraction. TMV was not significantly associated with death from a cause other than SCD. Conclusions TMV identifies individuals at life-threatening ventricular arrhythmia and SCD risk using a single-beat single-lead ECG, enabling inexpensive, quick, and safe risk assessment in large populations.

PEDIATRICS AND CHILDREN

1. Medicine (Baltimore). 2022 Sep 9;101(36):e30445. doi: 10.1097/MD.0000000000030445.

Epidemiologic study of in-hospital cardiopulmonary resuscitation among pediatric patients: A retrospective, population-based cohort study in South Korea.

Oh TK(1)(2), Choi CW(3)(4), Song IA(1).

ABSTRACT

We aimed to examine the clinical trends of in-hospital cardiopulmonary resuscitation (ICPR) and factors associated with live discharge following ICPR. As a national population-based cohort study, data were extracted from the South Korean National Inpatient Database. This study included 8992 pediatric patients under 18 years of age who underwent ICPR due to in-hospital cardiac arrest during hospitalization in South Korea between 2010 and 2019 (10 years). The annual prevalence, survival, duration of hospitalization, and total cost of hospitalization at ICPR were examined as clinical trends. In 2010, 7.94 per 100,000 pediatric patients received ICPR; the prevalence increased to 11.51 per 100,000 pediatric patients in 2019. The 10-year survival rates were similar, and the in-hospital, 6-month, and 1-year survival rates over 10 years were 44.0%, 34.0%, and 32.4%, respectively. The mean length of hospital stay at ICPR in 2010 was 20.7 (95% confidence interval [CI]: 19.3-22.2) days; this decreased to 16.6 (95% CI: 15.2-18.0) days in 2019. The mean total cost at ICPR was 11,081.1 (95% CI: 10,216.2-11,946.1) United States Dollars (USD) in 2010; this increased to 22,629.4 (95% CI: 20,588.3-24,670.5) USD in 2019. The prevalence of ICPR increased among pediatric patients in South Korea between 2010 and 2019; however, the survival rates were similar for the 10 years. The length of hospital stay at ICPR gradually decreased from 2010 through 2019, while the total cost of hospitalization at ICPR has gradually increased between 2010 and 2019.

2. J Clin Med. 2022 Aug 26;11(17):5003. doi: 10.3390/jcm11175003.

Long-Term Outcomes after Non-Traumatic Out-of-Hospital Cardiac Arrest in Pediatric Patients: A Systematic Review.

Ng ZHC(1), Ho SJ(1), Caleb T(1), Yaow CYL(1), Teoh SE(1), Tham LP(2), Ong MEH(3)(4), Chong SL(2)(5), Ho AFW(3)(4).

ABSTRACT

Long-term outcomes after non-traumatic pediatric out-of-hospital cardiac arrest (OHCA) are not well understood. This systematic review aimed to summarize long-term outcomes (1 year and beyond), including overall survival, survival with favorable neurological outcomes, and health-related quality of life (HRQoL) outcomes) amongst pediatric OHCA patients who survived to discharge. Embase, Medline, and The Cochrane Library were searched from inception to October 6, 2021. Studies were included if they reported outcomes at 1 year or beyond after pediatric OHCA. Data abstraction and quality assessment was conducted by three authors independently. Qualitative outcomes were reported systematically. Seven studies were included, and amongst patients that survived to hospital discharge or to 30 days, longer-term survival was at least 95% at 24 months of follow up. A highly variable proportion (range 10-71%) of patients had favorable neurological outcomes at 24 months of follow up. With regard to health-related quality of life outcomes, at a time point distal to 1 year, at least 60% of pediatric non-traumatic OHCA patients were reported to have good outcomes. Our study found that at least 95% of pediatric OHCA patients, who survived to discharge, survived to a time point distal to 1 year. There is a general paucity of data surrounding the pediatric OHCA population.

3. JAMA Netw Open. 2022 Sep 1;5(9):e2230518. doi: 10.1001/jamanetworkopen.2022.30518.

Association of Blood-Based Brain Injury Biomarker Concentrations With Outcomes After Pediatric Cardiac Arrest.

Fink EL(1)(2)(3), Kochanek PM(1)(2)(3), Panigrahy A(4), Beers SR(5), Berger RP(2)(3), Bayir H(1)(2)(3)(6), Pineda J(7), Newth C(7), Topjian AA(8), Press CA(9), Maddux AB(10), Willyerd F(11), Hunt EA(12)(13), Siems A(12)(13), Chung MG(14), Smith L(15), Wenger J(16), Doughty L(16), Diddle JW(17), Patregnani J(18), Piantino J(19), Walson KH(20), Balakrishnan B(21), Meyer MT(21), Friess S(22), Maloney D(1), Rubin P(1), Haller TL(23), Treble-Barna A(24), Wang C(23), Clark RRSB(1)(2)(3), Fabio A(23); Personalizing Outcomes After Child Cardiac Arrest (POCCA) Investigators.

ABSTRACT

IMPORTANCE: Families and clinicians have limited validated tools available to assist in estimating long-term outcomes early after pediatric cardiac arrest. Blood-based brain-specific biomarkers may be helpful tools to aid in outcome assessment. OBJECTIVE: To analyze the association of blood-based brain injury biomarker concentrations with outcomes 1 year after pediatric cardiac arrest. DESIGN, SETTING, AND PARTICIPANTS: The Personalizing Outcomes After Child Cardiac Arrest multicenter prospective cohort study was conducted in pediatric intensive care units at 14 academic referral centers in the US between May 16, 2017, and August 19, 2020, with the primary investigators blinded to 1-year outcomes. The study included 120 children aged 48 hours to 17 years who were resuscitated after cardiac arrest, had pre-cardiac arrest Pediatric Cerebral Performance Category scores of 1 to 3 points, and were admitted to an intensive care unit after cardiac arrest. EXPOSURE: Cardiac arrest. MAIN OUTCOMES AND MEASURES: The primary outcome was an unfavorable outcome (death or survival with a Vineland Adaptive Behavior Scales, third edition, score of <70 points) at 1 year after cardiac arrest. Glial fibrillary acidic protein (GFAP), ubiquitin carboxyl-terminal esterase L1 (UCH-L1), neurofilament light (NfL), and tau concentrations were measured in blood samples from days 1 to 3 after cardiac arrest. Multivariate logistic regression and area under the

receiver operating characteristic curve (AUROC) analyses were performed to examine the association of each biomarker with outcomes on days 1 to 3. RESULTS: Among 120 children with primary outcome data available, the median (IQR) age was 1.0 (0-8.5) year; 71 children (59.2%) were male. A total of 5 children (4.2%) were Asian, 19 (15.8%) were Black, 81 (67.5%) were White, and 15 (12.5%) were of unknown race; among 110 children with data on ethnicity, 11 (10.0%) were Hispanic, and 99 (90.0%) were non-Hispanic. Overall, 70 children (58.3%) had a favorable outcome, and 50 children (41.7%) had an unfavorable outcome, including 43 deaths. On days 1 to 3 after cardiac arrest, concentrations of all 4 measured biomarkers were higher in children with an unfavorable vs a favorable outcome at 1 year. After covariate adjustment, NfL concentrations on day 1 (adjusted odds ratio [aOR], 5.91; 95% CI, 1.82-19.19), day 2 (aOR, 11.88; 95% CI, 3.82-36.92), and day 3 (aOR, 10.22; 95% CI, 3.14-33.33); UCH-L1 concentrations on day 2 (aOR, 11.27; 95% CI, 3.00-42.36) and day 3 (aOR, 7.56; 95% CI, 2.11-27.09); GFAP concentrations on day 2 (aOR, 2.31; 95% CI, 1.19-4.48) and day 3 (aOR, 2.19; 95% CI, 1.19-4.03); and tau concentrations on day 1 (aOR, 2.44; 95% CI, 1.14-5.25), day 2 (aOR, 2.28; 95% CI, 1.31-3.97), and day 3 (aOR, 2.04; 95% CI, 1.16-3.57) were associated with an unfavorable outcome. The AUROC models were significantly higher with vs without the addition of NfL on day 2 (AUROC, 0.932 [95% CI, 0.877-0.987] vs 0.871 [95% CI, 0.793-0.949]; P = .02) and day 3 (AUROC, 0.921 [95% CI, 0.857-0.986] vs 0.870 [95% CI, 0.786-0.953]; P = .03). CONCLUSIONS AND RELEVANCE: In this cohort study, blood-based brain injury biomarkers, especially NfL, were associated with an unfavorable outcome at 1 year after pediatric cardiac arrest. Additional evaluation of the accuracy of the association between biomarkers and neurodevelop-mental outcomes beyond 1 year is needed.

EXTRACORPOREAL LIFE SUPPORT

1. Curr Probl Cardiol. 2022 Sep 4:101387. doi: 10.1016/j.cpcardiol.2022.101387. Online ahead of print.

Cost-Effectiveness Analysis of Out-Of-Hospital versus In-Hospital Extracorporeal Cardiopulmonary Resuscitation for Out-Hospital Refractory Cardiac Arrest.

Al-Badriyeh D(1), Hssain AA(2), Abushanab D(3).

ABSTRACT

It has been speculated that out-of-hospital cardiac arrest (OHCA) patients' survival might be improved by implementing extracorporeal cardiopulmonary resuscitation (ECPR) before arrival to hospital. Therefore, we sought to assess the cost-effectiveness of OH-ECPR versus in-hospital (IH)-ECPR in OHCA patients in Qatar. From the hospital perspective, a conventional decision-analytic model was constructed to follow up the clinical and economic consequences of OH-ECPR versus IH-ECPR in a simulated OHCA population over one year. The primary outcome was the survival at discharge after arrest as well as the overall direct healthcare costs of managing OHCA patients. The robustness of this model was evaluated via sensitivity analyses. The OH-ECPR yielded 16% survival at discharge after arrest compared to 7% with IH-ECPR, [risk ratio (RR)=0.91; 95%CI 0.79 to 1.06; P=0.26]. Incorporating the uncertainty associated with this survival rate, and based on the estimated willingness to pay threshold in Qatar, the OH-ECPR was cost-effective with an incremental cost-effectiveness ratio of QAR 464,589 (USD 127,634). Sensitivity and uncertainty analyses confirmed the robustness of the study outcome. This is the first cost-effectiveness evaluation of OH-ECPR versus IH-ECPR in OHCA patients. OH-ECPR is potentially an economically acceptable resuscitative strategy in Qatar.

2. Int J Cardiol. 2022 Sep 7:S0167-5273(22)01311-0. doi: 10.1016/j.ijcard.2022.09.004. Online ahead of print.

Mechanical circulatory device utilization in cardiac arrest: Racial and gender disparities and impact on mortality.

Gilani A(1), Maknojia A(2), Mufty M(2), Patel S(2), Grines CL(3), Ghatak A(4).

ABSTRACT

The objectives of this retrospective study include identifying the utilization trend of mechanical circulatory devices (MCD) such as Intra-Aortic Balloon Pump (IABP), Impella and Extracorporeal Membrane Oxygenation (ECMO) in admissions with cardiac arrest, determining whether racial or gender disparities exist in their usage, and discerning if their use is associated with a reduction in mortality. By leveraging the National Inpatient Sample, we identified 229,180 weighted adult cardiac arrest admissions between October 1, 2015 and December 31, 2018. MCD were used in 6005 admissions (2.6%). IABP had the highest utilization, representing 77.8% of all MCDs, followed by Impella at 24.8%. The utilization of IABP decreased from 90.6% to 71.6%, while the use of Impella increased from 13.5% to 29.8% in this study period; both trends were statistically significant. MCD use was found to be lower in women compared to men (1.4% vs 3.6, P < 0.001) and in the Black population compared to White (1.5% vs 2.8%, P < 0.001). There was no difference in MCD utilization between Hispanic and the White cohorts. In-hospital mortality was lower in admissions associated with MCD (31.4% vs 45.9%, P < 0.001). ECMO was associated with the lowest mortality rate at 14.3%, followed by IABP at 28.1%. The use of Impella and combination therapy were not associated with a significant decrease in mortality. In conclusion, MCD use may decrease mortality in cardiac arrest, however their utilization appears to be lower in African Americans and in women.

EXPERIMENTAL RESEARCH

1. Resusc Plus. 2022 Aug 26;11:100292. doi: 10.1016/j.resplu.2022.100292. eCollection 2022 Sep.

A randomised preclinical trial of adrenaline use during cardiac arrest in mice.

Donner DG(1)(2)(3), Bloom JE(1)(4), Shihata WA(1), Brown AA(1), Cook R(1), Yee Tai T(1), Lambert GW(5), Chu PY(1), Chan W(1)(4), Stub D(4)(6), Wang BH(1)(3), Kaye DM(1)(4)(3).

ABSTRACT

BACKGROUND: Adrenaline is routinely administered during cardiac arrest resuscitation. Using a novel murine model of cardiac arrest, this study evaluates the effects of adrenaline use on survival and end-organ injury. METHODS: A total of 58 mice, including cardiac arrest (CA) and sham (SHAM) groups received intravenous potassium chloride either as a bolus (CA) or slow infusion (SHAM), inducing ECG-confirmed asystole (in CA only) for 4-minutes prior to intravenous adrenaline (+ADR;250 ul,32 ug/ml) or saline (-ADR;250 ul) and manual chest compressions (300 BPM) for 4-minutes. Mice with return of spontaneous circulation (ROSC) were assessed at 24- or 72-h timepoints. RESULTS: Among animals that underwent CA, rates of ROSC (n = 21 (95 %) vs n = 14 (82 %), P = 0.18) and survival to the planned endpoint (n = 11 (50 %) vs n = 12 (71 %), P = 0.19) were similar when comparing those treated with (CA+ADR) and without (CA-ADR) adrenaline. However, in CA animals that initially achieved ROSC, subsequent mortality was approximately 3-fold greater with adrenaline treatment (48 % vs 14 %, P = 0.042). Among SHAM animals, adrenaline use had no impact on survival rates or other endpoints. Greater myocardial injury occurred in CA+ADR vs CA-ADR, with increased Hs-Troponin levels measured at 24- (26.0 ± 0.9 vs 9.4 ± 5.3 ng/mL, P = 0.015) and 72-h (20.9 ± 8.3 vs 5.0 ± 2.4 ng/mL, P = 0.012), associated with increased expression of pro-inflammatory and fibrotic genes within cardiac and renal tissue. CONCLUSION: Adrenaline did not improve ROSC or overall survival but following successful ROSC, its use resulted in 3-fold greater mortality rates. Adrenaline was also associated with increased myocardial injury, end-organ inflammation, and fibrosis. These findings underscore the need for further preclinical evaluation of alternate

pharmacologic adjuncts for cardiopulmonary resuscitation that improve survival and limit end-organ injury.

2. Exp Neurol. 2022 Nov;357:114197. doi: 10.1016/j.expneurol.2022.114197. Epub 2022 Aug 4.
Chrysophanol postconditioning attenuated cerebral ischemia-reperfusion injury induced NLRP3-related pyroptosis in a TRAF6-dependent manner.
Xia P(1), Marjan M(2), Liu Z(1), Zhou W(3), Zhang Q(3), Cheng C(3), Zhao M(3), Tao Y(3), Wang Z(4), Ye Z(5).

ABSTRACT
Individuals who suffer from post-CA (cardiac arrest) brain injury experience higher mortality and more severe functional disability. Neuroinflammation has been identified as a vital factor in cerebral ischemia-reperfusion injury (CIRI) following CA. Pyroptosis induces neuronal death by triggering an excessive inflammatory injury. Chrysophanol possesses robust anti-inflammatory features, and it is protective against CIRI. The purpose of this research was to assess the effect of Chrysophanol postconditioning on CIRI-induced pyroptotic cell death, and to explore its underlying mechanisms. CIRI was induced in rats by CA and subsequent cardiopulmonary resuscitation, and PC12 cells were exposed to oxygen-glucose deprivation/reoxygenation (OGD/R) to imitate CIRI in vitro. It was found that post-CA brain injury led to a notable cerebral damage revealed by histopathological changes and neurological outcomes. The existence of pyroptosis was also confirmed in in vivo and in vitro CIRI models. Moreover, we further confirmed that Chrysophanol, the main bioactive ingredient of Rhubarb, significantly suppressed expressions of pyroptosis-associated proteins, e.g., NLRP3, ASC, cleaved-caspase-1 and N-terminal GSDMD, and inhibited the expression of tumor necrosis factor receptor-associated factor 6 (TRAF6). Furthermore, NLRP3 overexpression neutralized the neuroprotection of Chrysophanol postconditioning, suggesting that pyroptosis was the major neuronal death pathway modulated by Chrysophanol postconditioning in OGD/R. Additionally, the neuroprotection of Chrysophanol postconditioning was also abolished by gain-of-function analyses of TRAF6. Finally, the results demonstrated that Chrysophanol postconditioning suppressed the interaction between TRAF6 and NLRP3. Taken together, our findings revealed that Chrysophanol postconditioning was protective against CIRI by inhibiting NLRP3-related pyroptosis in a TRAF6-dependent manner.

CASE REPORTS

No articles identified.