

This week's PubMed 19th – 25th September 2021: articles of interest n = 23

CPR AND COVID-19

1. Am J Emerg Med. 2021 Sep 6;50:575-581. doi: 10.1016/j.ajem.2021.09.007. Online ahead of print.
Leg-heel chest compression as an alternative for medical professionals in times of COVID-19.
Ott M(1), Krohn A(2), Bilfield LH(3), Dengler F(2), Jaki C(4), Echterdiek F(5), Schilling T(2), Heymer J(2).

ABSTRACT

OBJECTIVE: To evaluate leg-heel chest compression without previous training as an alternative for medical professionals and its effects on distance to potential aerosol spread during chest compression. METHODS: 20 medical professionals performed standard manual chest compression followed by leg-heel chest compression after a brief instruction on a manikin. We compared percentage of correct chest compression position, percentage of full chest recoil, percentage of correct compression depth, average compression depth, percentage of correct compression rate and average compression rate between both methods. In a second approach, potential aerosol spread during chest compression was visualized. RESULTS: Our data indicate no credible difference between manual and leg-heel compression. The distance to potential aerosol spread could have been increased by leg-heel method. CONCLUSION: Under special circumstances like COVID-19-pandemic, leg-heel chest compression may be an effective alternative without previous training compared to manual chest compression while markedly increasing the distance to the patient.

2. Rev Esp Anesthesiol Reanim (Engl Ed). 2021 Sep 15;68(8):437-42. doi: 10.1016/j.redare.2021.09.001. Online ahead of print.

Cardiopulmonary resuscitation during the COVID-19 pandemic in Spain.

Aliaño Piña M(1), Ruiz Villén C(2), Galán Serrano J(2), Monedero Rodríguez P(2).

ABSTRACT

OBJECTIVES: The disease COVID-19 produces serious complications that can lead to cardio-respiratory arrest. Quality cardiopulmonary resuscitation (CPR) can improve patient prognosis. The objective of this study is to evaluate the performance of the specialty of Anesthesiology in the management of CPR during the pandemic. METHODS: A survey was carried out with Google Forms consisting of 19 questions. The access link to the questionnaire was sent by email by the Spanish Society of Anesthesia (SEDAR) to all its members. RESULTS: 225 responses were obtained. The regions with the highest participation were: Madrid, Catalonia, Valencia and Andalusia. 68.6% of the participants work in public hospitals. 32% of the participants habitually work in intensive care units (ICU), however, 62.1% have attended critical COVID-19 in the ICU and 72.6% have anesthetized them in the operating room. 26,3% have attended some cardiac arrest, 16,8% of the participants admitted to lead the manoeuvres, 16,8% detailed that it had been another department, and 66,2% was part of the team, but did not lead the assistance. Most of the CPR was performed in supine, only 5% was done in prone position. 54.6% of participants had not taken any course of Advance Life Support (ALS) in the last 2 years. 97.7% of respondents think that Anesthesia should lead the in-hospital CPR. CONCLUSION: The specialty of Anesthesiology has actively participated in the care of the critically ill patient and in the management of CPR during the COVID-19 pandemic. However, training and/or updating in ALS is required.

CPR/MECHANICAL CHEST COMPRESSION

No articles identified.

REGISTRIES, REVIEWS AND EDITORIALS

1. Curr Opin Crit Care. 2021 Sep 20. doi: 10.1097/MCC.0000000000000876. Online ahead of print.

Cardiac arrest in special circumstances.

Lott C(1), Truhlár A.

ABSTRACT

PURPOSE OF REVIEW: European Resuscitation Council Guidelines for Cardiopulmonary Resuscitation prioritize treatments like chest compression and defibrillation, known to be highly effective for cardiac arrest from cardiac origin. This review highlights the need to modify this approach in special circumstances. **RECENT FINDINGS:** Potentially reversible causes of cardiac arrest are clustered into four Hs and four Ts (Hypoxia, Hypovolaemia, Hyperkalaemia/other electrolyte disorders, Hypothermia, Thrombosis, Tamponade, Tension pneumothorax, Toxic agents). Point-of-care ultrasound has its role in identification of the cause and targeting treatment. Time-critical interventions may even prevent cardiac arrest if applied early. The extracorporeal CPR (eCPR) or mechanical CPR should be considered for bridging the period needed to reverse the precipitating cause(s). There is low quality of evidence available to guide the treatment in the majority of situations. Some topics (pulmonary embolism, eCPR, drowning, pregnancy and opioid toxicity) were included in recent ILCOR reviews and evidence updates but majority of recommendations is based on individual systematic reviews, scoping reviews, evidence updates and expert consensus. **SUMMARY:** Cardiac arrests from reversible causes happen with lower incidence. Return of spontaneous circulation and neurologically intact survival can hardly be achieved without a modified approach focusing on immediate treatment of the underlying cause(s) of cardiac arrest.

IN-HOSPITAL CARDIAC ARREST

No articles identified.

INJURIES AND CPR

No articles identified.

CAUSE OF THE ARREST

No articles identified.

END-TIDAL CO₂

No articles identified.

ORGAN DONATION

No articles identified.

FEEDBACK

No articles identified.

DRUGS

1. Resuscitation. 2021 Sep 21:S0300-9572(21)00366-X. doi: 10.1016/j.resuscitation.2021.09.012.

Online ahead of print.

Adrenaline effects on cerebral physiology during cardiac arrest: more to this story.

Slovic JC(1), Morgan RW(1), Kilbaugh TJ(1), Ber RA(1).

NO ABSTRACTAVAILABLE

TRAUMA

1. Resuscitation. 2021 Sep 20:S0300-9572(21)00365-8. doi: 10.1016/j.resuscitation.2021.09.011.

Online ahead of print.

Survival outcomes in emergency medical services witnessed traumatic out-of-hospital cardiac arrest after the introduction of a trauma-based resuscitation protocol.

Alqudah Z(1), Nehme Z(2), Williams B(3), Oteir A(4), Smith K(2).

ABSTRACT

AIM: In this study, we examine the impact of a trauma-based resuscitation protocol on survival outcomes following emergency medical services (EMS) witnessed traumatic out-of-hospital cardiac arrest (OHCA). METHODS: We included EMS-witnessed OHCA's arising from trauma and occurring between 2008 and 2019. In December 2016, a new resuscitation protocol for traumatic OHCA was introduced prioritising the treatment of potentially reversible causes before conventional cardiopulmonary resuscitation. The effect of the new protocol on survival outcomes was assessed using adjusted multivariable logistic regression models. RESULTS: Paramedics attempted resuscitation on 490 patients, with 341 (69.6%) and 149 (30.4%) occurring during the control and intervention periods, respectively. A reduction in the proportion of cases receiving cardiopulmonary resuscitation and epinephrine administration were found in the intervention period compared to the control period, whereas trauma-based interventions increased significantly, including blood administration (pre-arrest: 17.9% vs 3.7%; intra-arrest: 24.1% vs 2.7%), splinting (pre-arrest: 38.6% vs 17.1%; intra-arrest: 20.7% vs 5.2%), and finger thoracostomy (pre-arrest: 13.1% vs 0.6%; intra-arrest: 22.8% vs 0.9%), respectively, with p-values <0.001 for all comparisons. After adjustment, the trauma-based resuscitation protocol was not associated with an improvement in survival to hospital discharge (AOR 1.29, 95% CI: 0.51-3.23), event survival (AOR 0.72, 95% CI: 0.41-1.28) or prehospital return of spontaneous circulation (AOR 0.63, 95% CI: 0.39-1.03). CONCLUSION: In our region, the introduction of a trauma-based resuscitation protocol led to an increase in the delivery of almost all trauma interventions; however, this did not translate into better survival outcomes following EMS-witnessed traumatic OHCA.

VENTILATION

1. Ann Emerg Med. 2021 Sep 15:S0196-0644(21)00695-8. doi: 10.1016/j.annemergmed.2021.07.114. Online ahead of print.

Association of Advanced Airway Insertion Timing and Outcomes After Out-of-Hospital Cardiac Arrest.

Okubo M(1), Komukai S(2), Izawa J(3), Aufderheide TP(4), Benoit JL(5), Carlson JN(6), Daya MR(7), Hansen M(7), Idris AH(8), Le N(7), Lupton JR(7), Nichol G(9), Wang HE(10), Callaway CW(11).

ABSTRACT

STUDY OBJECTIVE: While often prioritized in the resuscitation of patients with out-of-hospital cardiac arrest, the optimal timing of advanced airway insertion is unknown. We evaluated the association between the timing of advanced airway (laryngeal tube and endotracheal intubation) insertion attempt and survival to hospital discharge in adult out-of-hospital cardiac arrest.

METHODS: We performed a secondary analysis of the Pragmatic Airway Resuscitation Trial (PART), a clinical trial comparing the effects of laryngeal tube and endotracheal intubation on outcomes after adult out-of-hospital cardiac arrest. We stratified the cohort by randomized airway strategy (laryngeal tube or endotracheal intubation). Within each subset, we defined a time-dependent propensity score using patients, arrest, and emergency medical services systems characteristics.

Using the propensity score, we matched each patient receiving an initial attempt of laryngeal tube or endotracheal intubation with a patient at risk of receiving laryngeal tube or endotracheal intubation attempt within the same minute. **RESULTS:** Of 2,146 eligible patients, 1,091 (50.8%) and 1,055 (49.2%) were assigned to initial laryngeal tube and endotracheal intubation strategies, respectively. In the propensity score-matched cohort, timing of laryngeal tube insertion attempt was not associated with survival to hospital discharge: 0 to lesser than 5 minutes (risk ratio [RR]=1.35, 95% confidence interval [CI] 0.53 to 3.44); 5 to lesser than 10 minutes (RR=1.07, 95% CI 0.66 to 1.73); 10 to lesser than 15 minutes (RR=1.17, 95% CI 0.60 to 2.31); or 15 to lesser than 20 minutes (RR=2.09, 95% CI 0.35 to 12.47) after advanced life support arrival. Timing of endotracheal intubation attempt was also not associated with survival: 0 to lesser than 5 minutes (RR=0.50, 95% CI 0.05 to 4.87); 5 to lesser than 10 minutes (RR=1.20, 95% CI 0.51 to 2.81); 10 to lesser than 15 minutes (RR=1.03, 95% CI 0.49 to 2.14); 15 to lesser than 20 minutes (RR=0.85, 95% CI 0.30 to 2.42); or more than/equal to 20 minutes (RR=0.71, 95% CI 0.07 to 7.14). **CONCLUSION:** In the PART, timing of advanced airway insertion attempt was not associated with survival to hospital discharge.

CEREBRAL MONITORING

No articles identified.

ULTRASOUND AND CPR

No articles identified.

ORGANISATION AND TRAINING

1. Prehosp Emerg Care. 2021 Sep 22:1-10. doi: 10.1080/10903127.2021.1983094. Online ahead of print.

Association of GPS-based Logging and Manual Confirmation of the First Responders' Arrival Time in a Smartphone Alerting System: An Observational Study.

Ganter J(1), Pooth JS(1), Damjanovic D(1), Trummer G(1)(2), Busch HJ(3)(2), Baldas K(4), Schmitz D(4), Müller MP(4)(2).

ABSTRACT

The latest guidelines for cardiopulmonary resuscitation recommend that in case of suspected cardiac arrest first responders, who are close to the emergency location, should be notified by a smartphone app or text message. Smartphone Alerting Systems (SAS) aim to reduce the resuscitation-free interval. Thus, there is a need for uniform reporting of process times. Objective: To compare the response times in a SAS either by using global positioning system (GPS) data or by manual confirmation of first responders arriving at the scene. Methods: In the region of Freiburg (Southern Germany, 1,531 km², 493,000 inhabitants), a SAS is activated when the emergency dispatch centre receives a call regarding suspected cardiac arrest. First responders who accept a mission are tracked using GPS. GPS-based times are logged for each responder when their position is within a radius of 100, 50, or 10 metres around the geographical position of the reported emergency. When arriving at the patient location, the first responders manually confirm "arrived" via their app. GPS-based and manually confirmed response arrival times were compared for all cases between 1 October and 31 March. Results: 192 missions with correct manual logging of the arrival time were included. GPS-based times were available in 175 (91%), 100 (52%), and 30 (16%) cases within radii of 100, 50, and 10 metres, respectively. GPS arrival times were approximately 1.5 minutes shorter when using a 100-metre radius and significantly longer when using a 10-metre radius. No difference was found for a 50-metre radius, but this would result in a lack of data in nearly half of the cases. Conclusion: GPS-based logging of arrival times leads to missing data. A 100-metre circle is associated with a low number of missing values, but 1.5 minutes must be added for the last 100 metres the first responder has to move. A wide range of the difference in response times (GPS vs. manual confirmation) must be regarded as a disadvantage. Manual confirmation reveals precise response times, but first responders may forget to confirm when they arrive. Trial registration: DRKS00016625 (14-April-2019).

2. Scand J Trauma Resusc Emerg Med. 2021 Sep 16;29(1):138. doi: 10.1186/s13049-021-00946-7.

How senior paramedics decide to cease resuscitation in pulseless electrical activity out of hospital cardiac arrest: a mixed methods study.

Coppola A(1), Black S(2), Endacott R(3)(4).

ABSTRACT

BACKGROUND: Evidenced-based guidelines on when to cease resuscitation for pulseless electrical activity are limited and support for paramedics typically defaults to the senior clinician. Senior clinicians include paramedics employed to work beyond the scope of clinical guidelines as there may be a point at which it is reasonable to cease resuscitation. To support these decisions, one ambulance service has applied a locally derived cessation of resuscitation checklist. This study aimed to describe the patient, clinical and system factors and examine senior clinician experiences when ceasing resuscitation for pulseless electrical activity. **DESIGN AND METHODS:** An explanatory sequential mixed method study was conducted in one ambulance service in the South West of England. A consecutive sample of checklist data for adult pulseless electrical activity were retrieved from 1st December 2015 to 31st December 2018. Unexpected results which required exploration were identified and developed into semi-structured interview questions. A purposive sample of senior clinicians who ceased resuscitation and applied the checklist were interviewed. Content framework analysis was applied to the qualitative findings. **RESULTS:** Senior clinicians ceased resuscitation for 50 patients in the presence of factors known to optimise survival: Witnessed cardiac arrest (n = 37, 74%), bystander resuscitation (n = 30, 60%), defibrillation (n = 22, 44%), return of spontaneous circulation (n = 8, 16%). Significant association was found between witnessed cardiac arrest and bystander resuscitation (p = .00). Six senior clinicians were interviewed, and analysis resulted in four themes: defining resuscitation futility, the impact of ceasing resuscitation, conflicting

views and clinical decision tools. In the local context, senior clinicians applied their clinical judgement to balance survivability. Multiple factors were considered as the decision to cease resuscitation was not always clear. Senior clinicians deviated from the checklist when the patient was perceived as non-survivable. **CONCLUSION:** Senior clinicians applied clinical judgement to assess patients as non-survivable or when continued resuscitation was considered harmful with no patient benefit. Senior clinicians perceived pre-existing factors with duration of resuscitation and clinical factors known to optimise patient survival. Future practice could look beyond a set criteria in which to cease resuscitation, however, it would be helpful to investigate the value or threshold of factors associated with patient outcome.

3. *Cardiol Young*. 2021 Sep 24:1-7. doi: 10.1017/S1047951121003917. Online ahead of print.

Standard CPR versus interposed abdominal compression CPR in shunted single ventricle patients: comparison using a lumped parameter mathematical model.

Stromberg D(1), Carvalho K(1), Marsden A(2)(3), Mery CM(1), Immanuel C(1), Mizrahi M(1), Yang W(2)(3).

ABSTRACT

INTRODUCTION: Cardiopulmonary resuscitation (CPR) in the shunted single-ventricle population is associated with poor outcomes. Interposed abdominal compression-cardiopulmonary resuscitation, or IAC-CPR, is an adjunct to standard CPR in which pressure is applied to the abdomen during the recoil phase of chest compressions. **METHODS:** A lumped parameter model that represents heart chambers and blood vessels as resistors and capacitors was used to simulate blood flow in both Blalock-Taussig-Thomas and Sano circulations. For standard CPR, a prescribed external pressure waveform was applied to the heart chambers and great vessels to simulate chest compressions. IAC-CPR was modelled by adding phasic compression pressure to the abdominal aorta. Differential equations for the model were solved by a Runge-Kutta method. **RESULTS:** In the Blalock-Taussig-Thomas model, mean pulmonary blood flow during IAC-CPR was 30% higher than during standard CPR; cardiac output increased 21%, diastolic blood pressure 16%, systolic blood pressure 8%, coronary perfusion pressure 17%, and coronary blood flow 17%. In the Sano model, pulmonary blood flow during IAC-CPR increased 150%, whereas cardiac output was improved by 13%, diastolic blood pressure 18%, systolic blood pressure 8%, coronary perfusion pressure 15%, and coronary blood flow 14%. **CONCLUSIONS:** In this model, IAC-CPR confers significant advantage over standard CPR with respect to pulmonary blood flow, cardiac output, blood pressure, coronary, and coronary blood flow. These results support the notion that single-ventricle paediatric patients may benefit from adjunctive resuscitation techniques, and underscores the need for an in-vivo trial of IAC-CPR in children.

4. *Eur J Emerg Med*. 2021 Sep 21. doi: 10.1097/MEJ.0000000000000880. Online ahead of print.

Transparency in out-of-hospital cardiac arrest resuscitation: decision-making when patients are in the grey area between treatment and futility.

Milling L(1), Lassen AT, Mikkelsen S.

NO ABSTRACT AVAILABLE

5. *J Emerg Med*. 2021 Sep 18:S0736-4679(21)00640-5. doi: 10.1016/j.jemermed.2021.07.058. Online ahead of print.

Predicting Survived Events in Nontraumatic Out-of-Hospital Cardiac Arrest: A Comparison Study on Machine Learning and Regression Models.

Lo YH(1), Siu YCA(2).

ABSTRACT

BACKGROUND: Prediction of early outcomes of nontraumatic out-of-hospital cardiac arrest (OHCA) by emergency physicians is inaccurate. **OBJECTIVE:** Our aim was to develop and validate practical machine learning (ML)-based models to predict early outcomes of nontraumatic OHCA for use in the emergency department (ED). We compared their discrimination and calibration performances with the traditional logistic regression (LR) approach. **METHODS:** Between October 1, 2017 and March 31, 2020, prehospital resuscitation was performed on 17,166 OHCA patients. There were 8157 patients 18 years or older with nontraumatic OHCA who received continued resuscitation in the ED included for analysis. Eleven demographic and resuscitation predictor variables were extracted to predict survived events, defined as any sustained return of spontaneous circulation until in-hospital transfer of care. Prediction models based on random forest (RF), multilayer perceptron (MLP), and LR were created with hyperparameter optimization. Model performances on internal and external validation were compared using discrimination and calibration statistics. **RESULTS:** The three models showed similar discrimination performances with c-statistics values of 0.712 (95% confidence interval [CI] 0.711-0.713) for LR, 0.714 (95% CI 0.712-0.717) for RF, and 0.712 (95% CI 0.710-0.713) for MLP models on external validation. For calibration, MLP model had a better performance (slope of calibration regression line = 1.10, intercept = -0.09) than LR (slope = 1.17, intercept = -0.11) and RF (slope = 1.16, intercept = -0.10). **CONCLUSIONS:** Two practical ML-based and one regression-based clinical prediction models of nontraumatic OHCA for survived events were developed and validated. The ML-based models did not outperform LR in discrimination, but the MLP model showed a better calibration performance.

6. Crit Care Nurs Q. 2021 Oct-Dec 01;44(4):424-430. doi: 10.1097/CNQ.0000000000000379.

Rapid Response System Restructure: Focus on Prevention and Early Intervention.

Winterbottom FA(1), Webre H.

ABSTRACT

This article describes the staged restructure of the rapid response program into a dedicated 24/7 proactive rapid response system in a quaternary academic medical center in the southern United States. Rapid response nurses (RRNs) completed clinical leadership training on artificial intelligence, electronic risk stratification alerts, expert nurse rounding, emergency response, teamwork, closed-loop communication, and outcome measurement. The program goal was to reduce preventable deaths and resuscitation events outside the intensive care unit (ICU). Program outcomes between 2017 and 2019 included a 65% decrease in cardiac arrests outside the ICU, a 27% decrease of cardiac arrests inside the ICU, a 4.7% decrease in patients admitted to the ICU from inpatient beds, and a 27% reduction in the risk-adjusted mortality index for patients with expert proactive rounding encounters. Hospital peer group ranking on the Hospital Survey of Patient Safety improved in the areas of events reported, actions promoting patient safety, and continuous improvement suggesting a positive cultural shift. Implementation of a dedicated 24/7 RRN model of care integrating proactive rounding, technology, and ART can improve outcomes for patients and staff.

7. Intensive Care Med. 2021 Sep 20:1-15. doi: 10.1007/s00134-021-06508-w. Online ahead of print.

Critically ill cancer patient's resuscitation: a Belgian/French societies' consensus conference.

Meert AP(1), Wittnebel S(2), Holbrechts S(3), Toffart AC(4), Lafitte JJ(5), Piagnerelli M(6), Lemaitre F(7), Peyrony O(8), Calvel L(9), Lemaitre J(10), Canet E(11), Demoule A(12), Darmon M(13), Sculier JP(14), Voigt L(15), Lemiale V(13), Pène F(16), Schnell D(17), Lengline E(18), Berghmans T(19)(20), Fiévet L(19), Jungels C(19), Wang X(19), Bold I(19), Pistone A(19), Salaroli A(2), Grigoriu B(14), Benoit D(21); Critically ill cancer patients consensus conference group.

ABSTRACT

To respond to the legitimate questions raised by the application of invasive methods of monitoring and life-support techniques in cancer patients admitted in the ICU, the European Lung Cancer Working Party and the Groupe de Recherche Respiratoire en Réanimation Onco-Hématologique, set up a consensus conference. The methodology involved a systematic literature review, experts' opinion and a final consensus conference about nine predefined questions¹. Which triage criteria, in terms of complications and considering the underlying neoplastic disease and possible therapeutic limitations, should be used to guide admission of cancer patient to intensive care units?². Which ventilatory support [High Flow Oxygenation, Non-invasive Ventilation (NIV), Invasive Mechanical Ventilation (IMV), Extra-Corporeal Membrane Oxygenation (ECMO)] should be used, for which complications and in which environment?³. Which support should be used for extra-renal purification, in which conditions and environment?⁴. Which haemodynamic support should be used, for which complications, and in which environment?⁵. Which benefit of cardiopulmonary resuscitation in cancer patients and for which complications?⁶. Which intensive monitoring in the context of oncologic treatment (surgery, anti-cancer treatment ...)?⁷. What specific considerations should be taken into account in the intensive care unit?⁸. Based on which criteria, in terms of benefit and complications and taking into account the neoplastic disease, patients hospitalized in an intensive care unit (or equivalent) should receive cellular elements derived from the blood (red blood cells, white blood cells and platelets)?⁹. Which training is required for critical care doctors in charge of cancer patients?

8. Resusc Plus. 2021 Jun 29;7:100138. doi: 10.1016/j.resplu.2021.100138. eCollection 2021 Sep.

Different perceptions of thorax anatomy and hand placement for chest compressions among healthcare professionals and laypersons: Implications for cardiopulmonary resuscitation.

Østergaard AMH(1), Grove EL(2)(3), Lauridsen KG(4)(5)(6), Løfgren B(3)(4)(5).

ABSTRACT

AIM: The European Resuscitation Council guidelines recommend that the hand position for chest compressions is obtained by "placing the heel of your hand in the centre of the chest". Importantly, guidelines are based on a study on healthcare professionals being extrapolated to laypersons. This study explored whether healthcare professionals and laypersons differ in anatomical knowledge necessary for obtaining the correct hand position for chest compressions and understanding of European Resuscitation Council guideline recommendations in the absence of a demonstration. **METHODS:** We asked laypersons and healthcare professionals to identify where to place the hands for chest compressions on digital pictures of the chest of a man and a woman. Both groups were asked to identify where to place the hands for chest compressions, the left nipple (positive control), the centre of the chest and to delineate the anterior area of the chest. **RESULTS:** In total, 50 laypersons and 50 healthcare professionals were included. Healthcare professionals were significantly better at identifying the correct hand position for chest compressions compared to laypersons (male chest: $P = 0.03$, female chest: $P < 0.0001$) and delineating the anterior area of the chest. We found no significant difference between groups when instructed to identify the left nipple nor the centre of the chest (male chest: $P = 0.57$, female chest: $P = 0.50$). **CONCLUSION:** Laypersons and healthcare professionals have different perceptions of chest anatomy and where to perform chest compressions suggesting that caution should be taken when extrapolating results from healthcare professionals to laypersons. The ERC 2015 guideline recommendations on hand placement for chest compressions seems understandable by both laypersons and healthcare professionals.

POST-CARDIAC ARREST TREATMENTS

No articles identified.

TARGETED TEMPERATURE MANAGEMENT

1. Ann N Y Acad Sci. 2021 Sep 23. doi: 10.1111/nyas.14676. Online ahead of print.

The evolution of hypothermia for neuroprotection after cardiac arrest: a history in the making.

Presciutti A(1), Perman SM(2).

ABSTRACT

While much has been observed regarding hypothermia by way of environmental exposure, it is modern day medicine that deployed hypothermia as a therapeutic. From the early 1930s, when Temple Fay deployed "refrigeration" to treat pain, to the work of Wilfred Bigelow and Charles Drew, who utilized hypothermia in open heart surgery-the opportunities seemed endless. However, questions arose surrounding appropriate temperatures to achieve best outcomes and how to minimize adverse events, such as coagulopathy and infection. In the 1980s, hypothermia underwent a resurgence through Peter Safar's critical studies in large animals, which quickly translated into feasibility studies and the landmark trials of 2002 that paved the way for postcardiac arrest care as we currently know it. Through clinical and observational trials, modern-day targeted temperature management continues to adapt, striving to improve patient outcomes. While hypothermia has come a long way from the writings of Hippocrates, the ideal therapy has not yet been defined, and more work is needed. While the history is long, there is more to be written and advances to be achieved as we optimize the neuroprotective effects of hypothermia for comatose survivors of cardiac arrest.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

No articles identified.

PEDIATRICS AND CHILDREN

1. Resuscitation. 2021 Sep 20:S0300-9572(21)00369-5. doi: 10.1016/j.resuscitation.2021.09.015.

Online ahead of print.

Applying a Set of Termination of Resuscitation Criteria to Paediatric Out-of-Hospital Cardiac Arrest.

Harris MI(1), Crowe RP(2), Anders J(3), D'Acunto S(4), Adelgais KM(5), Fische J(6).

ABSTRACT

OBJECTIVE: Prehospital Termination of Resuscitation (TOR) protocols for adults can reduce the number of futile transports of patients in cardiac arrest, yet similar protocols are not widely available for paediatric out-of-hospital cardiac arrest (POHCA). The objective of this study was to apply a set of criteria for paediatric TOR (pTOR) from the Maryland Institute for Emergency Medical Services Systems (MIEMSS) to a large national cohort and determine its association with return of spontaneous circulation (ROSC) after POHCA. **METHODS:** We identified patients ages 0-17 treated by Emergency Medical Services (EMS) with cardiac arrest in 2019 from the ESO dataset and applied the separate pTOR criteria for medical and traumatic arrests. We calculated predictive test characteristics for the outcome of prehospital ROSC, stratified by medical and traumatic cause of arrest. **RESULTS:** We analyzed records for 1,595 POHCA patients. Eighty-eight percent (n=1,395)

were classified as medical. ROSC rates were 23% among medical POHCA and 27% among traumatic POHCA. The medical criteria correctly classified >99% (322/323) of patients who achieved ROSC as ineligible for TOR. The trauma criteria correctly classified 93% (50/54) of patients with ROSC as ineligible for TOR. Of the five misclassified patients, three were involved in drowning incidents. CONCLUSIONS: The Maryland pTOR criteria reliably identified POHCA patients unlikely to achieve ROSC. As most misclassified patients were victims of drowning, we recommend considering the exclusion of drowning patients from future pTOR guidelines. Further studies are needed to evaluate the long-term survival and neurologic outcome of patients misclassified by pTOR criteria.

EXTRACORPOREAL LIFE SUPPORT

No articles identified.

EXPERIMENTAL RESEARCH

1. Sci Rep. 2021 Sep 23;11(1):18918. doi: 10.1038/s41598-021-98044-2.

Effects of rewarming with extracorporeal membrane oxygenation to restore oxygen transport and organ blood flow after hypothermic cardiac arrest in a porcine model.

Nilsen JH(1)(2)(3), Schanche T(1)(4), Valkov S(1), Mohyuddin R(1), Haaheim B(1), Kondratiev TV(1), Næsheim T(3), Sieck GC(4), Tveita T(5)(6)(7).

ABSTRACT

We recently documented that cardiopulmonary resuscitation (CPR) generates the same level of cardiac output (CO) and mean arterial pressure (MAP) during both normothermia (38 °C) and hypothermia (27 °C). Furthermore, continuous CPR at 27 °C provides O₂ delivery ($\dot{V}O_2$) to support aerobic metabolism throughout a 3-h period. The aim of the present study was to investigate the effects of extracorporeal membrane oxygenation (ECMO) rewarming to restore $\dot{V}O_2$ and organ blood flow after prolonged hypothermic cardiac arrest. Eight male pigs were anesthetized and immersion cooled to 27 °C. After induction of hypothermic cardiac arrest, CPR was started and continued for a 3-h period. Thereafter, the animals were rewarmed with ECMO. Organ blood flow was measured using microspheres. After cooling with spontaneous circulation to 27 °C, MAP and CO were initially reduced to 66 and 44% of baseline, respectively. By 15 min after the onset of CPR, there was a further reduction in MAP and CO to 42 and 25% of baseline, respectively, which remained unchanged throughout the rest of 3-h CPR. During CPR, $\dot{V}O_2$ and O₂ uptake ($\dot{V}O_2$) fell to critical low levels, but the simultaneous small increase in lactate and a modest reduction in pH, indicated the presence of maintained aerobic metabolism. Rewarming with ECMO restored MAP, CO, $\dot{V}O_2$, and blood flow to the heart and to parts of the brain, whereas flow to kidneys, stomach, liver and spleen remained significantly reduced. CPR for 3-h at 27 °C with sustained lower levels of CO and MAP maintained aerobic metabolism sufficient to support $\dot{V}O_2$. Rewarming with ECMO restores blood flow to the heart and brain, and creates a "shockable" cardiac rhythm. Thus, like continuous CPR, ECMO rewarming plays a crucial role in "the chain of survival" when resuscitating victims of hypothermic cardiac arrest.

2. J Am Heart Assoc. 2021 Sep 21;10(18):e021250. doi: 10.1161/JAHA.121.021250. Epub 2021 Sep 17.

Comparison of Resuscitation Outcomes Between 2- or 3-Stacked Defibrillation Strategies With Minimally Interrupted Chest Compression and the Single Defibrillation Strategy: A Swine Cardiac Arrest Model.

Kim S(1), Jung WJ(1), Roh YI(1), Kim TY(2), Hwang SO(1), Cha KC(1).

ABSTRACT

Background There is controversy over whether the number and mode of electrical shock are optimal for successful defibrillation. Methods and Results Fifty-four pigs were randomly assigned to 3 groups. After inducing ventricular fibrillation and a 2-minute downtime, basic life support was initiated with a 30:2 compression/ventilation ratio for 8 minutes. Subsequently, 20 minutes of advanced life support, including asynchronous ventilation, every 10 chest compressions with 15 L/min of oxygen, was delivered. Animals of the single shock group received a single shock, animals of the 2-stacked shock group received 2 consecutive shocks, and animals of the 3-stacked shock group received 3 consecutive shocks. Animals with the return of spontaneous circulation underwent post-cardiac arrest care for 12 hours. The rates of successful defibrillation, return of spontaneous circulation, 24-hour survival, and 48-hour survival and neurological deficit score were compared between the groups. Hemodynamic parameters, arterial blood gas profiles, troponin I, and cardiac output were not different between the groups. There was a significant difference in chest compression fraction between the single and 3-stacked shock groups ($P<0.001$), although there was no difference between the single and 2-stacked shock groups ($P=0.022$) or the 2-stacked and 3-stacked shock groups ($P=0.040$). The rates of successful defibrillation, return of spontaneous circulation, 24-hour survival, and 48-hour survival were higher in the 2- and 3-stacked shock groups than in the single shock group ($P=0.021$, $P=0.015$, and $P=0.021$, respectively). Neurological deficit score at 48 hours was not different between the groups. Conclusions A stacked shock strategy was superior to a single shock strategy for successful defibrillation and better resuscitation outcomes in treating ventricular fibrillation.

3. Prog Brain Res. 2021;265:317-375. doi: 10.1016/bs.pbr.2021.06.009. Epub 2021 Aug 12.

Upregulation of hemeoxygenase enzymes HO-1 and HO-2 following ischemia-reperfusion injury in connection with experimental cardiac arrest and cardiopulmonary resuscitation: Neuroprotective effects of methylene blue.

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ABSTRACT

Oxidative stress plays an important role in neuronal injuries after cardiac arrest. Increased production of carbon monoxide (CO) by the enzyme hemeoxygenase (HO) in the brain is induced by the oxidative stress. HO is present in the CNS in two isoforms, namely the inducible HO-1 and the constitutive HO-2. Elevated levels of serum HO-1 occurs in cardiac arrest patients and upregulation of HO-1 in cardiac arrest is seen in the neurons. However, the role of HO-2 in cardiac arrest is not well known. In this review involvement of HO-1 and HO-2 enzymes in the porcine brain following cardiac arrest and resuscitation is discussed based on our own observations. In addition, neuroprotective role of methylene blue- an antioxidant dye on alterations in HO under in cardiac arrest is also presented. The biochemical findings of HO-1 and HO-2 enzymes using ELISA were further confirmed by immunocytochemical approach to localize selective regional alterations in cardiac arrest. Our observations are the first to show that cardiac arrest followed by successful cardiopulmonary resuscitation results in significant alteration in cerebral concentrations of HO-1 and

HO-2 levels indicating a prominent role of CO in brain pathology and methylene blue during CPR followed by induced hypothermia leading to superior neuroprotection after return of spontaneous circulation (ROSC), not reported earlier.

CASE REPORTS

1. Int J Emerg Med. 2021 Sep 20;14(1):55. doi: 10.1186/s12245-021-00382-5.

Successful treatment of severe electrolyte imbalance-induced cardiac arrest caused by adrenal tuberculosis with ECMO in the ED.

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ABSTRACT

BACKGROUND: Tuberculosis (TB) is a chronic infectious disease, common in China. TB bacteria can invade multiple organs throughout the body, but they rarely cause critical illness. We present a complex critically ill case in this report. **CASE PRESENTATION:** A 40-year-old man suffered sudden cardiac arrest during an emergency room visit. Spontaneous circulation resumed after emergency cardiopulmonary resuscitation (CPR), but recurrent ventricular fibrillation and refractory cardiac shock emerged. Thereafter, extracorporeal membrane oxygenation (ECMO) was implemented to maintain hemodynamic stability. Blood test results revealed that the patient had severe electrolyte imbalance and adrenal insufficiency. Further imaging examination showed multiple tuberculosis lesions throughout the body, including the lungs, adrenal glands, and lumbar spine. In the end, the patient was successfully moved from the ICU after weaning from ECMO and the ventilator, and then transferred to an infectious disease specialist hospital for standard anti-tuberculosis therapy.

CONCLUSIONS: ECMO has won the opportunity for the diagnosis and treatment of this young patient who suffered from a rare cause of cardiac arrest and finally achieved a good prognosis.

2. Am J Case Rep. 2021 Sep 18;22:e930380. doi: 10.12659/AJCR.930380.

Spontaneous Coronary Artery Dissection with Sudden Cardiac Arrest in a Female Patient During Her Postpartum Period: A Case Report and Review.

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ABSTRACT

BACKGROUND Spontaneous coronary artery dissection (SCAD) is a rare cause of acute myocardial infarction, and the literature is undecided on the etiology, predisposing factors, and susceptible populations involved. SCAD is a disease that is under-recognized, underdiagnosed, and mainly affects young women of reproductive age. It has the highest incidence in the third trimester and postpartum period. **CASE REPORT** We present a case of a 29-year-old woman who was brought by family members to our Emergency Department (ED) in Riyadh, Saudi Arabia with sudden cardiac arrest due to SCAD in the right coronary artery 13 days after normal spontaneous vaginal delivery. The patient was brought in with no cardiopulmonary resuscitation for 20 min. She was resuscitated successfully in the ED. Her initial rhythm was ventricular fibrillation (VF). Point-of-care ultrasound (PoCUS) was performed during pulse checks, which revealed no signs of right ventricular strain nor signs of deep vein thrombosis (DVT). After that, she underwent primary percutaneous coronary intervention, which confirmed the diagnosis of right coronary artery dissection. The patient was successfully managed and discharged from the hospital after 18 days. She was independent and in good health after 4 months of follow-up. **CONCLUSIONS** A high index of suspicion, familiarity with predisposing factors for SCAD, and PoCUS may play a critical role in detecting and managing SCAD patients.

3. JACC Case Rep. 2021 Sep 15;3(12):1422-1426. doi: 10.1016/j.jaccas.2021.07.006. eCollection 2021 Sep 15.

Sudden Cardiac Arrest Secondary to Early Repolarization Syndrome.

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ABSTRACT

A healthy 41-year-old man sustained cardiac arrest secondary to ventricular fibrillation. An extensive ischemic, structural, and genetic evaluation did not identify an attributable pathologic condition. Electrocardiograms were notable for early repolarization pattern. Here we review the diagnosis, prevalence, and prognostic significance of the early repolarization syndrome on sudden cardiac death.

4. Cureus. 2021 Aug 11;13(8):e17089. doi: 10.7759/cureus.17089. eCollection 2021 Aug.

Lazarus Phenomenon: Return of Spontaneous Circulation After Cessation of Prolonged Cardiopulmonary Resuscitation in a Patient With COVID-19.

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ABSTRACT

The pandemic caused by the SARS-CoV-2 or COVID-19 infection has had an unimaginable impact on health systems worldwide. Cardiorespiratory arrest remains a potentially reversible medical emergency that requires the performance of a set of maneuvers designed to replace and restore spontaneous breathing and circulation. Suspending cardiopulmonary resuscitation (CPR) usually corresponds to an ethical-clinical dilemma that the health professional in charge must assume. The "Lazarus phenomenon" is an unusual syndrome with a difficult pathophysiological explanation, defined as the spontaneous return of circulation in the absence of any life support technique or after the cessation of failed CPR maneuvers. We present the case of a 79-year-old patient hospitalized in the intensive care unit for septic shock of pulmonary origin associated with COVID-19 infection who presented cardiorespiratory arrest that required unsuccessful resuscitation maneuvers for 40 minutes, declared deceased. After 20 minutes of death, he presented a return to spontaneous circulation. The pathophysiological changes of the Lazarus phenomenon remind us of the limitations we have in determining when to end cardiopulmonary resuscitation and that its interruption must be approached with more caution, especially in the context of the COVID-19 pandemic.