RCP

Chest compression-only versus conventional cardiopulmonary resuscitation for bystander-witnessed out-of-hospital cardiac arrest of medical origin: A propensity score-matched cohort from 143,500 patients.

Kitamura T1, Kiyohara K2, Nishiyama C3, Kiguchi T4, Kobayashi D4, Kawamura T4, Iwami T5.

Abstract

BACKGROUND: Current cardiopulmonary resuscitation (CPR) guidelines do not define the optimal type of CPR (chest compression-only CPR [CCCPR] or conventional CPR with rescue breathing [CCRB]) to be performed by bystanders when they witness someone collapse.

METHODS: Using a nationwide database of 1.17 million patients who underwent out-of-hospital cardiac arrest (OHCA) in Japan, we enrolled consecutive bystander-witnessed OHCAs of medical origin with resuscitation attempts from January 2005 through December 2014. Multivariable logistic regression analysis was used to assess the association between the type of bystander CPR and the OHCA outcome after one-to-one propensity score matching for CCCPR versus CCRB. The primary outcome measure was one-month survival with a favorable neurological outcome, defined as a cerebral performance category of 1 or 2.

RESULTS: Among 143,500 eligible patients with bystander-witnessed OHCAs receiving bystander-initiated CPR, 71.4% received CCCPR and 28.6% received CCRB. In the univariate analysis, the proportion of one-month survival cases with favorable neurological outcome was lower in the CCCPR group than the CCRB group (5.6% [5749/102,487] vs. 6.5% [2682/41,013], odds ratio [OR]; 0.85 [95% confidence interval {CI}; 0.81-0.89]). However, in the multivariate analysis, the CCCPR group showed a more favorable neurological outcome than the CCRB group (adjusted OR 1.12, 95% CI; 1.06-1.19). In the propensity-matched cohort, the CCCPR group also showed a more favorable neurological outcome than the CCRB group (7.2% [2894/40,096] vs. 6.5% [2610/40,096], adjusted OR 1.14, 95% CI; 1.09-1.22).

CONCLUSIONS: CCCPR is an acceptable resuscitation technique for lay-rescuers responding to bystander witnessed OHCA of presumed medical origin.

The dead and the dying - a difficult part of EMS transport: A Swiss cross-sectional study.

Hasler RM1,2, Stucky S1, Bähler H2, Exadaktylos AK1, Neff F2,3.

Abstract

OBJECTIVE: Most deaths occur in the pre-hospital setting, whereas mortality in the emergency department (ED) is low (<1%). However, our clinical impression is that some patients are being transported to hospital in devastating conditions with no likelihood of survival, but demanding extensive hospital resources. The decision on whether to transport a dying person to hospital or not is a difficult task for emergency medical services (EMS) personnel. As there is little epidemiological data about these patients, this paper aims to describe this special population.

METHODS: Retrospective cross-sectional study on adult patients transported by ground ambulance to the ED of a Swiss university hospital, who died during their stay in the ED between January 2008 and

December 2012. Data was collected on the basis of ambulance report forms and discharge summaries of the ED.

RESULTS: One hundred and sixty-one patients were analysed. Most deaths were due to cardiovascular diseases (43%). Only 9% of patients died of trauma. The median age was 70 years (IQR 56-81 years) and 70% (n = 112) were men. Trauma patients were significantly younger (median age 55 years, p<0.001). The overall mortality rate was 0.9% for all patients transported by EMS to the ED. About one third of all patients received cardiopulmonary resuscitation (CPR) from bystanders (n = 53). The most common electrocardiogram (ECG) findings were asystole (n = 57) and pulseless electrical activity (n = 91). Fifty percent (n = 64) of the resuscitated patients were defibrillated. Three quarters (n = 115, 72%) of all patients were intubated on site. The mechanical chest compression device Lucas™2 was mainly used in cases of cardiovascular or uncertain cause of death and did not reduce the operating time on site.

CONCLUSION: The low ED mortality rate of 0.9% shows that only a few dying patients are transported to hospital. However, transport to hospital has to be carefully evaluated, especially for elderly patients with asystole or PEA due to medical conditions. The low CPR rate from bystanders demonstrates that public CPR training should be promoted further. The use of Lucas™2 did not reduce the operating time on site. For further investigations, comparison with survivors would be needed.

Free Article

Registres, revisions I editorials

1. **Crit Care Nurs** Q. 2018 Apr/Jun;41(2):102-108. doi: 10.1097/CNQ.0000000000000199.

Targeted Temperature Management for Improved Outcomes: Are We There Yet?

Carwell M1.

Abstract

Therapeutic hypothermia, also referred to as targeted temperature management, has been a component of the postcardiac arrest treatment guidelines since 2010. Although almost a decade has passed since its inclusion in the postarrest guidelines, many unanswered questions remain regarding selection of the appropriate patient population, optimal target temperature, ideal window of time in which to initiate therapy after arrest, most efficient, safe, and accurate equipment choice for inducing and maintaining hypothermia, most effective duration of treatment, and rate of cooling or rewarming. On a national and international level, critical care nurses are in a unique position to participate in research that will define targeted temperature management protocols and practices. Nurses are also ideal for standardizing the targeted temperature management policy and protocol locally and nationally based on current available evidence. This review aims to serve 2 purposes: first, to provide a broad update on the current clarifications and limitations per research findings on target temperature management therapy; second, to explain how critical care nurses can use this updated information to improve outcomes for their patients with cardiac arrest.

2. **J Clin Monit Comput**. 2018 Feb 26. doi: 10.1007/s10877-018-0118-3. [Epub ahead of print]

Quantitative measures of EEG for prediction of outcome in cardiac arrest subjects treated with hypothermia: a literature review.

Asgari S1,2, Moshirvaziri H3, Scalzo F4,5, Ramezan-Arab N5,6.

Abstract

Cardiac arrest (CA) is the leading cause of death and disability in the United States. Early and accurate prediction of CA outcome can help clinicians and families to make a better-informed decision for the patient's healthcare. Studies have shown that electroencephalography (EEG) may assist in early prognosis of CA outcome. However, visual EEG interpretation is subjective, labor-intensive, and requires interpretation by a medical expert, i.e., neurophysiologists. These limiting factors may hinder the applicability of such testing as the prognostic method in clinical settings. Automatic EEG pattern recognition using quantitative measures can make the EEG analysis more objective and less time consuming. It also allows to detect and display hidden patterns that may be useful for the prognosis over longer time periods of monitoring. Given these potential benefits, there have been an increasing interest over the last few years in the development and employment of EEG quantitative measures to predict CA outcome. This paper extensively reviews the definition and efficacy of various measures that have been employed for the prediction of outcome in CA subjects undergoing hypothermia (a neuroprotection method that has become a standard of care to improve the functional recovery of CA patients after resuscitation). The review details the State-of-the-Art and provides some perspectives on what seems to be promising for the early and accurate prognostication of CA outcome using the quantitative measures of EEG.

Regional variation in the characteristics, incidence and outcomes of out-of-hospital cardiac arrest in Australia and New Zealand: Results from the Aus-ROC Epistry.

Beck B1, Bray J2, Cameron P3, Smith K4, Walker T5, Grantham H6, Hein C7, Thorrowgood M8, Smith A9, Inoue M10, Smith T11, Dicker B12, Swain A13, Bosley E14, Pemberton K15, McKay M16, Johnston-Leek M16, Perkins GD17, Nichol G18, Finn J19; Aus-ROC Steering Committee.

Abstract

INTRODUCTION: The aim of this study was to investigate regional variation in the characteristics, incidence and outcomes of out-of-hospital cardiac arrest (OHCA) in Australia and New Zealand.

METHODS: This was a population-based cohort study of OHCA using data from the Aus-ROC Australian and New Zealand OHCA Epistry over the period of 01 January 2015 to 31 December 2015. Seven ambulance services contributed data to the Epistry with a capture population of 19.8 million people. All OHCA attended by ambulance, regardless of aetiology or patient age, were included.

RESULTS: In 2015, there were 19,722 OHCA cases recorded in the Aus-ROC Epistry with an overall crude incidence of 102.5 cases per 100,000 population (range: 51.0-107.7 per 100,000 population). Of all OHCA cases attended by EMS (excluding EMS-witnessed cases), bystander CPR was performed in 41% of cases (range: 36%-50%). Resuscitation was attempted (by EMS) in 48% of cases (range: 40%-68%). The crude incidence for attempted resuscitation cases was 47.6 per 100,000 population (range: 34.7-54.1 per 100,000 population). Of cases with attempted resuscitation, 28% survived the event (range: 21%-36%) and 12% survived to hospital discharge or 30 days (range: 9%-17%; data provided by five ambulance services).

CONCLUSION: In the first results of the Aus-ROC Australian and New Zealand OHCA Epistry, significant regional variation in the incidence, characteristics and outcomes was observed. Understanding the system-level and public health drivers of this variation will assist in optimisation of the chain of survival provided to OHCA patients with the aim of improving outcomes.

Effect of a first responder on survival outcomes after out-of-hospital cardiac arrest occurs during a period of exercise in a public place.

Ko SY1,2, Ro YS2, Shin SD1,2, Song KJ1,2, Hong KJ2,3, Kong SY2.

Abstract

INTRODUCTION: The deployment of first responders in a public place is one of the interventions that is used for increasing bystander cardiopulmonary resuscitation (CPR) of out-of-hospital cardiac arrests (OHCA). We studied the association between the presence of a first responder and the survival of OHCA that occurred during a period of exercise in a public place.

METHODS: All of the adult OHCAs of a presumed cardiac etiology that occurred during a period of exercise in a public place and that were witnessed by a bystander between 2013 and 2015 were analyzed. The main exposure of interest was the characteristics of the bystander (first responder vs. layperson). The endpoints were the provision of bystander CPR and good neurological recovery. Multivariable logistic regression analysis, adjusting for patient-environment and prehospital factors, was performed.

RESULTS: A total of 870 patients had a cardiac arrest during a period of exercise in a public place, and 58 (6.7%) patients were witnessed by the first responder. The OHCAs witnessed by first responders were more likely to result in bystander CPR than those witnessed by laypersons (89.7% vs. 75.4%, p = 0.01, adjusted OR (95% CI): 3.51 (1.44-8.55)). In terms of good neurological recovery, the OHCAs witnessed by first responders had a higher likelihood than the patients witnessed by laypersons (37.9% vs, 24.0%, p = 0.02, adjusted OR (95% CI): 2.92 (1.33-6.40)).

CONCLUSION: The OHCAs occurred during a period of exercise in a public place and whom first responders witnessed were more likely to receive bystander CPR and to have a neurologically intact survival.

Free Article

Out-of-Hospital Cardiac Arrest Resuscitation Systems of Care: A Scientific Statement From the American Heart Association.

McCarthy JJ, Carr B, Sasson C, Bobrow BJ, Callaway CW, Neumar RW, Ferrer JME, Garvey JL, Ornato JP, Gonzales L, Granger CB, Kleinman ME, Bjerke C, Nichol G; American Heart Association Emergency Cardiovascular Care Committee; Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation; and the Mission: Lifeline Resuscitation Subcommittee.

Abstract

The American Heart Association previously recommended implementation of cardiac resuscitation systems of care that consist of interconnected community, emergency medical services, and hospital efforts to measure and improve the process of care and outcome for patients with cardiac arrest. In addition, the American Heart Association proposed a national process to develop and implement evidence-based guidelines for cardiac resuscitation systems of care. Significant experience has been gained with implementing these systems, and new evidence has accumulated. This update describes recent advances in the science of cardiac resuscitation systems and evidence of their effectiveness, as

well as recent progress in dissemination and implementation throughout the United States. Emphasis is placed on evidence published since the original recommendations (ie, including and since 2010).

A disparity in outcomes of out-of-Hospital cardiac arrest by community socioeconomic status: A ten-year observational study.

Lee SY1, Song KJ2, Shin SD3, Ro YS 4, Hong KJ5, Kim YT6, Hong SO7, Park JH8, Lee SC9.

Abstract

BACKGROUND: The objective of this study was to compare the temporal trends in good neurologic outcome after out-of-hospital cardiac arrest (OHCA) between communities with different socioeconomic status (SES).

METHODS: A nationwide, population-based observational study was conducted in adult patients with OHCA of cardiac etiology from 2006 to 2015. Community SES was defined using the Carstairs index categorized into 5 groups, from Q1 (the least deprived) to Q5 (the most deprived). Outcomes included good neurologic outcome, survival to hospital discharge and rate of bystander cardiopulmonary resuscitation (CPR). Using multivariable logistic regression, we examined temporal trends in risk-adjusted outcome rates according to community SES and estimated a difference-in-differences model between 2006 and 2015 to compare the changes over time in communities with different SES.

RESULTS: A total of 120,365 OHCAs met inclusion criteria. Risk-adjusted rates increased from 2006 to 2015 for bystander CPR (1.2%-23.2%), survival to discharge (3.0%-8.0%), and good neurological outcome (0.9%-5.8%). However, the degree of improvement in each risk-adjusted rate among SES groups were different. The communities with highest SES showed much greater improvement (bystander CPR 1.6%-34.6%; survival to discharge 3.5%-9.9%; and good neurological outcome 1.6%-7.4%) while less improvement in lower SES communities (1.6%-15.5%; 2.3%-6.2%; and 0.5%-4.2%, respectively). For rates of bystander CPR, the adjusted difference-in-differences value was statistically significant in highest SES communities, showing gradient from 11.48% increase in the lowest SES to 22.39% increase in the highest SES.

CONCLUSION: In Korea, both survival to hospital discharge and good neurologic outcomes after OHCA have improved during the past decade. However, disparity in outcomes was observed based on community socioeconomic status. Outcome improvements were greatest in communities with higher SES but relatively less in lower SES communities.

LESIONS PER RCP

CPR-related thoracic injuries: comparison of CPR guidelines between 2010 and 2015

Yusufoğlu K, Erdoğan MÖ, Tayfur İ, Afacan MA, Çolak Ş .

Abstract

BACKGROUND/AIM:This study aimed to evaluate traumatic thorax complications in post-CPR patients and to investigate whether or not there has been a decrease in these complications since the adoption of current chest compression recommendations.

MATERIALS AND METHODS:Post-CPR patients with return of spontaneous circulation (ROSC) were admitted between January 2014 and January 2016 were analyzed retrospectively. Patients admitted to the ED in 2014 were resuscitated according to 2010 AHA CPR guidelines, while those admitted to the ED in 2015 were resuscitated according to current ERC CPR guidelines.

RESULTS: The study population comprised 48 male and 35 female patients. Of the 2010 AHA guideline patients, 39.21% experienced pulmonary contusion, while 54.83% of 2015 ERC guideline patients had pulmonary contusion. It was found that 11.76% of 2010 AHA guideline patients and 3.22% of 2015 ERC guideline patients had pneumothorax, while 9.8% of 2010 AHA guideline patients and 12.9% of 2015 ERC guideline patients experienced hemothorax. Incidence rates of lung contusion, pneumothorax, and hemothorax were higher in patients with rib fractures.

CONCLUSION: In this study, traumatic thoracic complications were investigated in patients with ROSC after CPR. The incidence of CRP-related injuries did not decrease on application of the new 2015 ERC CPR guideline recommendations. The most common injury in this study was rib fracture, followed by sternal fracture, lung contusion, hemothorax, and pneumothorax. Statistically, rib fracture had a positive relationship with lung contusion, hemothorax, and pneumothorax.

ETCO$_2$

End-tidal carbon dioxide monitoring and load band device for mechanical cardio-pulmonary resuscitation: Never trust the numbers, believe at the curves.

Raimondi M1, Savastano S2, Pamploni G1, Molinari S1, Degani A3, Belliato M4.

Abstract

The use of end-tidal carbon dioxide (ETCO$_2$) monitoring during the treatment of cardiac arrest is suggested by the current guidelines to confirm tracheal intubation, to monitor the quality of cardiopulmonary resuscitation (CPR), to early detect the return of spontaneous circulation (ROSC) and to identify those cardiac arrest patients candidate to extracorporeal-CPR (ECPR). Moreover in the 90s, ETCO2 was also supposed to have a prognostic value for cardiac arrest patients. From here, the importance of waveform capnography and its accuracy.

 TRAUMA

Prehospital Interventions Performed on Pediatric Trauma Patients in Iraq and Afghanistan.

Schauer SG, April MD, Hill GJ, Naylor JF, Borgman MA, De Lorenzo RA.

Abstract

BACKGROUND: United States (US) and coalition military medical units deployed to combat zones frequently encounter pediatric trauma patients. Pediatric patients may present unique challenges due

to their anatomical and physiological characteristics and most military prehospital providers lack pediatric-specific training. A minimal amount of data exists to illuminate the prehospital care of pediatric patients in this environment. We describe the prehospital care of pediatric trauma patients in Iraq and Afghanistan.

METHODS: We queried the Department of Defense Trauma Registry (DODTR) for all pediatric subjects admitted to US and Coalition fixed-facility hospitals in Iraq and Afghanistan from January 2007 to January 2016. Subjects were grouped by age: <1, 1-4, 5-9, 10-14, and 15-17 years. We focused our analysis on interventions related to trauma resuscitation.

RESULTS: Of 42,790 encounters in the DODTR during the study period, 3,439 (8.0%) were aged <18 years. Most subjects were in the 5-9 age group (33.1%), male (77.1%), located in Afghanistan (67.8%), injured by explosives (43.1%). Most subjects survived to hospital discharge (90.2%). The most frequently performed interventions were tourniquet placement (6.6%), intubation (6.1%), supplemental oxygen (11.7%), IV access (24.8%), IV fluids (13.3%), IO access (5.1%), and hypothermia prevention (44.5%). The most frequently administered medications were antibiotics (6.2%) and opioids (15.0%). Most procedural and medication interventions occurred in subjects injured by explosives (43.1%) and gunshot wounds (22.1%).

CONCLUSIONS: Pediatric subjects comprised over 1 in 13 casualties treated in the joint theaters with the majority injured by explosives. Vascular access and hypothermia prevention interventions were the most frequently performed procedures. Key words: prehospital; pediatric; combat; trauma; military.

How many patients could benefit from REBOA in prehospital care? A retrospective study of patients rescued by the doctors of the Paris fire brigade.

Thabouillot O1, Bertho K1, Rozenberg E1, Roche NC2, Boddaert G3, Jost D1, Tourtier JP1.

Abstract

INTRODUCTION: Resuscitative endovascular balloon occlusion of the aorta (REBOA) is a technique to control haemorrhage by placing a retrograde catheter in an artery and inflating a balloon at its tip. This retrospective study aimed to evaluate the proportion of injured people who could potentially have benefited from this technique prior to hospitalisation, including on the scene or during transport.

METHODS: A retrospective analysis was conducted of all patients with trauma registered in the Paris Fire Brigade emergency medical system between 1 January and 31 December 2014. Inclusion criteria included all patients over 18 years of age with bleeding of supposedly abdominal and/or pelvic and/or junctional origin, uncontrolled haemorrhagic shock or cardiac arrest with attempted resuscitation.

RESULTS: During this study period, a total of 1159 patients with trauma (3.2%) would have been eligible to undergo REBOA. Death on scene rate was 83.8% (n=31) and six patients had a beating heart when they arrived at the hospital. Ten out of the 37 patients had spontaneous circulatory activity. Among them, four people died on the scene or during transport. Thirty-six out of 37 patients were intubated, one benefited from the use of a haemostatic dressing and one benefited from a tourniquet.

CONCLUSIONS: REBOA can be seen as an effective non-surgical solution to ensure complete haemostasis during the prehospital setting. When comparing the high mortality rate following haemorrhage with the REBOA's rare side effects, the risk-benefit balance is positive. Given that 3% of all patients with trauma based on this study would have been eligible for REBOA, we believe that this intervention should be available in the prehospital setting. The results of this study will be used: educational models for REBOA

balloon placement using training manikins, with an ultimate aim to undertake a prospective feasibility study in the prehospital setting.

VENTILACIÓ

Effect of Bag-Mask Ventilation vs Endotracheal Intubation During Cardiopulmonary Resuscitation on Neurological Outcome After Out-of-Hospital Cardiorespiratory Arrest: A Randomized Clinical Trial.

Jabre P1, Penaloza A2, Pinero D3, Duchateau FX4, Borron SW5, Javaudin F6, Richard O7, de Longueville D8, Bouilleau G9, Devaud ML10, Heidet M11, Lejeune C12, Fauroux S13, Greingor JL14, Manara A15, Hubert JC16, Guihard B17, Vermylen O18, Lievens P19, Auffret Y20, Maisondieu C21, Huet S22, Claessens B8, Lapostolle F23, Javaud N24, Reuter PG25, Baker E23, Vicaut E26, Adnet F23.

Comment in: Airway Management During Out-of-Hospital Cardiac Arrest. [JAMA. 2018]

Abstract

Importance: Bag-mask ventilation (BMV) is a less complex technique than endotracheal intubation (ETI) for airway management during the advanced cardiac life support phase of cardiopulmonary resuscitation of patients with out-of-hospital cardiorespiratory arrest. It has been reported as superior in terms of survival.

Objectives: To assess noninferiority of BMV vs ETI for advanced airway management with regard to survival with favorable neurological function at day 28.

Design, Settings, and Participants: Multicenter randomized clinical trial comparing BMV with ETI in 2043 patients with out-of-hospital cardiorespiratory arrest in France and Belgium. Enrollment occurred from March 9, 2015, to January 2, 2017, and follow-up ended January 26, 2017.

Intervention: Participants were randomized to initial airway management with BMV (n = 1020) or ETI (n = 1023).

Main Outcomes and Measures: The primary outcome was favorable neurological outcome at 28 days defined as cerebral performance category 1 or 2. A noninferiority margin of 1% was chosen. Secondary end points included rate of survival to hospital admission, rate of survival at day 28, rate of return of spontaneous circulation, and ETI and BMV difficulty or failure.

Results: Among 2043 patients who were randomized (mean age, 64.7 years; 665 women [32%]), 2040 (99.8%) completed the trial. In the intention-to-treat population, favorable functional survival at day 28 was 44 of 1018 patients (4.3%) in the BMV group and 43 of 1022 patients (4.2%) in the ETI group (difference, 0.11% [1-sided 97.5% CI, -1.64% to infinity]; P for noninferiority = .11). Survival to hospital admission (294/1018 [28.9%] in the BMV group vs 333/1022 [32.6%] in the ETI group; difference, -3.7% [95% CI, -7.7% to 0.3%]) and global survival at day 28 (55/1018 [5.4%] in the BMV group vs 54/1022 [5.3%] in the ETI group; difference, 0.1% [95% CI, -1.8% to 2.1%]) were not significantly different. Complications included difficult airway management (186/1027 [18.1%] in the BMV group vs 134/996 [13.4%] in the ETI group; difference, 4.7% [95% CI, 1.5% to 7.9%]; P = .004), failure (69/1028 [6.7%] in the BMV group vs 21/996 [2.1%] in the ETI group; difference, 4.6% [95% CI, 2.8% to 6.4%]; P < .001), and regurgitation of gastric content (156/1027 [15.2%] in the BMV group vs 75/999 [7.5%] in the ETI group; difference, 7.7% [95% CI, 4.9% to 10.4%]; P < .001).

Conclusions and Relevance: Among patients with out-of-hospital cardiorespiratory arrest, the use of BMV compared with ETI failed to demonstrate noninferiority or inferiority for survival with favorable 28-day neurological function, an inconclusive result. A determination of equivalence or superiority between these techniques requires further research.

Trial Registration: clinicaltrials.gov Identifier: NCT02327026.

Ventilation Strategies during Neonatal Cardiopulmonary Resuscitation.

Baik N1,2, O'Reilly M2,3, Fray C2,3, van Os S2,3, Cheung PY2,3, Schmölzer GM2,3.

Abstract

Approximately, 10-20% of newborns require breathing assistance at birth, which remains the cornerstone of neonatal resuscitation. Fortunately, the need for chest compression (CC) or medications in the delivery room (DR) is rare. About 0.1% of term infants and up to 15% of preterm infants receive these interventions, this will result in approximately one million newborn deaths annually worldwide. In addition, CC or medications (epinephrine) are more frequent in the preterm population (~15%) due to birth asphyxia. A recent study reported that only 6 per 10,000 infants received epinephrine in the DR. Further, the study reported that infants receiving epinephrine during resuscitation had a high incidence of mortality (41%) and short-term neurologic morbidity (57% hypoxic-ischemic encephalopathy and seizures). A recent review of newborns who received prolonged CC and epinephrine but had no signs of life at 10 min following birth noted 83% mortality, with 93% of survivors suffering moderate-to-severe disability. The poor prognosis associated with receiving CC alone or with medications in the DR raises questions as to whether improved cardiopulmonary resuscitation methods specifically tailored to the newborn could improve outcomes.

Free Article

POST CARDIAC ARREST TREATMENTS

Short-Latency Positive Peak Following N20 Somatosensory Evoked Potential Is Superior to N20 in Predicting Neurologic Outcome After Out-of-Hospital Cardiac Arrest.

Kim SW1, Oh JS, Park J, Jeong HH, Kim JH, Wee JH, Oh SH, Choi SP, Park KN; Cerebral Resuscitation and Outcome evaluation Within catholic Network (CROWN) Investigators.

Abstract

OBJECTIVES: The absence of N20 somatosensory evoked potential after cardiac arrest is related to poor outcome. However, discrimination between the low-amplitude and the absence of N20 is challenging. P25 and P30 are short-latency positive peaks with latencies between 25 and 30 ms following N20 (P25/30). P25/30 is evident even with an ambiguous N20 in patients with good outcome. Therefore, we evaluated the predictive value of P25/30 after cardiac arrest.

DESIGN: A retrospective observational study.

SETTING: University-affiliated hospital.

SUBJECTS:

Comatose survivors after out-of-hospital cardiac arrest treated by hypothermic targeted temperature management.

INTERVENTION: None.

MEASUREMENTS AND MAIN RESULTS: The specificity and the positive predictive value of P25/30 and N20 in predicting poor outcome were the same, showing a rate of 100%. The sensitivity of P25/30 in predicting poor outcome (90.12% [95% CI, 81.5-95.6%]) was higher than that of N20 (70.37% [95% CI, 59.2-80%]). Also, the negative predictive value of P25/30 in predicting poor outcome (81.4% [95% CI, 69.4-89.4%]) was higher than that of N20 (59.3% [95% CI, 51-67.1%]). The P25/30-based adjusted model showed a larger area under the curve (0.98 [95% CI, 0.95-1]) compared with the N20-based adjusted model (0.95 [95% CI, 0.91-0.98]) (p = 0.02).

CONCLUSIONS: The absence of P25/30 is related to poor outcome with a higher sensitivity, negative predictive value than the absence of N20.

Hemodynamic, Biochemical, and Ventilatory Parameters are Independently Associated with Outcome after Cardiac Arrest.

Pitcher JH1, Dziodzio J1, Keller J1, May T1, Riker RR1, Seder DB2.

Abstract

BACKGROUND: Hypotension, hyperglycemia, dysoxia, and dyscarbia may contribute to reperfusion injury, and each is independently associated with poor outcome (PO) after cardiac arrest. We investigated whether the combined effects of these physiological derangements are associated with cardiac arrest outcomes.

METHODS: This institutional review board-approved retrospective cohort study included consecutive resuscitated cardiac arrest patients that received targeted temperature management at Maine Medical Center from 2013 to 2015. We abstracted demographics, intra-arrest factors, and physiological parameters. The primary outcome was dichotomized cerebral performance category (CPC 1-2 vs 3-5) at hospital discharge. After comparing demographics, clinical factors, and persistent post-arrest physiological derangements in patients with good and PO, we constructed a logistic regression model comprised of clinical and demographic factors separately associated with severity, and physiology variables, attempting to evaluate the independent effects of persistent physiological derangements on outcome.

RESULTS: Sixty-eight of 222 (31%) patients had CPC 1-2 (good outcome [GO]) at discharge. In bivariate analysis, factors associated with PO included increased time from collapse to resuscitation, non-shockable rhythm, and age-combined Charlson comorbidity index. In multivariate analysis, each persistent physiological derangement incrementally decreased the likelihood of GO [OR GO per derangement 0.71 (interquartile range [IQR] 0.51-0.99), p = 0.042, area under the curve (AUC) for final model 0.769].

CONCLUSIONS: Uncorrected physiological derangements in the first 24 h after cardiac arrest are independently associated with PO. Although causality cannot be established, these findings support preclinical models suggesting that aggressive normalization of physiology after resuscitation may be a reasonable strategy to decrease reperfusion injury.

TARGET TEMPERATURE MANAGEMENT

Hypothermia outcome prediction after extracorporeal life support for hypothermic cardiac arrest patients: The HOPE score.

Pasquier M1, Hugli O2, Paal P3, Darocha T4, Blancher M5, Husby P6, Silfvast T7, Carron PN8, Rousson V9.

Abstract

AIMS: Currently, the decision to initiate extracorporeal life support for patients who suffer cardiac arrest due to accidental hypothermia is essentially based on serum potassium level. Our goal was to build a prediction score in order to determine the probability of survival following rewarming of hypothermic arrested patients based on several covariates available at admission.

METHODS: We included consecutive hypothermic arrested patients who underwent rewarming with extracorporeal life support. The sample comprised 237 patients identified through the literature from 18 studies, and 49 additional patients obtained from hospital data collection. We considered nine potential predictors of survival: age; sex; core temperature; serum potassium level; mechanism of hypothermia; cardiac rhythm at admission; witnessed cardiac arrest, rewarming method and cardiopulmonary resuscitation duration prior to the initiation of extracorporeal life support. The primary outcome parameter was survival to hospital discharge.

RESULTS: Overall, 106 of the 286 included patients survived (37%; 95% CI: 32-43%), most (84%) with a good neurological outcome. The final score included the following variables: age, sex, core temperature at admission, serum potassium level, mechanism of cooling, and cardiopulmonary resuscitation duration. The corresponding area under the receiver operating characteristic curve was 0.895 (95% CI: 0.859-0.931) compared to 0.774 (95% CI: 0.720-0.828) when based on serum potassium level alone.

CONCLUSIONS: In this large retrospective study we found that our score was superior to dichotomous triage based on serum potassium level in assessing which hypothermic patients in cardiac arrest would benefit from extracorporeal life support. External validation of our findings is required.

ELECTROFISIOLOGIA I DESFIBRIL·LACIÓ

Impact of Bystander Automated External Defibrillator Use on Survival and Functional Outcomes in Shockable Observed Public Cardiac Arrests.

Pollack RA1, Brown SP2, Rea T3, Aufderheide T4, Barbic D5, Buick JE6, Christenson J5, Idris AH7, Jasti J4, Kampp M8, Kudenchuk P3, May S2, Muhr M9, Nichol G10, Ornato JP11, Sopko G12, Vaillancourt C13, Morrison L14, Weisfeldt M15; ROC Investigators.

Abstract

Background - Survival following out-of-hospital cardiac arrest (OHCA) with shockable rhythms can be improved with early defibrillation. Although shockable OHCA accounts for only ≈25% of overall arrests, ≈60% of public OHCAs are shockable, offering the possibility of restoring thousands of individuals to full recovery with early defibrillation by bystanders. We sought to determine the association of bystander automated external defibrillator use with survival and functional outcomes in shockable observed public OHCA.

Methods - From 2011 to 2015, the Resuscitation Outcomes Consortium prospectively collected detailed information on all cardiac arrests at 9 regional centers. The exposures were shock administration by a bystander-applied automated external defibrillator in comparison with initial defibrillation by emergency medical services. The primary outcome measure was discharge with normal or near-normal (favorable) functional status defined as a modified Rankin Score ≤2. Survival to hospital discharge was the secondary outcome measure.

Results -Among 49 555 OHCAs, 4115 (8.3%) observed public OHCAs were analyzed, of which 2500 (60.8%) were shockable. A bystander shock was applied in 18.8% of the shockable arrests. Patients shocked by a bystander were significantly more likely to survive to discharge (66.5% versus 43.0%) and be discharged with favorable functional outcome (57.1% versus 32.7%) than patients initially shocked by emergency medical services. After adjusting for known predictors of outcome, the odds ratio associated with a bystander shock was 2.62 (95% confidence interval, 2.07-3.31) for survival to hospital discharge and 2.73 (95% confidence interval, 2.17-3.44) for discharge with favorable functional outcome. The benefit of bystander shock increased progressively as emergency medical services response time became longer.

Conclusions - Bystander automated external defibrillator use before emergency medical services arrival in shockable observed public OHCA was associated with better survival and functional outcomes. Continued emphasis on public automated external defibrillator utilization programs may further improve outcomes of OHCA.

PEDIATRIA

Pediatric trauma transfusion and cognitive aids.

Clebone A1.

Abstract

PURPOSE OF REVIEW: Trauma is the most common cause of pediatric mortality. Much of the research that led to life-saving interventions in adults, however, has not been replicated in the pediatric population. Children have important physiologic and anatomic differences from adults, which impact hemostasis and transfusion. Hemorrhage is a leading cause of death in trauma, and children have important differences in their coagulation profiles. Transfusion strategies, including the massive transfusion protocol and use of antifibrinolytics, are still controversial. In addition to the blood that is lost from the injury itself, trauma leads to inflammation and to a dysfunction in hemostasis, causing coagulopathy.

RECENT FINDINGS: In one study in which children suffered from mainly blast and penetrating injuries in a combat setting (PEDTRAX trial), the early administration of tranexamic acid was associated with decreased mortality. Some authors suggest that this result may not apply to blunt trauma, which is much more common in children in noncombat settings. Using thromboelastography to guide the

administration of recombinant Factor VIIa has been done in selected cases and may represent a future avenue of research.

SUMMARY: This article explores new research from the past year in pediatric trauma, starting with the physiologic differences in pediatric red blood cells and coagulation profiles. We also looked at the dramatic change in thinking over the past decade in the tolerable level of anemia in critically ill pediatric patients, as well as scales for determining the need for massive transfusion and exploring if the concepts of damage control resuscitation apply to children. Other strategies, such as avoiding hypothermia, and the selective administration of antifibriniolytics, are important in pediatric trauma as well. Future research that is pediatric focused is needed for the optimal care of our youngest patients.

Predicting the need for home gavage or g-tube feeds in asphyxiated neonates treated with therapeutic hypothermia.

Gupta S1, Bapuraj JR2, Carlson G1, Trumpower E1, Dechert RE1, Sarkar S3.

Abstract

BACKGROUND: Asphyxiated infants treated with therapeutic cooling can have persistent oral feeding difficulty because of involvement of neural pathways in the brainstem, cortex, and basal ganglia. The goal is to predict the composite adverse outcome of death or persistent oral feeding difficulty using precooling/cooling attributes, and the severity and distribution of hypoxic-ischemic lesions, especially brainstem lesions on post-cooling brain magnetic resonance imaging (MRI).

METHODS: Retrospective review of 86 asphyxiated infants cooled from January 2006 to August 2014. Persistent feeding difficulty was defined as needing feeding support (gastrostomy tube (g-tube) or home gavage feeds) after discharge. Clinical and laboratory risk factors, and the brain MRI abnormalities including the presence of brainstem lesions were compared between infants with and without adverse outcome using univariate analysis. Significant variables were then analyzed in a stepwise logistic regression (LR) model.

RESULTS: Infants with adverse outcome (n = 31, 4 died pre-discharge) had longer hospital stay (26 days, interquartile range (IQR) 19-43 vs. 13 days, IQR 9-20; p < 0.01) and reached goal enteral feeds (oral/gavage) later (11 days vs. 8 days, p < 0.01) compared to 55 infants discharged on full oral feeds. The former infants were more likely to have cord pH ≤ 7.15, severely abnormal neurological examination, bleeding diathesis, continued need for ventilation, and positive MRI findings including brainstem lesions. In LR analysis, brainstem lesions on MRI (p = 0.00, odds ratio 19, 95% confidence interval 4-85) was independently associated with the adverse outcome.

CONCLUSIONS: Brainstem involvement on post-cooling brain MRI was predictive of adverse outcome. Early identification of these infants may facilitate discussion of home feeding plans between clinicians and parents earlier, thereby potentially reducing the length of hospital stay.

Initiation of passive cooling at referring centre is most predictive of achieving early therapeutic hypothermia in asphyxiated newborns.

Lemyre B1, Ly L2, Chau V3,4, Chacko A 2, Barrowman N5, Whyte H2,4, Miller SP3,4.

Abstract

Objective: To identify factors associated with early initiation and achievement of therapeutic hypothermia (TH) in newborns with hypoxic-ischemic encephalopathy (HIE).

Methods: Retrospective cohort study of newborns who received TH according to National Institute of Child Health and Human Development (NICHD) criteria in two academic level 3 Neonatal Intensive Care Units (NICU) between 2009 and 2013. All infants were transported by a neonatal transport team (NNTT). Multivariate linear regression including who initiated cooling and degree of resuscitation in the model was performed.

Results: Two hundred and seven infants were included. Waiting for advice from a tertiary care NICU was independently associated with a 50 minute delay in the median time of initiation of TH. The need for extensive resuscitation (cardiopulmonary resuscitation [CPR] or epinephrine) was independently associated with a reduction of 43 minutes in the median time to reach target core temperature. Log-transformed time to initiation of TH was associated with time to reach target core temperature (P<0.001). A doubling of time to initiation of TH corresponds to a 24% (95% CI 18% to 30%) increase in median time to reach target core temperature.

Conclusions: Initiating passive cooling at the referring centre, before transfer, is critical to faster achievement of target core temperature in asphyxiated infants. Greater outreach education and development of clinical care pathways are needed to improve optimal delivery of TH to enhance outcome.

Effect of a Pediatric Early Warning System on All-Cause Mortality in Hospitalized Pediatric Patients: The EPOCH Randomized Clinical Trial.

Parshuram CS1,2,3,4,5,6,7,8, Dryden-Palmer K1,2,3, Farrell C9, Gottesman R10, Gray M1,4,5,8,11,12, Hutchison JS1,4,5,11,12, Helfaer M13, Hunt EA14, Joffe AR15, Lacroix J9, Moga MA1,4,8, Nadkarni V13, Ninis N16, Parkin PC2,6, 8,11, Wensley D17, Willan AR18, Tomlinson GA6,19; Canadian Critical Care Trials Group and the EPOCH Investigators.

Abstract

Importance: There is limited evidence that the use of severity of illness scores in pediatric patients can facilitate timely admission to the intensive care unit or improve patient outcomes.

Objective: To determine the effect of the Bedside Paediatric Early Warning System (BedsidePEWS) on all-cause hospital mortality and late admission to the intensive care unit (ICU), cardiac arrest, and ICU resource use.

Design, Setting, and Participants: A multicenter cluster randomized trial of 21 hospitals located in 7 countries (Belgium, Canada, England, Ireland, Italy, New Zealand, and the Netherlands) that provided inpatient pediatric care for infants (gestational age ≥37 weeks) to teenagers (aged ≤18 years). Participating hospitals had continuous physician staffing and subspecialized pediatric services. Patient enrollment began on February 28, 2011, and ended on June 21, 2015. Follow-up ended on July 19, 2015.

Interventions: The BedsidePEWS intervention (10 hospitals) was compared with usual care (no severity of illness score; 11 hospitals).

Main Outcomes and Measures: The primary outcome was all-cause hospital mortality. The secondary outcome was a significant clinical deterioration event, which was defined as a composite outcome reflecting late ICU admission. Regression analyses accounted for hospital-level clustering and baseline rates.

Results: Among 144 539 patient discharges at 21 randomized hospitals, there were 559 443 patient-days and 144 539 patients (100%) completed the trial. All-cause hospital mortality was 1.93 per 1000 patient discharges at hospitals with BedsidePEWS and 1.56 per 1000 patient discharges at hospitals with usual care (adjusted between-group rate difference, 0.01 [95% CI, -0.80 to 0.81 per 1000 patient discharges]; adjusted odds ratio, 1.01 [95% CI, 0.61 to 1.69]; P = .96). Significant clinical deterioration events occurred during 0.50 per 1000 patient-days at hospitals with BedsidePEWS vs 0.84 per 1000 patient-days at hospitals with usual care (adjusted between-group rate difference, -0.34 [95% CI, -0.73 to 0.05 per 1000 patient-days]; adjusted rate ratio, 0.77 [95% CI, 0.61 to 0.97]; P = .03).

Conclusions and Relevance: Implementation of the Bedside Paediatric Early Warning System compared with usual care did not significantly decrease all-cause mortality among hospitalized pediatric patients. These findings do not support the use of this system to reduce mortality.

Trial Registration: clinicaltrials.gov Identifier: NCT01260831.

RECERCA EXPERIMENTAL

Antioxidant defense and protection against cardiac arrhythmias: lessons from a mammalian hibernator (the woodchuck).

Zhao Z1,2, Kudej RK2,3, Wen H2,4, Fefelova N 2, Yan L5, Vatner DE2, Vatner SF2, Xie LH2.

Abstract

Hibernating animals show resistance to hypothermia-induced cardiac arrhythmias. However, it is not clear whether and how mammalian hibernators are resistant to ischemia-induced arrhythmias. The goal of this investigation was to determine the susceptibility of woodchucks (Marmota monax) to arrhythmias and their mechanisms after coronary artery occlusion at the same room temperature in both winter, the time for hibernation, and summer, when they do not hibernate. By monitoring telemetric electrocardiograms, we found significantly higher arrhythmia scores, calculated as the severity of arrhythmias, with incidence of ventricular tachycardia, ventricular fibrillation, and thus sudden cardiac death (SCD) in woodchucks in summer than they had in winter. The level of catalase expression in woodchuck hearts was significantly higher, whereas the level of oxidized Ca^{2+}/calmodulin-dependent protein kinase II (CaMKII) was lower in winter than it was in summer. Ventricular myocytes isolated from woodchucks in winter were more resistant to H_2O_2-induced early afterdepolarizations (EADs) compared with myocytes isolated from woodchucks in summer. The EADs were eliminated by inhibiting CaMKII (with KN-93), l-type Ca current (with nifedipine), or late Na^+ current (with ranolazine). In woodchucks, in the summer, the arrhythmia score was significantly reduced by overexpression of catalase (via adenoviral vectors) or the inhibition of CaMKII (with KN-93) in the heart. This study suggests that the heart of the mammalian hibernator is more resistant to ischemia-induced arrhythmias and SCD in winter. Increased antioxidative capacity and reduced CaMKII activity may confer resistance in woodchuck hearts against EADs and arrhythmias during winter. The profound protection conferred by catalase overexpression or CaMKII inhibition in this novel natural animal model may provide insights into clinical directions for therapy of arrhythmias.-Zhao, Z., Kudej, R. K., Wen, H., Fefelova, N., Yan, L., Vatner, D. E., Vatner, S. F., Xie, L.-H. Antioxidant defense and protection against cardiac arrhythmias: lessons from a mammalian hibernator (the woodchuck).

Glibenclamide Prevents Water Diffusion Abnormality in the Brain After Cardiac Arrest in Rats.

Huang K1, Wang Z1, Gu Y1, Ji Z1, Lin Z1, Wang S1, Pan S1, Wu Y2.

Abstract

BACKGROUND: Glibenclamide (GBC) improves neurological outcome after cardiac arrest (CA) in rats. In this study, we sought to elucidate the mechanism responsible for the neuroprotective effects of GBC by using a high-field MRI system.

METHODS: Male Sprague-Dawley rats were subjected to 10-min asphyxial CA followed by cardiopulmonary resuscitation (CPR). Diffusion-weighted imaging (DWI) as well as conventional T2-weighted imaging was conducted prior to CA and at 24, 48, and 72 h after resuscitation. Afterward, histological examination was performed.

RESULTS: Twelve rats were randomized to receive GBC (n = 6) or vehicle (n = 6) at 15 min after return of spontaneous circulation, while four rats were set as sham control. Rats that underwent CA/CPR and received vehicle exhibited distinct neurological deficit, which was alleviated by GBC treatment. Marked water diffusion abnormality as demonstrated by hyperintense DWI in vulnerable regions of the brain was detected after CA/CPR, with the most prominent hyperintense DWI observed in the hippocampal CA1 region at 72 h. Consistently, histological examination revealed neuronal swelling, dendritic injury, and activation of astrocytes and microglia in the hippocampal CA1 region in vehicle-treated rats. Correlation analysis revealed that the ADC values in the hippocampus were significantly correlated with the histological findings (all $p < 0.05$).

CONCLUSION: These results suggest that the neuroprotective effects of GBC after CA was exerted, as least in part, through prevention of water diffusion abnormality, namely brain edema.