Association between chest compression rates and clinical outcomes following in-hospital cardiac arrest at an academic tertiary hospital.

Kilgannon JH1, Kirchhoff M1, Pierce L2, Aunchman N1, Trzeciak S3, Roberts BW4.

Abstract

AIMS: Recent guidelines for management of cardiac arrest recommend chest compression rates of 100-120 compressions/min. However, animal studies have found cardiac output to increase with rates up to 150 compressions/min. The objective of this study was to test the association between chest compression rates during cardiopulmonary resuscitation for in-hospital cardiac arrest (IHCA) and outcome.

METHODS: We conducted a prospective observational study at a single academic medical center.

INCLUSION CRITERIA: age ≥18, IHCA, cardiopulmonary resuscitation performed. We analyzed chest compression rates measured by defibrillation electrodes, which recorded changes in thoracic impedance. The primary outcome was return of spontaneous circulation (ROSC). We used multivariable logistic regression to determine odds ratios for ROSC by chest compression rate categories (100-120, 121-140,>140 compressions/min), adjusted for chest compression fraction (proportion of time chest compressions provided) and other known predictors of outcome. We set 100-120 compressions/min as the reference category for the multivariable model.

RESULTS: We enrolled 222 consecutive patients and found a mean chest compression rate of 139±15. Overall 53% achieved ROSC; among 100-120, 121-140, and>140 compressions/min, ROSC was 29%, 64%, and 49% respectively. A chest compression rate of 121-140 compressions/min had the greatest likelihood of ROSC, odds ratio 4.48 (95% CI 1.42-14.14).

CONCLUSIONS: In this sample of adult IHCA patients, a chest compression rate of 121-140 compressions/min had the highest odds ratio of ROSC. Rates above the currently recommended 100-120 compressions/min may improve the chances of ROSC among IHCA patients.

REGISTRES I REVISIONS

Translating into Practice Cancer Patients' Views on Do-Not-Resuscitate Decision-Making.

Olver IN1, Eliott JA2.

Abstract

Do-not-resuscitate (DNR) orders are necessary if resuscitation, the default option in hospitals, should be avoided because a patient is known to be dying and attempted resuscitation would be inappropriate. To avoid inappropriate resuscitation at night, if no DNR order has been recorded, after-hours medical staff are often asked to have a DNR discussion with patients whose condition is deteriorating, but with whom they are unfamiliar. Participants in two qualitative studies of cancer patients' views on how to present DNR discussions recognized that such patients are at different stages of understanding of their situation and may not be ready for a DNR discussion; therefore, a one-policy-fits-all approach was thought to be inappropriate. To formulate a policy that incorporates the patient's views, we propose that a standard form which mandates a DNR discussion is replaced by a "blank sheet" with instructions to record the progress of the discussion with the patient, and a medical recommendation for a DNR decision to guide the nursing staff in case of a cardiac arrest. Such an advance care directive would have to honor specifically expressed patient or guardian wishes whilst allowing for flexibility, yet would direct nurses or other staff so that they can avoid inappropriate cardiopulmonary resuscitation of a patient dying of cancer.

Location of In-Hospital Cardiac Arrest in the United States-Variability in Event Rate and Outcomes.

Perman SM1, Stanton E2, Soar J3, Berg RA4, Donnino MW5, Mikkelsen ME2, Edelson DP6, Churpek MM6, Yang L7, Merchant RM8; American Heart Association's Get With the Guidelines®—Resuscitation (formerly the National Registry of Cardiopulmonary Resuscitation) Investigators.
Collaborators: (16)
Nichol G, Nadkarni VM, Peberdy MA, Chan PS, Mader T, Kern KB, Warren S, Allen E, Eigel B, Hunt EA, Ornato JP, Braithwaite S, Geocadin RG, Mancini ME, Potts J, Truitt TL.

Abstract

BACKGROUND: In-hospital cardiac arrest (IHCA) is a major public health problem with significant mortality. A better understanding of where IHCA occurs in hospitals (intensive care unit [ICU] versus monitored ward [telemetry] versus unmonitored ward) could inform strategies for reducing preventable deaths.

METHODS AND RESULTS: This is a retrospective study of adult IHCA events in the Get with the Guidelines-Resuscitation database from January 2003 to September 2010. Unadjusted analyses were used to characterize patient, arrest, and hospital-level characteristics by hospital location of arrest (ICU versus inpatient ward). IHCA event rates and outcomes were plotted over time by arrest location. Among 85 201 IHCA events at 445 hospitals, 59% (50 514) occurred in the ICU compared to 41% (34 687) on the inpatient wards. Compared to ward patients, ICU patients were younger (64±16 years versus 69±14; P<0.001) and more likely to have a presenting rhythm of ventricular tachycardia/ventricular fibrillation (21% versus 17%; P<0.001). In the ICU, mean event rate/1000 bed-days was 0.337 (±0.215) compared with 0.109 (±0.079) for telemetry wards and 0.134 (±0.098) for unmonitored wards. Of patients with an arrest in the ICU, the adjusted mean survival to discharge was 0.140 (0.037) compared with the unmonitored wards 0.106 (0.037) and telemetry wards 0.193 (0.074). More IHCA events occurred in the ICU compared to the inpatient wards and there was a slight increase in events/1000 patient bed-days in both locations.

CONCLUSIONS: Survival rates vary based on location of IHCA. Optimizing patient assignment to unmonitored wards versus telemetry wards may contribute to improved survival after IHCA.

Age-specific prognostication after out-of-hospital cardiac arrest - The ethical dilemma between 'life-sustaining treatment' and 'the right to die' in the elderly.

Sulzgruber P1, Sterz F2, Poppe M1, Schober A1, Lobmeyr E1, Datler P3, Keferböck M1, Zeiner S1, Nürnberger A1, Hubner P1, Stratil P1, Wallmueller C1, Weiser C1, Warenits AM1, van Tulder R1, Zajicek A4, Buchinger A4, Testori C1.

Abstract

BACKGROUND: While prognostic values on survival after out-of-hospital cardiac arrest have been well investigated, less attention has been paid to their age-specific relevance. Therefore, we aimed to identify suitable age-specific early prognostication in elderly patients suffering out-of-hospital cardiac arrest in order to reduce the burden of unnecessary treatment and harm.

METHODS: In a prospective population-based observational trial on individuals suffering out-of-hospital cardiac arrest, a total of 2223 patients receiving resuscitation attempts by the local emergency medical service in Vienna, Austria, were enrolled. Patients were stratified according to age as follows: young and middle-aged individuals (<65 years), young old individuals (65-74 years), old individuals (75-84 years) and very old individuals (>85 years).

RESULTS: There was an increasing rate of 30-day mortality (+21.8%, p < 0.001) and unfavourable neurological outcome (+18.8%, p < 0.001) with increasing age among age groups. Established predictive variables lost their prognostic potential with increasing age, even after adjusting for potential confounders. Independently, an initially shockable electrocardiogram proved to be directly associated with survival, with an adjusted hazard ratio (HR) of 2.04 (95% confidence interval (CI) 1.89-2.38, p = 0.003) for >85-year-olds. Frailty was directly associated with mortality (HR 1.22, 95% CI 1.01-1.51, p = 0.049), showing a 30-day survival of 5.6% and a favourable neurological outcome of 1.1% among elderly individuals.

CONCLUSION: An initially shockable electrocardiogram proved to be a suitable tool for risk assessment and decision making in order to predict a successful outcome in elderly victims of out-of-hospital cardiac arrest. However, the outcomes of elderly patients seemed to be

exceptionally poor in frail individuals and need to be considered in order to reduce unnecessary treatment decisions.

Effect of Dispatcher-Assisted Cardiopulmonary Resuscitation Program and Location of Out-of-Hospital Cardiac Arrest on Survival and Neurologic Outcome.
Ro YS1, Shin SD2, Lee YJ3, Lee SC4, Song KJ3, Ryoo HW5, Ong ME6, McNally B7, Bobrow B8, Tanaka H9, Myklebust H10, Birkenes TS10.
Abstract
STUDY OBJECTIVE: We study the effect of a nationwide dispatcher-assisted cardiopulmonary resuscitation (CPR) program on out-of-hospital cardiac arrest outcomes by arrest location (public and private settings).
METHODS: All emergency medical services (EMS)-treated adults in Korea with out-of-hospital cardiac arrests of cardiac cause were enrolled between 2012 and 2013, excluding cases witnessed by EMS providers and those with unknown outcomes. Exposure was bystander CPR categorized into 3 groups: bystander CPR with dispatcher assistance, bystander CPR without dispatcher assistance, and no bystander CPR. The endpoint was good neurologic recovery at discharge. Multivariable logistic regression analysis was performed. The final model with an interaction term was evaluated to compare the effects across settings.
RESULTS: A total of 37,924 patients (31.1% bystander CPR with dispatcher assistance, 14.3% bystander CPR without dispatcher assistance, and 54.6% no bystander CPR) were included in the final analysis. The total bystander CPR rate increased from 30.9% in quarter 1 (2012) to 55.7% in quarter 4 (2014). Bystander CPR with and without dispatcher assistance was more likely to result in higher survival with good neurologic recovery (4.8% and 5.2%, respectively) compared with no bystander CPR (2.1%). The adjusted odds ratios for good neurologic recovery were 1.50 (95% confidence interval [CI] 1.30 to 1.74) in bystander CPR with dispatcher assistance and 1.34 (95% CI 1.12 to 1.60) in bystander CPR without it compared with no bystander CPR. For arrests in private settings, the adjusted odds ratios were 1.58 (95% CI 1.30 to 1.92) in bystander CPR with dispatcher assistance and 1.28 (95% CI 0.98 to 1.67) in bystander CPR without it; in public settings, the adjusted odds ratios were 1.41 (95% CI 1.14 to 1.75) and 1.37 (95% CI 1.08 to 1.72), respectively.
CONCLUSION: Bystander CPR regardless of dispatcher assistance was associated with improved neurologic recovery after out-of-hospital cardiac arrest. However, for out-of-hospital cardiac arrest cases in private settings, bystander CPR was associated with improved neurologic recovery only when dispatcher assistance was provided.

Accidental hypothermia: factors related to long-term hospitalization. A retrospective study from northern Finland.
Pirnes J1, Ala-Kokko T2.
Abstract
Accidental hypothermia has a low incidence, but is associated with a high mortality rate. Knowledge about concomitant factors, complications, and length of hospital stay is limited. A retrospective cohort study on patients with accidental hypothermia admitted to Oulu University Hospital in Finland, over a 5-year period. Patients were categorized as short-stay patients (7 days or less) and long-stay patients (more than 7 days) according to their length of stay in hospital. From a total of 105 patients, 67 patients were included in the analyses. Alcohol abuse was the most common concomitant factor (54 %). Median length of hospital stay was 4 days, and 16 patients (24 %) stayed in hospital over 7 days (median 15 days). Thirty-day mortality was low (14/105, 13 %). Patients with long-term hospitalization had a lower initial temperature (28.4 versus 31.2 °C, $p = 0.011$), a lower level of consciousness (GCS score 8.4 versus 12.8, $p = 0.003$), more severe acidosis (pH 7.08 versus 7.28, $p = 0.005$, and lactate 7.2 versus 3.9, $p = 0.043$), and a lower level of platelets (183 versus 242, $p = 0.041$) on admission compared with short-stay patients. Thirty-six patients (54 %) had at least one complication, and this prolonged median hospital treatment for 2.5 days ($p < 0.001$). Alcohol is the most common concomitant factor and every fourth patient spends more than 7 days in hospital. Long-term hospitalization is related to

a lower core temperature, lower consciousness, more severe lactic acidosis, lower platelet level and infections, rhabdomyolysis, and renal failure.

VENTILACIÓ

Feasibility of the capnogram to monitor ventilation rate during cardiopulmonary resuscitation.
Aramendi E1, Elola A2, Alonso E3, Irusta U2, Daya M4, Russell JK4, Hubner P5, Sterz F5.
Abstract
AIM: The rates of chest compressions (CCs) and ventilations are both important metrics to monitor the quality of cardiopulmonary resuscitation (CPR). Capnography permits monitoring ventilation, but the CCs provided during CPR corrupt the capnogram and compromise the accuracy of automatic ventilation detectors. The aim of this study was to evaluate the feasibility of an automatic algorithm based on the capnogram to detect ventilations and provide feedback on ventilation rate during CPR, specifically addressing intervals where CCs are delivered.
METHODS: The dataset used to develop and test the algorithm contained in-hospital and out-of-hospital cardiac arrest episodes. The method relies on adaptive thresholding to detect ventilations in the first derivative of the capnogram. The performance of the detector was reported in terms of sensitivity (SE) and Positive Predictive Value (PPV). The overall performance was reported in terms of the rate error and errors in the hyperventilation alarms. Results were given separately for the intervals with CCs.
RESULTS: A total of 83 episodes were considered, resulting in 4880min and 46,740 ventilations (8741 during CCs). The method showed an overall SE/PPV above 99% and 97% respectively, even in intervals with CCs. The error for the ventilation rate was below 1.8min-1 in any group, and >99% of the ventilation alarms were correctly detected.
CONCLUSION: A method to provide accurate feedback on ventilation rate using only the capnogram is proposed. Its accuracy was proven even in intervals where canpography signal was severely corrupted by CCs. This algorithm could be integrated into monitor/defibrillators to provide reliable feedback on ventilation rate during CPR.

DESFIBRIL·LACIÓ I ELECTROFISIOLOGIA

Optimization of Automated External Defibrillator Deployment Outdoors: an Evidence-Based Approach.
Dahan B1, Jabre P2, Karam N3, Misslin R4, Bories MC5, Tafflet M5, Bougouin W6, Jost D7, Beganton F5, Beal G5, Pelloux P8, Marijon E9, Jouven X9.
Abstract
BACKGROUND: The benefits of available automatic external defibrillators (AEDs) for out-of-hospital cardiac arrests (OHCAs) are well known, but strategies for their deployment outdoors remain somewhat arbitrary. Our study sought to assess different strategies for AED deployment.
METHODS: All OHCAs in Paris between 2000 and 2010 were prospectively recorded and geocoded. A guidelines-based strategy of placing an AED in locations where more than one OHCA had occurred within the past five years was compared to two novel strategies: a grid-based strategy with a regular distance between AEDs and a landmark-based strategy. The expected number of AEDs necessary and their median (IQR) distance to the nearest OHCA were assessed for each strategy.
RESULTS: Of 4,176 OHCAs, 1,372 (33%) occurred in public settings. The first strategy would result in the placement of 170 AEDs, with a distance to OHCA of 416 (180-614) meters and a continuous increase in the number of AEDS. In the second strategy, the number of AEDs and their distance to the closest OHCA would change with the grid size, with a number of AEDs between 200 and 400 seeming optimal. In the third strategy, median distances between OHCAs and AEDs would be 324meters if placed at post offices (n=195), 239 at subway stations (n=302), 137 at bike-sharing stations (n=957), and 142 at pharmacies (n=1466).

CONCLUSION: This study presents an original evidence-based approach to strategies of AED deployment to optimize their number and location. This rational approach can estimate the optimal number of AEDs for any city.

TRAUMA

Use of intraosseous devices in trauma: a survey of trauma practitioners in Canada, Australia and New Zealand.
Engels PT1, Erdogan M1, Widder SL1, Butler MB1, Kureshi N1, Martin K1, Green RS1.
Abstract
BACKGROUND: Although used primarily in the pediatric population for decades, the use of intraosseous (IO) devices in the resuscitation of severely injured adult trauma patients has recently become more commonplace. The objective of this study was to determine the experience level, beliefs and attitudes of trauma practitioners in Canada, Australia and New Zealand regarding the use of IO devices in adult trauma patients.
METHODS: We administered a web-based survey to all members of 4 national trauma and emergency medicine organizations in Canada, Australia and New Zealand. Survey responses were analyzed using descriptive statistics, univariate comparisons and a proportional odds model.
RESULTS: Overall, 425 of 1771 members completed the survey, with 375 being trauma practitioners. IO devices were available to 97% (353 of 363), with EZ-IO being the most common. Nearly all physicians (98%, 357 of 366) had previous training with IO devices, and 85% (223 of 261) had previously used an IO device in adult trauma patients. Most respondents (79%, 285 of 361) were very comfortable placing an IO catheter in the proximal tibia. Most physicians would always or often use an IO catheter in a patient without intravenous access undergoing CPR for traumatic cardiac arrest (84%, 274 of 326) or in a hypotensive patient (without peripheral intravenous access) after 2 attempts or 90 s of trying to establish vascular access (81%, 264 of 326).
CONCLUSION: Intraosseous devices are readily available to trauma practitioners in Canada, Australia and New Zealand, and most physicians are trained in device placement. Most physicians surveyed felt comfortable using an IO device in resuscitation of adult trauma patients and would do so for indications broader than current guidelines.

ECMO

Clinical outcomes in patients with acute hemodynamic collapse supported by extracorporeal life support.
Fujii T1, Nagamatsu H1, Nakano M1, Ohno Y1, Nakazawa G1, Shinozaki N1, Yoshimachi F1, Ikari Y2.
Author information:
Abstract
Although extracorporeal life support (ECLS) is utilized for acute hemodynamic collapse, clinical outcomes for such patients are uncertain. The present study examined 30-day clinical outcomes in patients treated with ECLS for acute hemodynamic collapse, and determined the factors associated with 30-day mortality in patients who required ECLS for cardiopulmonary arrest (CPA). A total of 200 patients, in whom emergency ECLS was utilized for acute hemodynamic collapse from 2006 to 2015, were analyzed retrospectively. The impact of CPA on all-cause 30-day death in the overall population was examined by multivariable logistic regression analysis; comparisons were made between 30-day survivors (n = 78) and non-survivors (n = 122). In addition, clinical factors associated with 30-day survival for patients in whom ECLS was utilized for CPA (n = 139) were examined. All-cause 30-day mortality in the overall study population was 61 % (122/200). CPA was the most common cause of ECLS requirement (70 %), and the factor associated strongest with death at 30-days (OR 3.31, 95 % CI 1.75-6.36, P < 0.01). Witnessed CPA with bystander cardiopulmonary resuscitation (CPR) (OR 4.33, 95 % CI 1.08-29.1, P = 0.04) and a less than 40 min interval between CPA and ECLS (OR 3.49, 95 % CI 1.39-9.02, P < 0.01) were

suggested as factors associated with 30-day survival in CPA patients. CPA as a trigger of ECLS was a strong contributor to 30-day death in patients in whom emergency ECLS was utilized. However, witnessed CPA with bystander CPR and a less than 40 min interval from CPA to start of ECLS were suggested as factors associated with survival in these CPA patients.

PEDIATRIA

1. Pediatr Crit Care Med. 2016 Sep 27. [Epub ahead of print]
Pediatric Out-of-Hospital Cardiac Arrest Characteristics and Their Association With Survival and Neurobehavioral Outcome.
Meert KL1, Telford R, Holubkov R, Slomine BS, Christensen JR, Dean JM, Moler FW; Therapeutic Hypothermia after Pediatric Cardiac Arrest (THAPCA) Trial Investigators.
Abstract
OBJECTIVE: To investigate relationships between cardiac arrest characteristics and survival and neurobehavioral outcome among children recruited to the Therapeutic Hypothermia after Pediatric Cardiac Arrest Out-of-Hospital trial.
DESIGN: Secondary analysis of Therapeutic Hypothermia after Pediatric Cardiac Arrest Out-of-Hospital trial data.
SETTING: Thirty-six PICUs in the United States and Canada.
PATIENTS: All children (n = 295) had chest compressions for greater than or equal to 2 minutes, were comatose, and required mechanical ventilation after return of circulation.
INTERVENTIONS: Neurobehavioral function was assessed using the Vineland Adaptive Behavior Scales, Second Edition at baseline (reflecting prearrest status) and 12 months postarrest. U.S. norms for Vineland Adaptive Behavior Scales, Second Edition scores are 100 (mean) ± 15 (SD). Higher scores indicate better functioning. Outcomes included 12-month survival and 12-month survival with Vineland Adaptive Behavior Scales, Second Edition greater than or equal to 70.
MEASUREMENT AND MAIN RESULTS: Cardiac etiology of arrest, initial arrest rhythm of ventricular fibrillation/tachycardia, shorter duration of chest compressions, compressions not required at hospital arrival, fewer epinephrine doses, and witnessed arrest were associated with greater 12-month survival and 12-month survival with Vineland Adaptive Behavior Scales, Second Edition greater than or equal to 70. Weekend arrest was associated with lower 12-month survival. Body habitus was associated with 12-month survival with Vineland Adaptive Behavior Scales, Second Edition greater than or equal to 70; underweight children had better outcomes, and obese children had worse outcomes. On multivariate analysis, acute life threatening event/sudden unexpected infant death, chest compressions more than 30 minutes, and weekend arrest were associated with lower 12-month survival; witnessed arrest was associated with greater 12-month survival. Acute life threatening event/sudden unexpected infant death, other respiratory causes of arrest except drowning, other/unknown causes of arrest, and compressions more than 30 minutes were associated with lower 12-month survival with Vineland Adaptive Behavior Scales, Second Edition greater than or equal to 70.
CONCLUSIONS: Many factors are associated with survival and neurobehavioral outcome among children who are comatose and require mechanical ventilation after out-of-hospital cardiac arrest. These factors may be useful for identifying children at risk for poor outcomes, and for improving prevention and resuscitation strategies.

2. Pediatr Emerg Care. 2016 Sep 23. [Epub ahead of print]
Predictive Factors for Clinical Severity and Cardiopulmonary Arrest in Pediatric Electrical Injuries in Southeastern Turkey.
Çağlar A1, Ayvaz A, Güzeçiçek A, Yildirim A, Karaarslan U, Babayiğit A, Duman M.
Abstract
OBJECTIVE: An electrical injury (EI) is an emergency that causes high morbidity and mortality each year. The aim of this study was to define the epidemiological, clinical, and laboratory factors that might predict severe patients and cardiac arrest in pediatric EI cases.
METHODS: All of the patients' medical files were reviewed retrospectively through a 2-year period for the demographic, clinical, and laboratory findings. The patients were classified into the severe injury group or the mild injury group. The SPSS (Chicago, Ill) software was used to analyze the data.

RESULTS: Among the 38 patients, 18 patients (47.4%) were in the mild group, and 20 patients (52.6%) were in the severe group. Low-voltage injuries were observed in 35 (92.1%) of the patients. Most of the severe patients were injured with low voltage (75%) and in household settings (85%). Plug and sockets were the most observed source of the injuries in all of the patients, whereas water-related injuries were most prevalent in the severe group. The source of injury was different in the mild and severe groups (P = 0.009). In the severe group, 13 patients (34.2%) were resuscitated after cardiopulmonary arrest. In the multivariate analysis of the demographic data, the most predictive parameters for cardiac arrest and the clinical severity in EIs are the factors of electrical cables and water.

CONCLUSIONS: Electrical injuries are a significant concern in the pediatric population. Our results showed that low voltage and household electricity could cause morbidity and mortality.

Theoretical knowledge and skill retention 4 months after a European Paediatric Life Support course.

Charalampopoulos D1, Karlis G, Barouxis D, Syggelou A, Mikalli C, Kountouris D, Modestou N, Van de Voorde P, Danou F, Iacovidou N, Xanthos T.

Abstract

OBJECTIVE: The European Paediatric Life Support (EPLS) provider course aims at training doctors and nurses in the efficient and prompt management of cardiopulmonary arrest in children. EPLS is a 2-day European Resuscitation Council course, involving the teaching of theoretical knowledge and practical skills. The aim of the study was to evaluate the retention of theoretical knowledge and certain skills of EPLS providers 4 months after the course.

MATERIALS AND METHODS: In total, 80 doctors and nurses who attended three EPLS provider courses, from May 2012 to December 2012, were asked to participate in the study and only 50 responded positively. Demographic data (age, sex, occupation) of the participants were collected. The European Resuscitation Council-approved EPLS written test was used to assess theoretical knowledge right after the course and after 4 months. The retention of certain skills (airway opening, bag-mask ventilation, chest compressions) was also examined.

RESULTS: The theoretical knowledge decreased significantly (P<0.001) 4 months after the course. Age, sex and occupational status (medical or nursing profession) had no effect in theoretical knowledge retention. Interestingly, certain skills such as the application of airway opening manoeuvres and effective bag-mask ventilation were retained 4 months after the course, whereas chest compression skill retention significantly declined (P=0.012).

CONCLUSION: According to our findings, theoretical knowledge of the EPLS course uniformly declines, irrespective of the provider characteristics, whereas retention of certain skills is evident 4 months after the course.

Two-Thumb Encircling Technique Over the Head of Patients in the Setting of Lone Rescuer Infant CPR Occurred During Ambulance Transfer: A Crossover Simulation Study.

Jo CH1, Cho GC, Lee CH.

Abstract

OBJECTIVE: The purpose of this study was to determine if the over-the-head 2-thumb encircling technique (OTTT) provides better overall quality of cardiopulmonary resuscitation compared with conventional 2-finger technique (TFT) for a lone rescuer in the setting of infant cardiac arrest in ambulance.

METHODS: Fifty medical emergency service students were voluntarily recruited to perform lone rescuer infant cardiopulmonary resuscitation for 2 minutes on a manikin simulating a 3-month-old baby in an ambulance. Participants who performed OTTT sat over the head of manikins to compress the chest using a 2-thumb encircling technique and provide bag-valve mask ventilations, whereas those who performed TFT sat at the side of the manikins to compress using 2-fingers and provide pocket-mask ventilations.

RESULTS: Mean hands-off time was not significantly different between OTTT and TFT (7.6 ± 1.1 seconds vs 7.9 ± 1.3 seconds, P = 0.885). Over-the-head 2-thumb encircling technique resulted in greater depth of compression (42.6 ± 1.4 mm vs 41.0 ± 1.4 mm, P < 0.001) and faster rate of compressions (114.4 ± 8.0 per minute vs 112.2 ± 8.2 per minute, P = 0.019) than TFT. Over-the-

head 2-thumb encircling technique resulted in a smaller fatigue score than TFT (1.7 ± 1.5 vs 2.5 ± 1.6, P < 0.001). In addition, subjects reported that compression, ventilation, and changing compression to ventilation were easier in OTTT than in TFT.

CONCLUSIONS: The use of OTTT may be a suitable alternative to TFT in the setting of cardiac arrest of infants during ambulance transfer.

LESIONS RELACIONADES AMB LA RCP

1. Prehosp Disaster Med. 2016 Sep 19:1-3. [Epub ahead of print]

Thoracic Spine Fracture in a Survivor of Out-of-Hospital Cardiac Arrest with Mechanical CPR.

Marshall RT1, Kotecha H2, Chiba T3, Tennyson J3.

Abstract

This is a report of a thoracic vertebral fracture in a 79-year-old male survivor of out-of-hospital cardiac arrest with chest compressions provided by a LUCAS 2 (Physio-Control Inc.; Lund Sweden) device. This is the first such report in the literature of a vertebral fracture being noted in a survivor of cardiac arrest where an automated compression device was used.

ENTRENAMENT

1. Biomed Res Int. 2016;2016:6418710. Epub 2016 Sep 7.

Evaluation of Smartphone Applications for Cardiopulmonary Resuscitation Training in South Korea.

Ahn C1, Cho Y1, Oh J2, Song Y3, Lim TH2, Kang H2, Lee J1.

Abstract

Objective: There are many smartphone-based applications (apps) for cardiopulmonary resuscitation (CPR) training. We investigated the conformity and the learnability/usability of these apps for CPR training and real-life supports. Methods. We conducted a mixed-method, sequential explanatory study to assess CPR training apps downloaded on two apps stores in South Korea. Apps were collected with inclusion criteria as follows, Korean-language instruction, training features, and emergency supports for real-life incidents, and analyzed with two tests; 15 medical experts evaluated the apps' contents according to current Basic Life Support guidelines in conformity test, and 15 nonmedical individuals examined the apps using System Usability Scale (SUS) in the learnability/usability test. Results. Out of 79 selected apps, five apps were included and analyzed. For conformity (ICC, 0.95, p < 0.001), means of all apps were greater than 12 of 20 points, indicating that they were well designed according to current guidelines. Three of the five apps yielded acceptable level (greater than 68 of 100 points) for learnability/usability.

Conclusion: All the included apps followed current BLS guidelines and a majority offered acceptable learnability/usability for layperson. Current and developmental smartphone-based CPR training apps should include accurate CPR information and be easy to use for laypersons that are potential rescuers in real-life incidents. For Clinical Trials. This is a clinical trial, registered at the Clinical Research Information Service (CRIS, cris.nih.go.kr), number KCT0001840.

CURES POST

1. Intensive Care Med. 2016 Sep 28. [Epub ahead of print]

Venoarterial extracorporeal membrane oxygenation for refractory cardiogenic shock post-cardiac arrest.

de Chambrun MP1,2, Bréchot N1,2, Lebreton G3, Schmidt M1, 2, Hekimian G1,2, Demondion P3, Trouillet JL1,2, Leprince P3, Chastre J1,2, Combes A1,2, Luyt CE4,5.

Abstract

PURPOSE: To describe the characteristics, outcomes, and risk factors associated with poor outcome of venoarterial extracorporeal membrane oxygenation (VA-ECMO)-treated patients with refractory shock post-cardiac arrest.

METHODS: We retrospectively analyzed data collected prospectively (March 2007-January 2015) in a 26-bed tertiary hospital intensive care unit. All patients implanted with VA-ECMO for refractory cardiogenic shock after successful resuscitation from cardiac arrest were included.

Refractory cardiac arrest patients, given VA-ECMO under cardiopulmonary resuscitation, were excluded.

RESULTS: Ninety-four patients received VA-ECMO for refractory shock post-cardiac arrest. Their hospital and 12-month survival rates were 28 and 27 %, respectively. All 1-year survivors were cerebral performance category 1. Multivariable analysis retained INR >2.4 (OR 4.9; 95 % CI 1.4-17.2), admission SOFA score >14 (OR 5.3; 95 % CI 1.7-16.5), and shockable rhythm (OR 0.3; 95 % CI 0.1-0.9) as independent predictors of hospital mortality, but not SAPS II, out-of-hospital cardiac arrest score, or other cardiac arrest variables. Only 10 % of patients with an admission SOFA score >14 survived, whereas 50 % of those with scores ≤14 were alive at 1 year. Restricting the analysis to the 67 patients with out-of-hospital cardiac arrest of coronary cause yielded similar results.

CONCLUSION: Among 94 patients implanted with VA-ECMO for refractory cardiogenic shock post-cardiac arrest resuscitation, the 24 (27 %) 1-year survivors had good neurological outcomes, but survival was significantly better for patients with admission SOFA scores <14, shockable rhythm, and INR ≤2.4. VA-ECMO might be considered a rescue therapy for patients with refractory cardiogenic shock post-cardiac arrest resuscitation.

Disseminated intravascular coagulation with the fibrinolytic phenotype predicts the outcome of patients with out-of-hospital cardiac arrest.
Wada T1, Gando S1, Ono Y1, Maekawa K1, Katabami K1, Hayakawa M1, Sawamura A1.
Abstract
BACKGROUND: We tested the hypothesis that disseminated intravascular coagulation (DIC) during the early phase of post-cardiopulmonary resuscitation (CPR) is associated with systemic inflammatory response syndrome (SIRS), multiple organ dysfunction syndrome (MODS) and affects the outcome of out-of-hospital cardiac arrest (OHCA) patients.

METHODS: A review of the computer-based medical records of OHCA patients was retrospectively conducted and included 388 patients who were divided into DIC and non-DIC patients based on the Japanese Association for Acute Medicine DIC diagnostic criteria. DIC patients were subdivided into two groups: those with and without hyperfibrinolysis. Pre-hospital factors, platelet count, coagulation and fibrinolysis markers and lactate levels within 24 h after resuscitation were evaluated. The outcome measure was all-cause hospital mortality.

RESULTS: DIC patients exhibited lower platelet counts, prolonged prothrombin time, decreased levels of fibrinogen and antithrombin associated with increased fibrinolysis than those without DIC. DIC patients more frequently developed SIRS and MODS, followed by worse outcomes than non-DIC patients. The same changes were observed in DIC patients with hyperfibrinolysis who showed a higher prevalence of MODS, leading to worse outcome than those without hyperfibrinolysis. Logistic regression analyses showed that lactate levels predicted hyperfibrinolysis and DIC is an independent predictor of patient death. Survival probabilities of DIC patients during hospital stay were significantly lower than non-DIC patients. The area under the receiver operating characteristic curve of DIC for the prediction of death was 0.704.

CONCLUSIONS: The fibrinolytic phenotype of DIC during the early phase of post-CPR more frequently results in SIRS and MODS, especially in patients with hyperfibrinolysis, and affects the outcome of OHCA patients.

High-sensitivity troponin-T as a prognostic marker after out-of-hospital cardiac arrest - A targeted temperature management (TTM) trial substudy.
Gilje P1, Koul S2, Thomsen JH3, Devaux Y4 , Friberg H5, Kuiper M6, Horn J7, Nielsen N8, Pellis T9, Stammet P10, Wise MP11, Kjaergaard J3, Hassager C3, Erlinge D2; TTM study group.
Abstract
AIM OF THE STUDY: Predicting outcome of unconscious patients after successful resuscitation is challenging and better prognostic markers are highly needed. Ischemic heart disease is a common cause of out-of-hospital cardiac arrest (OHCA). Whether or not high-sensitivity troponin T (hs-TnT) is a prognostic marker among survivors of OHCA with both ischemic and non-ischemic aetiologies remains to be determined. We sought to evaluate the ability of hs-TnT to prognosticate all-cause mortality, death due to cardiovascular causes or multi-organ failure

and death due to cerebral causes after OHCA. The influence of the level of target temperature management on hs-TnT as a marker of infarct size was also assessed.

METHODS: A total of 699 patients from the targeted temperature management (TTM) trial were included and hs-TnT was analyzed in blood samples from 24, 48 and 72h after return of spontaneous circulation (ROSC). The endpoints were 180 day all-cause mortality, death due to cardiovascular causes or multi-organ failure and death due to cerebral causes. Subgroups based on the initial ECG after ROSC (STEMI vs all other ECG presentations) were analyzed.

RESULTS: Hs-TnT was independently associated with all-cause mortality which was driven by death due to cardiovascular causes or multi-organ failure and not cerebral causes (at 48h: OR 1.10, CI 1.01-1.20, p<0.05). Hs-TnT was also an independent predictor of death due to cardiovascular causes or multi-organ failure (at 48h: OR 1.13, CI 1.01-1.26, p<0.05). In patients with STEMI, hs-TnT was independently associated with death due to cardiovascular causes or multi-organ failure (at 48h: OR 1.47, CI 1.10-1.95, p<0.01). Targeted temperature management at 33°C was not associated with hs-TnT compared to 36°C.

CONCLUSIONS: After OHCA due to both ischemic and non-ischemic causes, hs-TnT is an independent marker of both all-cause mortality and death due to cardiovascular causes or multi-organ failure. Targeted temperature management at 33°C did not reduce hs-TnT compared to 36°C. Hs-TnT may be a marker of poor prognosis after OHCA and this should be taken into consideration in patients that present with high troponin levels.

RECERCA EXPERIMENTAL

Moderate Hypothermia Provides Better Protection of the Intestinal Barrier than Deep Hypothermia during Circulatory Arrest in a Piglet Model: A Microdialysis Study.
Liang M1, Feng K1, Yang X2, Chen G1 , Tang Z1, Lin W1, Rong J3, Wu Z1.
Abstract
INTRODUCTION: This study aimed to assess the effects of different temperature settings of hypothermic circulatory arrest (HCA) on intestinal barrier function in a piglet model.

METHODS:

Twenty Wuzhishan piglets were randomly assigned to 40 min of HCA at 18°C (DHCA group, n = 5), 40 min of HCA at 24°C (MHCA group, n = 5), normothermic cardiopulmonary bypass (CPB group, n = 5) or sham operation (SO group, n = 5). Serum D-lactate (SDL) and lipopolysaccharide (LPS) levels were determined. Microdialysis parameters (glucose, lactate, pyruvate and glycerol) in the intestinal dialysate were measured. After 180 min of reperfusion, intestinal samples were harvested for real-time polymerase chain reaction and western blotting measurements for E-cadherin and Claudin-1.

RESULTS: Higher levels of SDL and LPS were detected in the DHCA group than in the MHCA group (P < 0.001). Both MHCA and DHCA groups exhibited lower glucose levels, higher lactate and glycerol levels and a higher lactate to pyruvate (L/P) ratio compared with the CPB group (p<0.05); the DHCA group had higher lactate and glycerol levels and a higher L/P ratio (p<0.05) but similar glucose levels compared to the MHCA group. No significant differences in E-cadherin mRNA or protein levels were noted. Upregulation of claudin-1 mRNA levels was detected in both the DHCA and MHCA animals' intestines (P < 0.01), but only the DHCA group exhibited a decrease in claudin-1 protein expression (P < 0.01).

CONCLUSION: HCA altered the energy metabolism and expression of epithelial junctions in the intestine. Moderate hypothermia (24°C) was less detrimental to the markers of normal functioning of the intestinal barrier than deep hypothermia (18°C).

Comparative resuscitation measures for the treatment of desipramine overdose.
O'Sullivan JC1, Johnson AD1, Waterman MA2.
Abstract
A toxic dose of desipramine (tricyclic antidepressant) causes cardiac arrhythmias and ultimately asystole. Resuscitation is difficult and almost always unsuccessful. Anecdotal evidence suggests that an infusion of lipid emulsion may be an effective treatment. The purpose of this study was to determine the optimal combination of lipid rescue and traditional Advanced Cardiac Life

Support therapy for the treatment of desipramine overdose. We use a prospective, experimental, between subjects design with a swine model investigating the effectiveness of the drugs and drug combinations administered with cardiopulmonary resuscitation. Subjects were randomly assigned to 1 of 8 cardiopulmonary resuscitation/drug combination interventions, and the results from each group were compared using an analysis of variance and post hoc Tukey where appropriate. The groups that received vasopressin were more likely to survive than those that did not receive vasopressin, and the groups that received lipid emulsion were more likely to survive than those that did not receive lipid emulsion. Vasopressin alone was shown to be the most effective treatment in the management of desipramine overdose. The results of this study may warrant changes in treatment protocols for desipramine overdose.

RCP MECÀNICA

Successful primary PCI during prolonged continuous cardiopulmonary resuscitation with an automated chest compression device (AutoPulse).
Latsios G1, Antonopoulos A1, Vogiatzakis N1, Melidi E2, Koufakis N1, Toutouzas K1, Papaioannou S1, Tsiamis E1, Tousoulis D3.
Abstract
Missing

FEEDBACK

Analysis of actual pressure point using the power flexible capacitive sensor during chest compression.
Minami K1, Kokubo Y2, Maeda I2, Hibino S2.
Abstract
In chest compression for cardiopulmonary resuscitation (CPR), the lower half of the sternum is pressed according to the American Heart Association (AHA) guidelines 2010. These have been no studies which identify the exact location of the applied by individual chest compressions. We developed a rubber power-flexible capacitive sensor that could measure the actual pressure point of chest compression in real time. Here, we examined the pressure point of chest compression by ambulance crews during CPR using a mannequin. We included 179 ambulance crews. Chest compression was performed for 2 min. The pressure position was monitored, and the quality of chest compression was analyzed by using a flexible pressure sensor (Shinnosukekun™). Of the ambulance crews, 58 (32.4 %) pressed the center and 121 (67.6 %) pressed outside the proper area of chest compression. Many of them pressed outside the center; 8, 7, 41, and 90 pressed on the caudal, left, right, and cranial side, respectively. Average compression rate, average recoil, average depth, and average duty cycle were 108.6 counts per minute, 0.089, 4.5 cm, and 48.27 %, respectively. Many of the ambulance crews did not press on the sternal lower half definitely. This new device has the potential to improve the quality of CPR during training or in clinical practice.

REGISTRES I REVISIONS

Mild therapeutic hypothermia in patients resuscitated from out-of-hospital cardiac arrest: A meta-analysis of randomized controlled trials.
Villablanca PA, Makkiya M, Einsenberg E, Briceno DF, Panagiota C, Menegus M, Garcia M, Sims D, Ramakrishna H1.
Abstract
AIMS: Guidelines recommend mild therapeutic hypothermia (MTH) for survivors of out-of-hospital cardiac arrest (OHCA). However, there is little literature demonstrating a survival

benefit. We performed a meta-analysis of randomized controlled trials (RCTs) assessing the efficacy of MTH in patients successfully resuscitated from OHCA.

MATERIALS AND METHODS: Electronic databases were searched for RCT involving MTH in survivors of OHCA, and the results were put through a meta-analysis. The primary endpoint was all-cause mortality, and the secondary endpoint was favorable neurological function. Odds ratios (ORs) and 95% confidence intervals (CIs) were computed using the Mantel-Haenszel method. A fixed-effect model was used and, if heterogeneity (I2) was >40, effects were analyzed using a random model.

RESULTS: Six RCT (n = 1400 patients) were included. Overall survival was 50.7%, and favorable neurological recovery was 45.5%. Pooled data demonstrated no significant all-cause mortality (OR, 0.81; 95% CI 0.55-1.21) or neurological recovery (OR, 0.77; 95% CI 0.47-1.24). No evidence of publication bias was observed.

CONCLUSION: This meta-analysis demonstrated that MTH did not confer benefit on overall survival rate and neurological recovery in patients resuscitated from OHCA.

Unmanned aerial vehicles (drones) in out-of-hospital-cardiac-arrest.
Claesson A1, Fredman D2, Svensson L2, Ringh M2, Hollenberg J2, Nordberg P2, Rosenqvist M3, Djarv T2, Österberg S2, Lennartsson J4, Ban Y4.
Abstract
BACKGROUND: The use of an automated external defibrillator (AED) prior to EMS arrival can increase 30-day survival in out-of-hospital cardiac arrest (OHCA) significantly. Drones or unmanned aerial vehicles (UAV) can fly with high velocity and potentially transport devices such as AEDs to the site of OHCAs. The aim of this explorative study was to investigate the feasibility of a drone system in decreasing response time and delivering an AED.

METHODS: Data of Global Positioning System (GPS) coordinates from historical OHCA in Stockholm County was used in a model using a Geographic Information System (GIS) to find suitable placements and visualize response times for the use of an AED equipped drone. Two different geographical models, urban and rural, were calculated using a multi-criteria evaluation (MCE) model. Test-flights with an AED were performed on these locations in rural areas.

RESULTS: In total, based on 3,165 retrospective OHCAs in Stockholm County between 2006-2013, twenty locations were identified for the potential placement of a drone. In a GIS-simulated model of urban OHCA, the drone arrived before EMS in 32 % of cases, and the mean amount of time saved was 1.5 min. In rural OHCA the drone arrived before EMS in 93 % of cases with a mean amount of time saved of 19 min. In these rural locations during (n = 13) test flights, latch-release of the AED from low altitude (3-4 m) or landing the drone on flat ground were the safest ways to deliver an AED to the bystander and were superior to parachute release.

DISCUSSION: The difference in response time for EMS between urban and rural areas is substantial, as is the possible amount of time saved using this UAV-system. However, yet another technical device needs to fit into the chain of survival. We know nothing of how productive or even counterproductive this system might be in clinical reality.

CONCLUSIONS: To use drones in rural areas to deliver an AED in OHCA may be safe and feasible. Suitable placement of drone systems can be designed by using GIS models. The use of an AED equipped drone may have the potential to reduce time to defibrillation in OHCA.

Description of the ambulance services participating in the Aus-ROC Australian and New Zealand out-of-hospital cardiac arrest Epistry.
Beck B1, Bray JE2,3, Smith K2,4,5, Walker T4, Grantham H6,7, Hein C6,7, Thorrowgood M7, Smith A8, Inoue M3, Smith T9, Dicker B9,10, Swain A10,11,12, Bosley E13,14, Pemberton K13, Mckay M 15, Johnston-Leek M15, Cameron P2,16, Perkins GD17, Finn J2,3,5,8; Aus-ROC Steering Committee.
Abstract
OBJECTIVE: The present study aimed to describe and examine similarities and differences in the current service provision and resuscitation protocols of the ambulance services participating in the Aus-ROC Australian and New Zealand out-of-hospital cardiac arrest (OHCA) Epistry.

Understanding these similarities and differences is important in identifying ambulance service factors that might explain regional variation in survival of OHCA in the Aus-ROC Epistry.

METHODS: A structured questionnaire was completed by each of the ambulance services participating in the Aus-ROC Epistry. These ambulance services were SA Ambulance Service, Ambulance Victoria, St John Ambulance Western Australia, Queensland Ambulance Service, St John Ambulance NT, St John New Zealand and Wellington Free Ambulance. The survey aimed to describe ambulance service and dispatch characteristics, resuscitation protocols and details of cardiac arrest registries.

RESULTS: We observed similarities between services with respect to the treatment of OHCA and dispatch systems. Differences between services were observed in the serviced population; the proportion of paramedics with basic life support, advanced life support or intensive care training skills; the number of OHCA cases attended; guidelines related to withholding or terminating resuscitation attempts; and the variables that might be used to define 'attempted resuscitation'. All seven participating ambulance services were noted to have existing OHCA registries.

CONCLUSION: There is marked variation between ambulance services currently participating in the Aus-ROC Australian and New Zealand OHCA Epistry with respect to workforce characteristics and key variable definitions. This variation between ambulance services might account for a proportion of the regional variation in survival of OHCA.

Incidence and clinical features of intracranial hemorrhage causing out-of-hospital cardiac arrest: a multicenter retrospective study.
Shin J1, Kim K2, Lim YS3, Lee HJ 1, Lee SJ1, Jung E1, Kim J4, Yang HJ3, Kim JJ3, Hwang SY5.
Abstract
OBJECTIVE: The general incidence of intracranial hemorrhage (ICH) as a cause of out-of-hospital cardiac arrest (OHCA) remains unclear, although the incidence of subarachnoid hemorrhage has been determined to be 4% to 18%. The main objectives of our study were to describe the incidence of ICH in OHCA and the different laboratory findings between ICH and non-ICH groups.

METHODS: A retrospective cohort study using the prospective OHCA registry was conducted at three university hospitals in Korea. All cases of OHCA that occurred over a period of 6 years, from January 2009 to December 2014, were examined. Pre-hospital and in-hospital variables and laboratory data taken during CPR were examined in order to compare the ICH and non-ICH groups.

RESULTS: A total of 2716 patients with OHCA were registered in the database. Among the 804 patients included in the final analysis, ICH was the cause of cardiac arrest in 92 patients (11.4%). Of those with ICH, 79 (86%) patients also had subarachnoid hemorrhage. No patient had a good neurological outcome in the ICH group. There were statistically significant differences in gender, age, pre-hospital return of spontaneous circulation, survival to hospital discharge, good neurologic outcomes, serum sodium, potassium, glucose, Pco2, and Po2 during CPR between the ICH and non-ICH groups. In multivariate analysis, gender, age, potassium, glucose and Po2 levels differed significantly between the two groups.

CONCLUSIONS: OHCA patients with confirmed ICH were identified in about 11% of cases after return of spontaneous circulation. Gender, age, higher glucose, and lower potassium and Po2 levels during CPR were associated with ICH.

2015 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death: The Task Force for the Management of Patients with Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death of the European Society of Cardiology (ESC). Endorsed by: Association for European Paediatric and Congenital Cardiology (AEPC).
Priori SG, Blomström-Lundqvist C, Mazzanti A, Blom N, Borggrefe M, Camm J, Elliott PM, Fitzsimons D, Hatala R, Hindricks G, Kirchhof P, Kjeldsen K, Kuck KH, Hernandez-Madrid A, Nikolaou N, Norekvål TM, Spaulding C, Van Veldhuisen DJ.
Abstract
Missing

Are Chinese Students Willing to Learn and Perform Bystander Cardiopulmonary Resuscitation?
Huang Q1, Hu C1, Mao J1.
Abstract
BACKGROUND: Immediate cardiopulmonary resuscitation (CPR) can improve survival rate from cardiac arrest and students are potentially important bystander CPR providers.
OBJECTIVE: Our aim was to investigate the willingness among Chinese students to learn and perform bystander CPR.
METHODS: Questionnaires were distributed to 1407 students. The survey investigated the willingness to learn and perform bystander CPR and the barriers to performing CPR on family members and strangers, assuming that students had mastered CPR.
RESULTS: Only 14.6% of respondents reported having ever attended CPR training classes, however, 88.3% expressed their willingness to learn. The main characteristics of the students who were willing to learn were the following: they considered the development of the local emergency system excellent (odds ratio [OR] = 3.15); cardiovascular diseases were present within their family (OR = 2.74); and they had previously heard about CPR (OR = 2.43). Almost all respondents (94.6%) reported that they would conduct bystander CPR on family members, while only 59.7% of respondents would do it for strangers. A lack of confidence was the principal barrier to doing CPR for family members (78.4%) and the leading barrier to stranger CPR was the fear of legal liability if their lifesaving attempts failed (90.8%). The complicated process of performing CPR was also a major barrier in both scenarios.
CONCLUSIONS: When there is a great desire to learn CPR, the rate and effect of training can be significantly improved by providing students with regular CPR training, especially compression-only CPR training. Training classes should focus on enhancing the participants' confidence. In addition, legislation by the government is needed to protect the rescuers.

CURES POST ROSC

What is the value of regional cerebral saturation in post-cardiac arrest patients? A prospective observational study.
Genbrugge C1,2, Eertmans W3,4, Meex I4, Van Kerrebroeck M3,4, Daems N3,4, Creemers A5, Jans F3,4, Boer W4, Dens J3,6, De Deyne C3,4 .
Abstract
BACKGROUND: The aim of this study was to elucidate the possible role of cerebral saturation monitoring in the post-cardiac arrest setting.
METHODS: Cerebral tissue saturation (SctO2) was measured in 107 successfully resuscitated out-of-hospital cardiac arrest patients for 48 hours between 2011 and 2015. All patients were treated with targeted temperature management, 24 hours at 33 °C and rewarming at 0.3 °C per hour. A threshold analysis was performed as well as a linear mixed models analysis for continuous SctO2 data to compare the relation between SctO2 and favorable (cerebral performance category (CPC) 1-2) and unfavorable outcome (CPC 3-4-5) at 180 days post-cardiac arrest in OHCA patients.
RESULTS: Of the 107 patients, 50 (47 %) had a favorable neurological outcome at 180 days post-cardiac arrest. Mean SctO2 over 48 hours was 68 % ± 4 in patients with a favorable outcome compared to 66 % ± 5 for patients with an unfavorable outcome (p = 0.035). No reliable SctO2 threshold was able to predict favorable neurological outcome. A significant different course of SctO2 was observed, represented by a logarithmic and linear course of SctO2 in patients with favorable outcome and unfavorable outcome, respectively (p < 0.001). During the rewarming phase, significant higher SctO2 values were observed in patients with a favorable neurological outcome (p = 0.046).
CONCLUSIONS: This study represents the largest post-resuscitation cohort evaluated using NIRS technology, including a sizeable cohort of balloon-assisted patients. Although a significant difference was observed in the overall course of SctO2 between OHCA patients with a favorable and unfavorable outcome, the margin was too small to likely represent functional outcome

differentiation based on SctO2 alone. As such, these results given such methodology as performed in this study suggest that NIRS is insufficient by itself to serve in outcome prognostication, but there may remain benefit when incorporated into a multi-neuromonitoring bedside assessment algorithm.

Dealing with a life changing event: the influence of spirituality and coping style on quality of life after survival of a cardiac arrest or myocardial infarction.

Wachelder EM1, Moulaert VR2, van Heugten C3, Gorgels T4, Wade DT5, Verbunt JA2.

Abstract

BACKGROUND: Survivors of a cardiac arrest often have cognitive and emotional problems. As a cardiac arrest is also an obvious life-threatening event, other psychological sequelae associated with surviving such as spirituality may also affect quality of life.

OBJECTIVES: To determine the relationship between spirituality, coping and quality of life in cardiac patients both with and without a cardiac arrest.

METHODS: In this retrospective cohort study, participants received a questionnaire by post. The primary outcome measure was quality of life (LiSat-9). Secondary outcome measures were spiritual well-being (FACIT-Sp12), coping style (UPCC), emotional well-being (HADS, IES), fatigue (FSS) and daily activities (FAI). Statistical analyses included multiple regression analyses.

RESULTS: Data were available from 72 (60% response rate) cardiac arrest survivors and 98 (47%) patients with a myocardial infarction. Against our hypothesis, there were no differences in spirituality or other variables between the groups, with the exception of more depressive symptoms in patients with myocardial infarction without arrest. Analysis of the total data set (170 participants) found that a better quality of life was associated with higher levels of meaning and peace in life, higher levels of social and leisure activities, and lower levels of fatigue.

CONCLUSIONS: Quality of life after a cardiac arrest and after a myocardial infarction without arrest are not different; fatigue, a sense of meaning and peace, and level of extended daily activities are factors related to higher life satisfaction.

DESFIBRIL·LACIÓ I ELECTROFISIOLOGIA

A Magnetic Resonance Imaging-Conditional External Cardiac Defibrillator for Resuscitation Within the Magnetic Resonance Imaging Scanner Bore.

Schmidt EJ1, Watkins RD2, Zviman MM2, Guttman MA2, Wang W2, Halperin HA2.

Abstract

BACKGROUND: Subjects undergoing cardiac arrest within a magnetic resonance imaging (MRI) scanner are currently removed from the bore and then from the MRI suite, before the delivery of cardiopulmonary resuscitation and defibrillation, potentially increasing the risk of mortality. This precludes many higher-risk (acute ischemic and acute stroke) patients from undergoing MRI and MRI-guided intervention. An MRI-conditional cardiac defibrillator should enable scanning with defibrillation pads attached and the generator ON, enabling application of defibrillation within the seconds of MRI after a cardiac event. An MRI-conditional external defibrillator may improve patient acceptance for MRI procedures.

METHODS AND RESULTS: A commercial external defibrillator was rendered 1.5 Tesla MRI-conditional by the addition of novel radiofrequency filters between the generator and commercial disposable surface pads. The radiofrequency filters reduced emission into the MRI scanner and prevented cable/surface pad heating during imaging, while preserving all the defibrillator monitoring and delivery functions. Human volunteers were imaged using high specific absorption rate sequences to validate MRI image quality and lack of heating. Swine were electrically fibrillated (n=4) and thereafter defibrillated both outside and inside the MRI bore. MRI image quality was reduced by 0.8 or 1.6 dB, with the generator in monitoring mode and operating on battery or AC power, respectively. Commercial surface pads did not create artifacts deeper than 6 mm below the skin surface. Radiofrequency heating was within US Food and Drug

Administration guidelines. Defibrillation was completely successful inside and outside the MRI bore.

CONCLUSIONS: A prototype MRI-conditional defibrillation system successfully defibrillated in the MRI without degrading the image quality or increasing the time needed for defibrillation. It can increase patient acceptance for MRI procedures.

Medium-term outcomes of idiopathic ventricular fibrillation survivors and family screening: a multicentre experience.

Honarbakhsh S1, Srinivasan N1, Kirkby C1, Firman E1, Tobin L1, Finlay M1, Hunter RJ1, Murphy C2, Lowe MD1, Schilling RJ1, Lambiase PD3.

Abstract

AIMS: Early repolarization (ER) has been linked to poorer outcomes in idiopathic ventricular fibrillation (IVF). The role of family screening in IVF is not clear. Our aim was to review predictors for poorer outcomes and evaluate the role of family screening in IVF.

METHODS AND RESULTS: This was a retrospective multicentre cohort study including all patients diagnosed with IVF. Data were collected on baseline characteristics, ECG findings, and recurrence of ventricular arrhythmia (VA) during follow-up. Electrocardiogram findings were reviewed in first-degree relatives that were screened. A total of 66 patients were included with male predominance (42/66, 64%) and Caucasian ethnicity (47/66, 71%). Mean age at cardiac arrest was 38 years ± 11. Thirty-one patients had ER (47%) predominantly with J-point amplitude ≥2 mm and horizontal ST segments (18/31, 58%). Recurrent VA was seen in 13 patients (20%). Horizontal ST segments were associated with increased rates of VA recurrence (OR 11, 95% CI 2.7-43.7; P = 0.0007). Early repolarization was seen in 20% of the 72 first-degree relatives and was more common if the proband had persistent ER pattern (OR 10.7, 95% CI 2.2-51.5; P = 0.003).

CONCLUSION: Ventricular arrhythmia recurrence was lower than previously reported. Early repolarization was common in this IVF cohort, and horizontal ST segments were suggestive predictor for poorer outcomes. Persistent ER in proband was associated with ER in first-degree relatives. With better understanding of its predictive value and the relationship to IVF, this information could potentially be used to guide family screening and identify new mutations using family members with persistent ER

Long-Term Outcome of Patients Initially Diagnosed With Idiopathic Ventricular Fibrillation: A Descriptive Study.

Visser M1, van der Heijden JF2, van der Smagt JJ2, Doevendans PA 2, Wilde AA2, Loh P2, Hassink RJ2.

Abstract

BACKGROUND: Idiopathic ventricular fibrillation (IVF) is a rare cause of sudden cardiac arrest. Limited data are available on the long-term outcome of IVF patients.

METHODS AND RESULTS: In this retrospective cohort study, 107 consecutive patients with an initial diagnosis of IVF were analyzed (age at index event 40.4 years, 60% male). Missing diagnostic data were acquired during follow-up, including genetic testing, to exclude underlying disease. A specific diagnosis was revealed in 22 of 107 patients (21%) during a median follow-up of 10.2 years. Mortality rate was 9% in IVF patients (8/85). Appropriate implantable cardioverter-defibrillator therapy was delivered in 23 patients (29%) of 78 IVF patients with an implantable cardioverter-defibrillator, with a median of 3 appropriate shocks per patient.

CONCLUSIONS: One fifth of the patients initially diagnosed with IVF reveal a specific diagnosis during long-term follow-up. Additional diagnostic testing, including genetic testing, contributes to the detection of specific diseases. The recurrence rate of ventricular arrhythmias in IVF patients is high. Our data show the importance of thorough follow-up and reassessment of diagnosis in IVF patients.

Ventricular Fibrillation in a General Population - A National Database Study.

Tseng WC1, Wu MH, Chen HC, Kao FY, Huang SK.

Abstract

BACKGROUND: Ventricular fibrillation (VF) is a life-threatening disease that can be remedied by prompt defibrillation. However, data regarding such risk in a general population remain limited. This general population study was to explore the epidemiological profile of VF.Methods and Results:We investigated patients with VF younger than 60 years (average population, 19,725,031) using a national database spanning the period 2000-2010. We identified 3,971 (68.4% male) patients with VF (crude incidence rate: 1.83/100,000). Incidence rates were low in patients younger than 10 years and increased steadily after adolescence. Comorbidities were noted in 2,766 (69.7%) patients, with 2,431 (61%) having cardiac diseases. Over half of the adolescent and young adult patients did not have comorbidities. Among the 838 deaths (mortality rate 21.1%), approximately half (381/838, 45.5%) occurred after arrival at emergency services (ES). The proportion of deaths after arrival at ES relative to total deaths increased sharply to a peak in the 15-19-years age group and thereafter remained stationary.

CONCLUSIONS: VF patients, with a male dominance, increased after adolescence and were likely to die at presentation to ES. Approximately half of young adults, with high mortality, did not have comorbidities, suggesting underdiagnosis of underlying primary electrical diseases and the need for implementing automated external defibrillator programs.

Free Article

DONACIÓ D'ÒRGANS

Positive impact of a clinical goal-directed protocol on reducing cardiac arrests during potential brain-dead donor maintenance.

Westphal GA1,2,3,4,5,6, Coll E7, de Souza RL8, Wagner S8, Montemezzo A9, Cani de Souza FC9, Torres G9, Halla S8, Carnin TC8, Machado MC 10, Berbigier E11, Busetto F12, Bittencourt I13, Gerent K14, de Souza BS15, Tassinari M16 , de Andrade J8.

Abstract

BACKGROUND: The disproportion between the large organ demand and the low number of transplantations performed represents a serious public health problem worldwide. Reducing the loss of transplantable organs from deceased potential donors as a function of cardiac arrest (CA) may contribute to an increase in organ donations. Our purpose was to test the hypothesis that a goal-directed protocol to guide the management of deceased donors may reduce the losses of potential brain-dead donors (PBDDs) due to CA.

METHODS: The quality improvement project included 27 hospitals that reported deceased donors prospectively to the Transplant Center of the State of Santa Catarina, Brazil. All deceased donors reported prospectively between May 2012 and April 2014 were analyzed. Hospitals were encouraged to use the VIP approach checklist during the management of PBDDs. The checklist was composed of the following goals: protocol duration 12-24 hours, temperature > 35 °C, mean arterial pressure ≥ 65 mmHg, diuresis 1-4 ml/kg/h, corticosteroids, vasopressin, tidal volume 6-8 ml/kg, positive end-expiratory pressure 8-10 cmH2O, sodium < 150 mEq/L, and glycemia < 180 mg/dl. A logistic regression model was used to identify predictors of CA.

RESULTS: There were 726 PBDD notifications, of which 324 (44.6) were actual donors, 141 (19.4 %) CAs, 226 (31.1 %) family refusals, and 35 (4.8 %) contraindications. Factors associated with CA reduction included use of the checklist (odds ratio (OR) 0.43, p < 0.001), maintenance performed inside the ICU (OR 0.49, p = 0.013), and vasopressin administration (OR 0.56, p = 0.04). More than three interventions had association with less CAs (OR 0.19, p < 0.001). After 24 months, CAs decreased from 27.3 % to 14.6 % (p = 0.002), reaching 12.1 % in the following two 4-month periods (p < 0.001). Simultaneous increases in organ recovered per donor and in actual donors were observed.

CONCLUSIONS: A quality improvement program based on education and the use of a goal checklist for the management of potential donors inside the ICU is strongly associated with a decrease in donor losses and an increase in organs recovered per donor.

PEDIATRIA

Neurologic Injury Associated with Rewarming from Hypothermia: Is Mild Hypothermia on Bypass Better than Deep Hypothermic Circulatory Arrest?
Bhalala US1, Appachi E1, Mumtaz MA1.
Abstract
Many known risk factors for adverse cardiovascular and neurological outcomes in children with congenital heart defects (CHD) are not modifiable; however, the temperature and blood flow during cardiopulmonary bypass (CPB), are two risk factors, which may be altered in an attempt to improve long-term neurological outcomes. Deep hypothermic circulatory arrest, traditionally used for aortic arch repair, has been associated with short-term and long-term neurologic sequelae. Therefore, there is a rising interest in using moderate hypothermia with selective antegrade cerebral blood flow on CPB during aortic arch repair. Rewarming from moderate-to-deep hypothermia has been shown to be associated with neuronal injury, neuroinflammation, and loss of cerebrovascular autoregulation. A significantly lesser degree of rewarming is required following mild (33-35°C) hypothermia as compared with moderate (28-32°C), deep (21-27°C), and profound (less than 20°C) hypothermia. Therefore, we believe that mild hypothermia is associated with a lower risk of rewarming-induced neurologic injury. We hypothesize that mild hypothermia with selective antegrade cerebral perfusion during CPB for neonatal aortic arch repair would be associated with improved neurologic outcome.

Exploring the Safety and Efficacy of Targeted Temperature Management amongst Infants with Out-of-Hospital Cardiac Arrest due to Apparent Life Threatening Events.
Meert K1, Telford R2, Holubkov R2, Slomine BS3, Christensen JR3, Dean JM2, Moler FW4.
Abstract
OBJECTIVE: To explore the safety and efficacy of targeted temperature management amongst infants with out-of-hospital cardiac arrest due to an apparent life threatening event (ALTE) recruited to the Therapeutic Hypothermia after Paediatric Cardiac Arrest Out-of-Hospital trial.
METHODS: Fifty-four infants (48hours to <1year of age) with ALTE who received chest compressions for ≥2minutes, were comatose, and required mechanical ventilation after return of circulation were included. Infants were randomised to therapeutic hypothermia (33°C) (n=26) or therapeutic normothermia (36.8°C) (n=28) within six hours of return of circulation. Outcomes included 12-month survival with Vineland Adaptive Behaviour Scales, Second Edition (VABS-II) score ≥70, 12-month survival, change in VABS-II score from pre-arrest to 12 months post-arrest, and select safety measures.
RESULTS: Amongst infants with pre-arrest VABS-II ≥70 (n=52), there was no difference in 12-month survival with VABS-II ≥70 between therapeutic hypothermia and therapeutic normothermia groups (2/25 (8.0%) vs. 1/27 (3.7%); relative risk 2.16; 95% confidence interval 0.21-22.38, p=0.60). Amongst all evaluable infants (n=53), the change in VABS-II score from pre-arrest to 12 months post-arrest did not differ (p=0.078) between therapeutic hypothermia and therapeutic normothermia groups, nor did 12-month survival (5/26 (19.2%) vs.1/27 (3.7%); relative risk 5.19; 95% confidence interval 0.65-41.50, p=0.10).
CONCLUSIONS: Mortality was high amongst infants that were comatose after out-of-hospital cardiac arrest due to ALTE in both therapeutic hypothermia and therapeutic normothermia treated groups. Functional status was markedly reduced among survivors. (ClinicalTrials.gov, NCT00878644).

The Use of Extracorporeal Membrane Oxygenation-Cardiopulmonary Resuscitation in Prolonged Cardiac Arrest in Pediatric Patients. Is it Time to Expand It?
Absi M1, Kumar ST, Sandhu H.
Abstract
Extracorporeal membrane oxygenation was instituted as an aid to in-hospital cardiopulmonary resuscitation (E-CPR) nearly 23 years ago, this led to remarkable improvement in survival considering the mortality rate associated with conventional cardiopulmonary resuscitation (CPR). Given this success, one begins to wonder whether the time has come for expanding the

use of E-CPR to outside hospital cardiac arrests especially in the light of development of newer extracorporeal life support devices that are small, mobile, and easy to assemble. This editorial will review recent studies on this subject and address some key guidelines and limitations of this evolving and promising technology.

Underweight Status Is an Independent Predictor of In-Hospital Mortality in Pediatric Patients on Extracorporeal Membrane Oxygenation.
Anton-Martin P1, Papacostas M2, Lee E3, Nakonezny PA4, Green ML2.
Abstract

BACKGROUND: Malnutrition is associated with an increased risk of mortality in patients admitted to the intensive care unit. Children requiring extracorporeal membrane oxygenation (ECMO) support represent an extremely ill subset of this population. There is a lack of data on the impact of nutrition state on survival in this cohort. We examined the association between being underweight and in-hospital mortality among children supported with ECMO.

MATERIALS AND METHODS: This article reports on an observational retrospective cohort study performed among neonatal and pediatric patients supported with ECMO in a tertiary children's hospital from May 1996 through June 2013. Nutrition status on intensive care unit admission was defined with z scores on weight for length and body mass index.

RESULTS: Patients (N = 491) had a median age of 31 days (interquartile range, 2-771): 24.4% were underweight, and 8.9% were obese. During ECMO support, 88.3% received total parenteral nutrition, and 30.3% received enteral nutrition. Median maximum energy intake while receiving ECMO was 82 kcal/kg/d (interquartile range, 54.7-105). Multiple logistic regression showed that underweight status was associated with increased predicted odds of in-hospital mortality when compared with normal weight (odds ratio: 1.99, 95% confidence interval: 1.21-3.25, P = .006). Other factors associated with increased odds of mortality included extracorporeal cardiopulmonary resuscitation and the need for continuous renal replacement therapy.

CONCLUSION: Underweight status was an independent predictor for in-hospital mortality in our cohort of pediatric ECMO patients. Prospective studies evaluating the impact of metabolic state of children on ECMO should further define this relationship.

RECERCA EXPERIMENTAL

The Responses of Tissues from the Brain, Heart, Kidney, and Liver to Resuscitation following Prolonged Cardiac Arrest by Examining Mitochondrial Respiration in Rats.
Kim J1, Villarroel JP1, Zhang W1, Yin T1, Shinozaki K1, Hong A2, Lampe JW1, Becker LB1.
Abstract

Cardiac arrest induces whole-body ischemia, which causes damage to multiple organs. Understanding how each organ responds to ischemia/reperfusion is important to develop better resuscitation strategies. Because direct measurement of organ function is not practicable in most animal models, we attempt to use mitochondrial respiration to test efficacy of resuscitation on the brain, heart, kidney, and liver following prolonged cardiac arrest. Male Sprague-Dawley rats are subjected to asphyxia-induced cardiac arrest for 30 min or 45 min, or 30 min cardiac arrest followed by 60 min cardiopulmonary bypass resuscitation. Mitochondria are isolated from brain, heart, kidney, and liver tissues and examined for respiration activity. Following cardiac arrest, a time-dependent decrease in state-3 respiration is observed in mitochondria from all four tissues. Following 60 min resuscitation, the respiration activity of brain mitochondria varies greatly in different animals. The activity after resuscitation remains the same in heart mitochondria and significantly increases in kidney and liver mitochondria. The result shows that inhibition of state-3 respiration is a good marker to evaluate the efficacy of resuscitation for each organ. The resulting state-3 respiration of brain and heart mitochondria following resuscitation reenforces the need for developing better strategies to resuscitate these critical organs following prolonged cardiac arrest.

CASE REPORTS

Decision-making in a patient with cardiac arrest due to venous thromboembolism within 24 h after glioblastoma resection.

Dubinski D1, Won SY2, Bruder M2, Forster MT2, Seifert V2, Senft C2, Berkefeld J3, Mersmann J2,4.

Abstract

In the fulminant VTE form with cardiac arrest, systemic thrombolysis remains the most effective therapy. However, several contraindications restrict the use such as intracranial neoplasm or a recent history of intracranial surgery. Here, we report the case of a 59-year-old man who underwent glioblastoma resection and suffered from a fulminant pulmonary embolism with cardiac arrest. After CPR, continuous tPA infusion via an endovascularly placed pulmonary catheter was maintained over a period of 8 h. In this case, we report on our decision-making process and the use of local thrombolysis as a successful therapy in a patient with multiple contraindications

Fulminant myocarditis as a primary manifestation of H1N1 infection: A first reported case from Serbia.

Davidović G1, Simović S2, Mitrović S3, Irić-Ćupić V4, Miloradović V4.

Abstract

A 19-year-old male was admitted to our clinic with a diagnosis of suspected acute pericarditis and acute coronary syndrome. The initial diagnostics at our clinic revealed fulminant myocarditis. Twenty-four hours after admission, the patient's condition deteriorated, and he required mechanical ventilation and cardiopulmonary resuscitation. Unfortunately, the patient died. Clinical course, postmortem pathohistological findings and virus serology indicated that an H1N1 viral caused fulminant myocarditis and was the primary manifestation.